Australian Government
Australian Transport Safety Bureau

Separation occurrence involving Airbus A320-232, VH-VGP and Jabiru J230D, 24-7456

Near Ballina Byron Gateway Airport, New South Wales, 28 November 2020

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Postal address: PO Box 967, Civic Square ACT 2608
Office: 12 Moore Street Canberra, ACT 2601
Telephone: 1800 020 616, from overseas +61 2 6257 2463
Accident and incident notification: 1800 011 034 (24 hours)
Email: atsbinfo@atsb.gov.au
Website: www.atsb.gov.au

Addendum

Page	Change	Date

Safety summary

What happened

On the morning of 28 November 2020, a Jetstar Airways Airbus A320, registered VH-VGP (VGP), was conducting an approach to land at Ballina Byron Gateway Airport, New South Wales (NSW). At the same time, a Jabiru J230D, registered 24-7456 (7456), was conducting a private flight from Heck Field, Queensland, to Evans Head, NSW. About 12 NM south-west of Ballina Airport, the flight paths of the two aircraft inadvertently intersected. The crew of VGP received a traffic collision avoidance system (TCAS) traffic advisory alert prior to passing beneath 7456. The vertical separation between the two aircraft reduced to about 600 ft. Both the pilot of 7456 and the flight crew of VGP observed no lateral separation between the two aircraft.

What the ATSB found

The ATSB's investigation identified that the pilot of 7456 was not aware of the presence of VGP, or that the two aircraft were converging, until having passed above VGP. The flight crew of VGP were also unaware of the presence of 7456 until they were alerted to the impending conflict by the aircraft's TCAS. The ATSB also found the pilot of 7456 did not set the aircraft's transponder to broadcast altitude data. Consequently, the TCAS on board VGP was unable to provide the flight crew with the necessary information to positively avoid the potential collision. The flight crew of VGP were unable to sight the aircraft until just before the flight paths intersected. The vertical separation between the two aircraft was influenced by chance alone as the flight crew of VGP and the pilot of 7456 were not aware of the altitude of the opposing aircraft.

The ATSB also found that the most recent regulatory review of the airspace surrounding Ballina Byron Gateway Airport, and subsequent periodic reviews, had not specifically considered the risks associated with aircraft transiting the airspace without taking off or landing at the airport (such as 7456).

What has been done as a result

The Ballina Airport broadcast area was expanded to a radius of 15 NM in January 2021 and an Airservices Australia surveillance flight information service (SFIS) began operating in August 2021. The SFIS provided traffic information to aircraft operating within the broadcast area on the airport's common traffic advisory frequency.

The Civil Aviation Safety Authority (CASA) has advised that the current Ballina Airport airspace review (due for release in February 2022) utilises data that includes transiting aircraft. Additionally, CASA has developed an airspace risk modelling system (ARMS) that should provide an enhanced capability to consider transiting aircraft. CASA also advised that an initiative by the Australian Government to increase the uptake of automatic dependent surveillance broadcast (ADS-B) equipment in general aviation would result in improved aircraft detection.

While the proposed CASA actions have the potential to address the safety issue, this will largely depend on the conclusions of the current Ballina Airport airspace review and the effectiveness of the new ARMS. As such, the ATSB will monitor and assess their effect on the safety issue.

Safety message

Communication and self-separation in non-controlled airspace is one of the ATSB's *SafetyWatch* priorities. Pilots can guard against similar issues to those highlighted by this incident by:

- making the recommended broadcasts when in the vicinity of a non-controlled aerodrome

- actively monitoring the common traffic advisory frequency while maintaining a visual lookout for other aircraft
- ensuring transponders, where fitted, are selected to transmit altitude information.

Contents

The occurrence

On the morning of 28 November 2020, a Jetstar Airways Airbus A320-232 aircraft, registered VH-VGP (VGP) (Figure 1), was conducting a scheduled passenger service from Melbourne Airport, Victoria, to Ballina Byron Gateway Airport (Ballina Airport), New South Wales (NSW). There were two flight crew, five cabin crew and 163 passengers on board. The captain was pilot flying (PF) and the first officer (FO) was pilot monitoring.[1]

Figure 1: VH-VGP

Source: Supplied

At about 1122 Eastern Daylight-saving Time,[2] when VGP was approximately 40 NM to the south-west of Ballina Airport, the FO made a positional broadcast on the Ballina Airport common traffic advisory frequency (CTAF).[3] This CTAF was also used by two neighbouring airports and several neighbouring aircraft landing areas (ALAs) (see the section titled *Common traffic advisory frequency*).

On receipt of the broadcast from VGP, the Ballina Airport certified air/ground radio operator (CA/GRO) (see the section titled *Certified air/ground radio service*) responded. The CA/GRO confirmed that the flight crew were aware of two other passenger services, an Airbus A320 aircraft departing to the south from runway 06 at Ballina Airport, and a Boeing 737 inbound to Ballina Airport from the south.

At about the same time, a Jabiru J230D aircraft, registered 24-7456 (7456) (Figure 2), was conducting a private visual flight rules flight from Heck Field ALA, Queensland, to Evans Head ALA, NSW. There was one pilot and one passenger on board. At 1124:49, the pilot of 7456 made a broadcast on the shared CTAF, addressed to Lismore traffic, advising that the aircraft was 4 NM

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1 Pilot Flying (PF) and Pilot Monitoring (PM): procedurally assigned roles with specifically assigned duties at specific stages of a flight. The PF does most of the flying, except in defined circumstances; such as planning for descent, approach and landing. The PM carries out support duties and monitors the PF's actions and the aircraft's flight path.

2 Eastern Daylight-saving Time (EDT): Universal Coordinated Time (UTC) +11 hours.

3 A common traffic advisory frequency is a designated frequency on which pilots make positional broadcasts when operating in the vicinity of a non-controlled airport or within a broadcast area.

to the east of Lismore at 5,300 feet and descending. The flight crew of VGP did not respond to (or recall hearing) this broadcast.

Figure 2: 24-7456

Source: Andrei Bezmylov

Meanwhile, VGP continued tracking towards Ballina Airport via the waypoint[4] OPESO, descending to an altitude of about 3,200 feet in preparation for the required navigation performance[5] approach for runway 06. Prior to crossing the OPESO waypoint, the flight crew of VGP received a traffic collision avoidance system (TCAS) proximate traffic alert for an unidentified aircraft at an unspecified altitude in the 11 o'clock[6] position relative to VGP (see the section titled *Traffic collision avoidance system*). Unbeknown to the flight crew of VGP, the proximate traffic was 7456 tracking in a southerly direction towards Evans Head (Figure 3).

[4] A waypoint is a specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation.

[5] A statement of the navigation performance necessary for operation within a defined airspace.

[6] The position of an object or location relative to the aircraft with 12 o'clock considered the dead-ahead position.

Figure 3: VH-VGP and 24-7456 tracks

Source: Google Earth, annotated by the ATSB

The pilot of 7456 did not recall hearing the earlier CTAF broadcast from VGP and was unaware that the two aircraft were on converging tracks. 7456 was fitted with a transponder that could transmit the aircraft's altitude (see the section titled *Transponder*). However, 7456's transponder was selected 'ON' (not ALT) and was not transmitting the altitude of the aircraft.

Without the altitude information, the TCAS on board VGP could only display the relative bearing and distance of 7456.

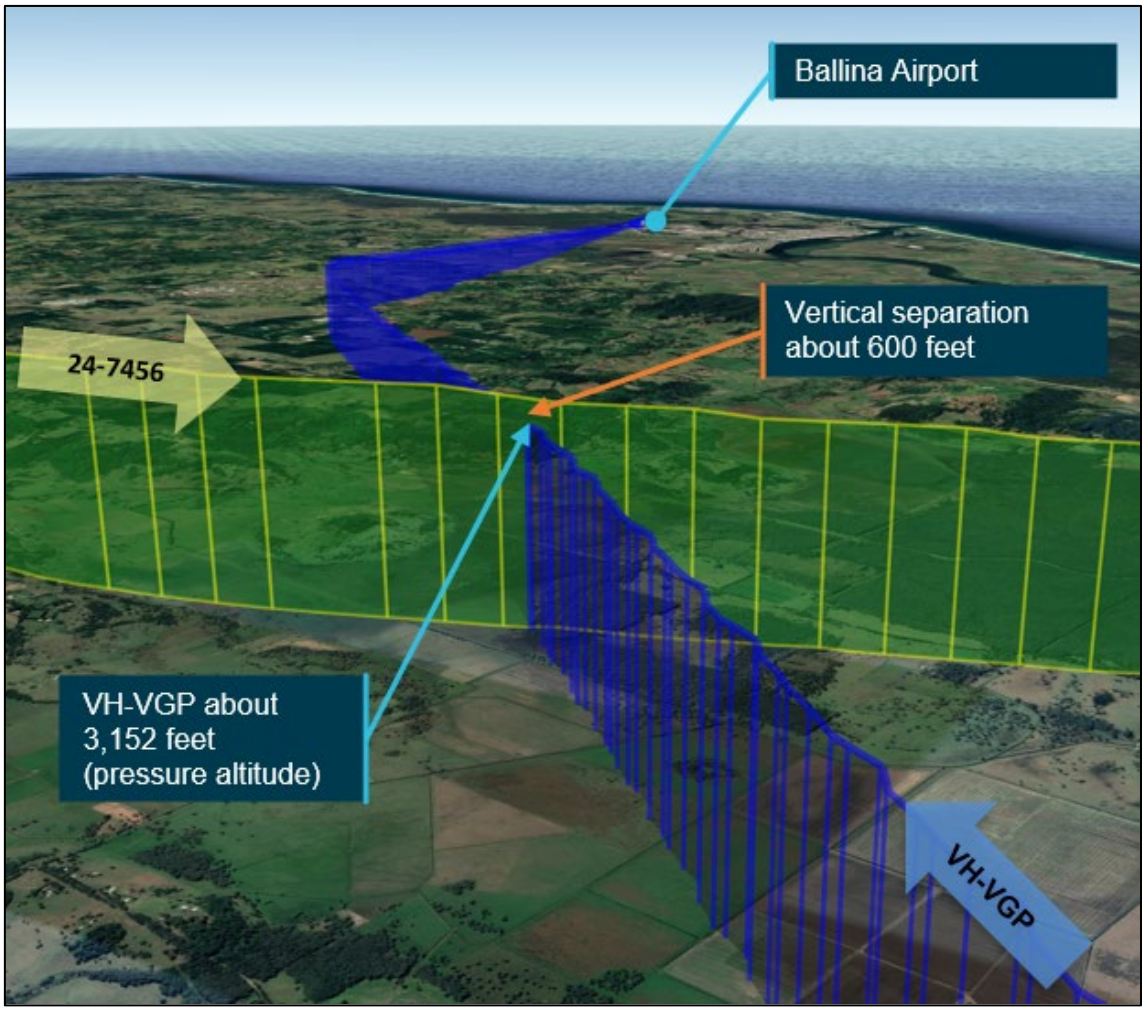
The flight crew of VGP attempted, unsuccessfully, to visually acquire the proximate traffic (visibility was greater than 10 km and there was no cloud at the time). The crew later reported experiencing 'tunnel vision' while conducting the visual search. They did not attempt to contact the traffic on the CTAF.

At 1128:18, VGP's flight crew received a TCAS traffic advisory. The flight crew maintained their visual scan and continued with the approach to runway 06.

At 1128:38, the flight crew of VGP made a broadcast on the shared CTAF and advised Ballina traffic, and the Boeing 737 aircraft in the vicinity, that VGP had just passed waypoint OPESO. The pilot of 7456 did not respond to, or recall hearing, this broadcast.

The data obtained from VGP's quick access recorder and the OzRunways program used by the pilot of 7456, indicated that, at 11:28:41 and 12 NM south west of Ballina Airport, the tracks of VGP and 7456 intersected, with vertical separation between the two aircraft reducing to about 600 ft. The flight crew of VGP sighted 7456 just prior to passing below the aircraft. The pilot of 7456 sighted VGP shortly after passing above the aircraft. Both the pilot of 7456 and the flight crew of VGP observed no lateral separation between the two aircraft (Figure 4).

Figure 4: : Recorded flight paths of VH-VGP and 24-7456



Source: Google Earth, annotated by the ATSB

At 1128:59, the flight crew of VGP contacted the crew of the Boeing 737 inbound to Ballina Airport on the shared CTAF to advise that they had experienced a traffic advisory, and the involved aircraft was headed in the direction of the Boeing 737.

A short time later, VGP landed at Ballina Airport while 7456 continued on to Evans Head ALA.

Context

Personnel information

Flight crew VH-VGP

The captain held an Air Transport Pilot Licence (ATPL) (Aeroplane) and had a total flying time of 13,935 hours, having flown 66.5 hours in the previous 90 days. The captain was familiar with Ballina Airport but had not operated there often. The captain's last flight to Ballina Airport took place in June 2019.

The FO held an ATPL (Aeroplane) and a total flying time of 4,830 hours, having flown 10.5 hours in the previous 90 days. The FO was somewhat familiar with Ballina Airport having operated there twice before the incident flight. The FO's last flight to Ballina Airport took place the day prior to the incident.

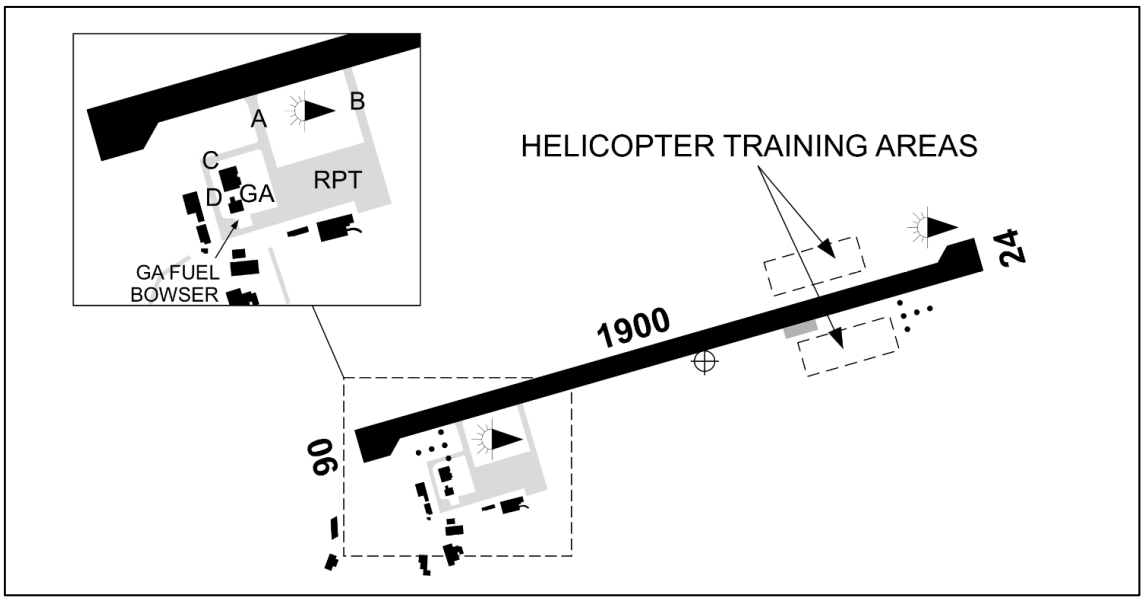
Pilot 24-7456

The pilot held a recreational pilot certificate and a total flying time of 775 hours, having flown 56 hours in the previous 90 days. The pilot was familiar with Ballina Airport and transited the surrounding airspace about eight times a year. The pilot reported being unfamiliar with the radio phraseology commonly used by passenger transport flight crew, including reference to waypoints such as OPESO.

Ballina Byron Gateway Airport

Ballina Byron Gateway Airport is a certified airport situated approximately 3 NM from the city of Ballina, NSW. The airport has an elevation of 7 feet above mean sea level (AMSL) and a single sealed runway orientated in a 062°-242° magnetic direction (Figure 5). The airport had GPS-based instrument approaches and a non-directional beacon ground-based navigation aid.

Figure 5: Ballina Byron Gateway Airport



Source: Airservices Australia

Airspace and traffic services

Ballina Airport was located within non-controlled Class G airspace which extended from the ground surface to 8,500 feet AMSL. The airport did not have a control tower and was not supported by air traffic control (a non-controlled airport).

Overlying the non-controlled airspace was Class C controlled airspace which extended up to flight level (FL) 180,[7] and controlled Class A airspace above that. An air traffic information and separation service was provided within the Class C airspace and a separation service was provided within the Class A airspace. A restricted area existed approximately 5 NM south of the airport (the aircraft involved in this incident were clear of this area).[8]

The non-controlled airspace surrounding Ballina Airport was available for use by aircraft operating under visual flight rules and instrument flight rules. No separation service was provided to aircraft operating in this airspace with pilots responsible for making themselves aware of nearby aircraft and maintaining self-separation.

The primary method of traffic separation at Ballina Airport was visual and relied on pilots using 'alerted see-and-avoid'[9] practices. A broadcast area was in place requiring aircraft to use a radio on the Ballina Airport CTAF when operating within a 10 NM radius of the airport.

Common traffic advisory frequency

The Ballina Airport CTAF was a designated frequency on which pilots made positional broadcasts when operating in the vicinity of the airport. The Ballina Airport CTAF was shared with neighbouring airports and ALAs Casino, Lismore and Evans Head to assist traffic coordination and enhance the situational awareness of pilots operating within the surrounding airspace (Figure 6).

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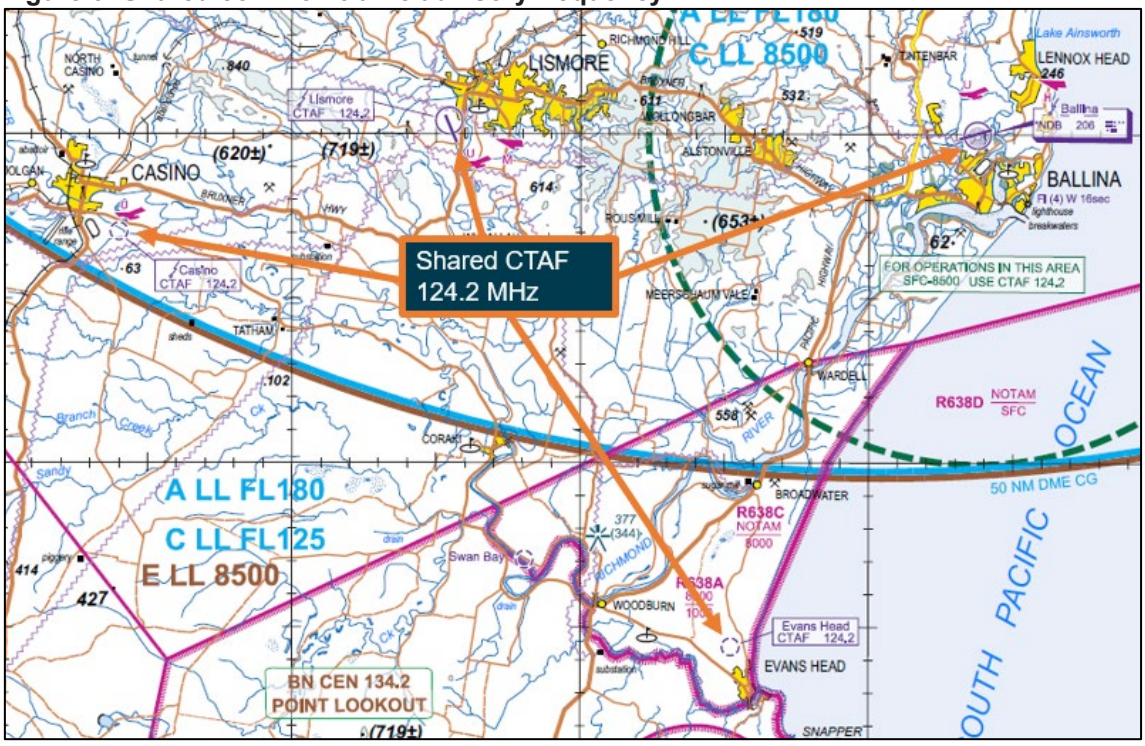
[7] Flight level: at altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL 180 equates to 18,000 ft.

[8] The restricted area was activated by a notice to airmen when military jet aircraft were operating within the area and/or live-firing exercises were taking place.

[9] Pilots are responsible for sighting conflicting traffic, and avoiding a collision, having been alerted to the presence of traffic in their immediate vicinity. This is principally achieved via radio communications.

Figure 6: Shared common traffic advisory frequency



Source: Airservices Australia, annotated by the ATSB

When operating within the Ballina Airport broadcast area, pilots were required to make mandatory transmissions when arriving or departing from the airport, and when flying through the broadcast area.

When operating outside of the Ballina Airport broadcast area, but within the vicinity of the other non-controlled airports on the shared CTAF, pilots were required to make a broadcast whenever it was reasonably necessary to do so to avoid a collision, or the risk of collision, with another aircraft. There were also several recommended positional broadcasts (Table 1).

Table 1: Recommended positional broadcasts in the vicinity of a non-controlled airport

Recommended calls in all circumstances	
Situation	**Broadcast**
The pilot intends to take-off	Immediately before, or during taxiing
The pilot is inbound to an aerodrome	10 NM from the aerodrome, or earlier, commensurate with aeroplane performance and pilot workload, with an estimated time of arrival for the aerodrome
The pilot intends to fly through the vicinity of, but not land at, a non-controlled aerodrome	10 NM from the aerodrome, or earlier, commensurate with aeroplane performance and pilot workload, with an estimated time of arrival
Recommended calls dependent on traffic	
Situation	**Broadcast**
The pilot intends to enter a runway	Immediately before entering a runway
The pilot is ready to join the circuit	Immediately before joining the circuit
The pilot intends to make a straight-in approach	On final approach at not less than 3 NM from the threshold
The pilot intends to join on base leg	Prior to joining on base
During an instrument approach when: a. departing final approach fix or established on final approach segment inbound b. terminating the approach, commencing the missed approach	Including details of position and intentions that are clear to all pilots (both instrument flight rules and visual flight rules)
The aircraft is clear of the active runway(s)	Once established outside the runway strip

Source: Civil Aviation Advisory Publication 166-01 V4.2 (Feb 2019) with minor amendments by the ATSB

Certified air/ground radio service

At the time of the incident, Ballina Airport was one of two airports in Australia to have a certified air/ground radio service (CA/GRS) in operation.

According to CASA's guidelines for a CA/GRS, the primary purpose of the service was to enhance the safety of passenger operations by providing all pilots with information to enhance their ability to see-and-avoid potentially conflicting traffic.

The information provided to pilots included:

- frequency confirmation
- traffic information on first call
- airport weather
- other advice to facilitate aeronautical safety and efficiency

The Ballina Airport CA/GRS commenced operations in March 2017 in response to the increasing number of aircraft movements at the airport. The service was delivered by the airport operator, via a third-party contractor, and had formal CASA approval. The service was delivered by a certified air/ground radio operator located at the airport.

At the time of the incident, the service was provided to all aircraft operating within the Ballina Airport broadcast area of 10 NM, during passenger service operations (greater than 30 seats) between the hours of 0800-1800 local time.

The CA/GRS did not provide a traffic separation service to aircraft as would occur at airports located within Class D or higher airspace (controlled airports).

Regulatory oversight

The *Airspace Act 2007* assigned the administration and regulation of Australian administered airspace to the Civil Aviation Safety Authority (CASA). As part of this function, CASA was required to undertake regular reviews to determine if:

- existing classifications of 'volumes of airspace' were appropriate
- existing air navigation services and facilities provided to volumes of airspace were appropriate
- there was safe and efficient use of airspace, and equitable access to that airspace for all users
- any identifiable risk factors were present

Ballina airport airspace review

At the time of this occurrence, CASA had last completed a review of the airspace surrounding Ballina Airport in July 2015. The purpose of that airspace review was to examine the airspace classification within 20 NM of the airport from ground level to 8,500 feet AMSL.

The objective of the review was to assess the risk levels for passenger transport operations to determine if the airspace classification was appropriate and whether an air traffic service was required. The options considered during the review included upgrading the airspace to Class D or higher classification (a controlled airport).

The Australian Airspace Policy Statement (AAPS) contained airspace review criteria thresholds for volumes of airspace around airports (Table 2). If an airport met or exceeded any of the thresholds for a classification, then CASA was required to undertake a review of the volume of airspace in question. This review was to consider public, industry and agency comments, forecast future traffic levels, and any significant risk mitigators before finalising an airspace determination.

Table 2: Airspace criteria thresholds AAPS 2015

	Class B	Class C	Class D
Service provider	ATC	ATC	ATC
Total annual aircraft movements	750,000	400,000	80,000
Total annual PTO aircraft movements	250,000	30,000	15,000
Total annual PTO passengers	25 million	1 million	350,000

Source: Civil Aviation Safety Authority

The 2015 airspace review found that the Ballina Airport exceeded the AAPS passenger criteria threshold for Class D airspace with 437,940 passenger movements recorded in 2014. However, it also found that both passenger transport aircraft movements and total aircraft movements for 2014 were significantly below the Class D trigger criteria. Therefore, CASA decided not to upgrade Ballina to a controlled airport on the basis that:

> Considering the total aircraft movements, total passenger transport aircraft movements, stakeholder feedback and aviation safety incident reports CASA considers Class D or higher would currently be a disproportionate response to the identified airspace issues at Ballina.

The ATSB noted that, in reaching that conclusion, the airspace review had not assessed risks associated with aircraft transiting the airspace surrounding Ballina Airport without taking off or landing at the airport (that is, transiting aircraft such as 24-7456 was in this occurrence). While the review included analysis of reportable events near Ballina Airport from 2009 to 2014, it did not specifically consider the involvement of transiting aircraft in those events or the influence such

aircraft may have on future separation events to properly assess the risks involved. Of the 11 separation events in the area that the review identified, 6 involved a passenger transport service. However, while CASA advised that all of these occurrences were considered, the review did not identify that 2 of those 6 also involved a conflict with a transiting aircraft.

The review primarily focused on aircraft movements (the total number of take-offs and landings at an airport) specified in the AAPS threshold criteria. Movement data for Ballina Airport was sourced from Airservices Australia (Airservices) and the Bureau of Infrastructure, Transport and Regional Economics.

While Airservices had some data on transiting aircraft, it was not readily available as computational analysis of this data was required to extract information on aircraft operating under the visual flight rules and/or aircraft operating without a flight plan. Notwithstanding these difficulties, data for transiting aircraft was available, but not obtained or analysed in the 2015 review.

In March 2020, CASA commenced another review of the airspace, but following the expansion of the Ballina Airport broadcast area, decided to defer its finalisation. At the time of writing, a final report had not been released.

Periodic assessments

In addition to the 2015 airspace review, CASA conducted periodic risk assessments of Ballina Airport and the surrounding airspace. The information considered for these assessments included:

- aircraft and passenger movements
- incident reports
- IFR to VFR traffic ratios
- stakeholder feedback
- previous risk assessments.

Records provided by CASA indicated eight documented risk assessments between July 2015 (when the 2015 airspace review was published) and the time of the incident. The last of these assessments was completed in June 2020. The analysis recorded within these assessments primarily focused on aircraft and passenger movements. There was no reference to transiting aircraft, either in terms of occurrences involving such aircraft or overall numbers/movements.

Comments included in this assessment stated that passenger transport aircraft and passenger numbers had declined at the airport, probably due to the impact of COVID-19,[10] but passenger numbers continued to exceed the AAPS 2018 threshold by 19 per cent. The assessment indicated three reported incidents had occurred in the vicinity of the airport, but provided no detail about those incidents. The last periodic assessment concluded that the risk level was lower than that of the previous assessment.

Previous events

A search of the ATSB database identified that between 1 January 2010 and 28 November 2020, there were 20 separation events involving passenger transport services (including this incident) within a radius of approximately 20 NM of Ballina Airport below 8,500 feet AMSL (Table 3). Of those 20 events, seven involved a conflict between an aircraft transiting the airspace and a

[10] Coronavirus disease (COVID-19) was an infectious disease caused by a newly discovered coronavirus. The World Health Organization (WHO) first learned of this new virus on 31 December 2019. International and domestic responses to manage the pandemic included reducing aviation activity internationally and domestically.

passenger transport service approaching or departing from Ballina Airport (Table 4). Two of these events occurred prior to the publication of the 2015 CASA airspace review.

Table 3: Ballina separation events involving passenger transport services

Year	Total	Not involving transiting aircraft	Involving transiting aircraft
2020	1	0	1
2019	4	3	1
2018	4	2	2
2017	2	2	0
2016	2	2	0
2015	1	0	1
2014	0	0	0
2013	1	0	1
2012	0	0	0
2011	3	2	1
2010	2	2	0
Total	**20**	**13**	**7**

Source: ATSB

Table 4: Separation events involving passenger transport service and transiting aircraft

Year	Aircraft 1	Aircraft 2	Overview
2020	Airbus A320	Jabiru J230D	During approach, the crew of the Airbus A320 received a TCAS TA on the Jabiru J230 on a crossing path.
2019	Airbus A320	Cessna 180	During approach, an Airbus A320 came into close proximity with the Cessna 180. No radio broadcasts were heard from the light aircraft.
2018	Boeing 737 & Airbus A320	Diamond DA40	During approach, a Boeing 737 and Airbus A320 came into close proximity with a Diamond DA40. There were no radio broadcasts identified from the crew of the DA40.
2018	Jetstream Series 3206	Aerospatiale Ind AS350B2	During approach, the crew of a Jetstream Series 3206 observed an Aerospatiale AS.350 helicopter on a reciprocal track. Both aircraft turned to increase separation. The crew of the 3206 did not hear any radio broadcasts from the AS.350.
2015	Airbus A320	Cessna 182	During approach, the crew of an Airbus A320 coordinated separation from a Cessna 182 that was in the vicinity. However, the pilot of the Cessna 182 did not follow their broadcast intentions, resulting in the crew of the Airbus A320 conducting a missed approach.
2013	Airbus A320	Unknown	During take-off, the crew of the Airbus A320 heard a broadcast from an aircraft transiting through Ballina airspace. The crew subsequently observed a TCAS return but were unable to sight the inbound aircraft.
2011	Airbus A320	Piper PA20	While an Airbus A320 was in a holding pattern an instrument flight rules aircraft in the vicinity did not track as expected. The A320 was turned early to ensure that separation was maintained.

Source: ATSB

Aircraft systems

Traffic collision avoidance system

A traffic collision avoidance system (TCAS), as fitted to VGP, interrogates the transponders (see the section titled *Transponder*) of nearby aircraft and uses this information to calculate the relative range and altitude of this traffic. The system provides a visual representation of this information to the flight crew as well as issuing alerts should a traffic issue be identified. These alerts include:

- Proximate traffic – an alert issued when an aircraft is within a range of less than 6 NM and 1,200 ft, or a range of 6 NM if the traffic is not transmitting altitude information. Depicted as a white filled diamond on the navigation display (ND)
- Traffic advisory (TA) – an alert issued when the detected traffic may result in a conflict (the closest point of separation is about 40 seconds away on the current projected flight paths). Depicted as an amber filled circle on the ND and an aural alert. Pilots are expected to initiate a visual search for the traffic causing the TA (the operator's procedures required flight crew not to perform a manoeuvre based solely on a TA).
- Resolution advisory (RA) – a manoeuvre, or a manoeuvre restriction, calculated by the TCAS to avoid a collision (the closest point of separation is approximately 25 seconds away or less). Depicted as a red filled square on the ND and vertical speed orders on the primary flight display. A series of aural alerts will also sound. Pilots are expected to respond immediately to an RA.

Due to its method of operation, a TCAS cannot detect aircraft that are not equipped with a transponder (or switched off). Additionally, the system is unable to issue an RA for traffic that is not fitted with an altitude reporting transponder (mode C or S), or in circumstances where the mode C or S transponder on board the conflicting traffic is not transmitting altitude information (as was the case with 7456).

Transponder

A transponder is a receiver/transmitter which transmits an automatic reply upon receiving an interrogation request. A manual 'ident' transmission can also be initiated by the pilot. The information transmitted by a transponder is dependent on the 'mode' of equipment fitted and the mode of transmission selected by the pilot.

The transponder fitted to 24-7456 was capable of operating in mode 3A and 3C. In mode 3A (ON) the equipment would transmit the configured transponder code only. In mode 3C (ALT) the equipment would transmit the aircraft's altitude in addition to the configured transponder code.

The pilot of 24-7456 had elected to set the transponder to mode A only so the altitude of the aircraft was not being transmitted. The pilot incorrectly believed there were no requirements relating to the use of modes 3A and 3C.

The Aeronautical Information Publication (AIP) contained information on the operation of aircraft transponders. AIP ENR 1.6 paragraph 7.1.2 stated:

> Unless advised otherwise by ATC, pilots of Mode 3A or Mode S transponder equipped aircraft operating in Australian airspace must activate their transponders, and where a Mode C capability is also available it must be activated simultaneously with Mode 3A.
> Note: Pilots must ensure that transponders and ADS-B transmitters are activated and the altitude function is selected as:
> a. primary radar coverage only exists within 50NM of major airports and the remainder of the ATS surveillance system relies on SSR transponder and ADS-B transmitter information, and
> b. TCAS relies on transponder information for its pilot alerting and collision avoidance functions.

AIP GEN 1.5 paragraph 7.1.2 stated:

> Pilots of transponder-equipped aircraft should ensure their transponder is switched to ON/ALT (Mode C) at all times.

Human factors

The ATSB investigation considered a range of human factors that could have influenced the decisions and actions of the pilots involved. No indicators that increased the risk of any of the individuals experiencing a level of fatigue known to influence performance were found. The following factors, however, were likely to have had an influence.

- cognitive tunnelling
- human visual system limitations.

Cognitive tunnelling is an inattentional blindness where an individual becomes overly-focused on some variable other than the present environment (Mack & Rock 1998). Cognitive tunnelling may also impact an individual's decision-making processes (Bell et al 2005). The comments by VGP's flight crew about 'tunnel vision' after they received the TCAS TA was a reference to this factor.

Limitations associated with the human visual system include:

- empty field myopia – in an empty field, such as blue sky, the eye will focus at around 56 cm which may reduce the chance of identifying a distant object
- a lack of relative motion when on a collision course – the human visual system is less effective at detecting stationary objects than moving objects. Because of the geometry of collision flightpaths, from each pilot's point of view, the converging aircraft will grow in size while remaining fixed at a particular point in the windscreen
- visual angle – an approaching aircraft at high speed will present a small visual angle until a short time before impact. Limitations associated with visual acuity mean this small visual angle may make it impossible for a pilot to detect the aircraft in time to take evasive action (Hobbs 1991).

All these limitations impair the effectiveness of 'see-and-avoid' practices, the primary method of self-separation in uncontrolled airspace, which requires pilots to conduct a visual search to 'see-and-avoid' potentially conflicting traffic.

An 'unalerted' search is one where reliance is entirely on the pilot searching for, and sighting, another aircraft without prior knowledge of its presence. On the other hand, an 'alerted' search is one where the pilot is alerted to another aircraft's presence, typically via radio communications or aircraft based alerting systems. An alerted search is likely to be eight times more effective than an unalerted search (Hobbs 1991).

Safety analysis

The incident

On 28 November 2020, the flights paths of Airbus A320, VH-VGP, and Jabiru J230D, 24-7456, intersected about 12 NM south west of Ballina Byron Gateway Airport, with the vertical separation between them reducing to about 600 ft. The aircraft were outside the airport's broadcast area and within non-controlled Class G airspace. That meant that the pilots were responsible for safe separation using radio communications and collision avoidance aids to support 'see-and-avoid' practices.

Communications and collision avoidance aids

The flight crew of VGP did not recall hearing the broadcast from 7456 prefixed with 'Lismore traffic' on the common traffic advisory frequency (CTAF). That prefix (a different airport to their destination, Ballina) probably did not trigger their auditory attention. In any case, they were not aware of 7456 until alerted to a conflict by the aircraft's traffic collision avoidance system (TCAS).

Similarly, the pilot of 7456 did not recall hearing broadcasts from VGP on the CTAF. Additionally, the pilot was not familiar with phraseology commonly used in passenger transport operations, including reference to instrument approach waypoints such as OPESO. That probably contributed to the pilot not registering those broadcasts and being unaware of the presence of VGP before the incident.

The pilot of 7456 incorrectly selected mode 3A (instead of the required 3C) on the aircraft's transponder resulting in altitude data not being transmitted. As the aircraft approached VGP, its TCAS issued the conflict alert and, subsequently, a traffic advisory alert with the relative bearing and distance of 7456. However, the TCAS could not indicate the approaching aircraft's altitude or provide a resolution advisory, significantly disadvantaging the flight crew in managing the situation.

See-and-avoid

The circumstances and the restrictions imposed on the available electronic aids, particularly TCAS functionality, were impediments to effectively applying see-and-avoid practices.

Since the pilot of 7456 was not aware of VGP, seeing and avoiding it depended on the success of 'unalerted' visual searches by the pilot. Although visibility was greater than 10 km with no cloud in the area, any searches were unsuccessful as the pilot only sighted VGP after passing above it.

On the other hand, VGP's TCAS alerted the flight crew to 7456. However, their 'alerted' search was unsuccessful in part due to the limitations associated with the human visual system and the absence of altitude data. Additionally, the effects of cognitive tunnelling, together with the rapid sequence of events following the TCAS alerts, possibly resulted in them not considering options such as contacting the approaching aircraft via radio on the CTAF. With no TCAS resolution advisory manoeuvre available, they continued visually searching, sighting 7456 moments before it passed and too late to take any action to avoid a potential collision.

Therefore, the vertical separation of about 600 ft when the aircraft passed was entirely fortuitous.

This incident, together with previous events involving transiting aircraft shows that separation occurrences, with potentially serious consequences, can and do occur (Table 4) in the airspace encompassing the approach and departure flight paths of large transport aircraft operating at Ballina Airport.

Airspace classification

The objective of the 2015 Civil Aviation Safety Authority (CASA) review of the airspace surrounding Ballina Byron Gateway Airport was to assess the level of risk posed to passenger transport services and determine if the airspace classification was appropriate. The review considered total aircraft movements (including passenger transport aircraft) at the airport, some reportable events near the airport and stakeholder feedback and determined that a Class D or higher airspace classification was not appropriate. Significantly, transiting aircraft movements were not considered, primarily due to difficulty in extracting this data.

However, the review had not specifically considered the risks associated with aircraft transiting the airspace without taking off or landing at Ballina Airport. Recognising that such a consideration at the time of the review would have only identified 2 occurrences associated with transiting aircraft, additional occurrences in the intervening years indicate that the risk of a proximity event in these circumstances may be significant. However, opportunities to consider such risk events in the periodic risk assessments of the airspace since the 2015 review had not been taken.

Capturing these tangible risks through the airspace review and periodic assessment mechanisms would result in a more accurate and realistic risk assessment. Such a risk assessment would, in turn, better inform an assessment of the appropriate airspace classification.

When operating in non-controlled airspace (such as the current Class G airspace around Ballina), whether under the instrument or visual flight rules, pilots hold responsibility for separation from other aircraft. A review of past occurrences indicates that self-separation using broadcast traffic advice has been a largely reliable procedure.

The ATSB does however note that the effectiveness of the current pilot-separation method relies on individual pilots:

- recognising a potentially unsafe situation
- formulating an effective separation plan that often requires coordination with the occupants of the other involved aircraft.

While on this occasion one of the involved aircraft was equipped with TCAS, this process is almost exclusively reliant on individual human actions without other mechanisms potentially acting as a safeguard and/or safety redundancy, and as such subject to human error, even when it involves experienced pilots. Furthermore, such errors often increase under high workload associated with, for example, instrument flying approach procedures, low experience or a busy airspace environment.

Of note, the airspace surrounding Ballina Airport accommodates a complex mix of aircraft types and operations, including high capacity passenger transport, while also being located close to several other non-controlled airports.

In that context, while the available evidence in this investigation does not support a conclusion that the present self-separation system is unsafe, there is an opportunity to potentially reduce safety risk further.

The ATSB therefore supports systemic enhancements to the overall air traffic system that have been assessed by regulatory and air traffic specialists, in keeping with their obligations as providing a net overall safety increase. Key examples of such enhancements include:

- the increased use of controlled airspace and ADS-B aircraft surveillance data (both by air traffic services and in-cockpit)
- improved monitoring of air traffic movements (both quantity and complexity) to assist the identification of increasing risk areas.

With respect to this occurrence, had the aircraft been operating in controlled airspace the crew of VGP would have, at a minimum, received traffic information from air traffic control on 7456 and may have been positively separated.

Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition 'other findings' may be included to provide important information about topics other than safety factors.

Safety issues are highlighted in bold to emphasise their importance. A safety issue is a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

From the evidence available, the following findings are made with respect to the separation occurrence involving Airbus A320-232, VH-VGP and Jabiru J230D, 24-7456 about 12 NM south-west Ballina Byron Gateway Airport, New South Wales on 28 November 2020.

Contributing factors

- The mode of the transponder on board 24-7456 was not selected to transmit altitude data, which resulted in VH-VGP's traffic collision avoidance system (TCAS) not indicating the approaching aircraft's altitude or providing a resolution advisory.
- The pilot of 24-7456 did not recall hearing broadcasts from VH-VGP and remained unaware of the other aircraft until passing above it.
- The flight crew of VH-VGP did not recall hearing the broadcast from 24-7456 when it was near Lismore and remained unaware of the aircraft until receiving a TCAS alert. However, they did not know the approaching aircraft's altitude, did not attempt to make radio contact and only sighted it moments before the aircraft passed.
- The vertical separation between the aircraft when their flight paths inadvertently intersected reduced to about 600 ft, which was entirely fortuitous as the pilots of neither aircraft had been able to manage aircraft separation in the circumstances.

Other factors that increased risk

- **The Civil Aviation Safety Authority review and periodic risk assessments of the airspace surrounding Ballina Byron Gateway Airport did not include data for aircraft transiting the airspace without using the airport. Therefore, the risk associated with occurrences such as this one were not specifically considered when assessing the appropriate airspace classification. (Safety issue)**

Safety issues and actions

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues. The ATSB expects relevant organisations will address all safety issues an investigation identifies.

Depending on the level of risk of a safety issue, the extent of corrective action taken by the relevant organisation(s), or the desirability of directing a broad safety message to the aviation industry, the ATSB may issue a formal safety recommendation or safety advisory notice as part of the final report.

All of the directly involved parties are invited to provide submissions to this draft report. As part of that process, each organisation is asked to communicate what safety actions, if any, they have carried out or are planning to carry out in relation to each safety issue relevant to their organisation.

The initial public version of these safety issues and actions will be provided separately on the ATSB website on release of the final investigation report, to facilitate monitoring by interested parties. Where relevant, the safety issues and actions will be updated on the ATSB website after the release of the final report as further information about safety action comes to hand.

Ballina airport safety review

Safety issue description

The Civil Aviation Safety Authority review of the airspace surrounding Ballina Byron Gateway Airport did not include data for aircraft transiting the airspace without using the airport. Therefore, the risk associated with occurrences such as this one were not specifically considered when assessing the appropriate airspace classification.

Issue number:	AO-2020-062-SI-01
Issue owner:	Civil Aviation Safety Authority
Transport function:	Aviation: Airspace management
Current issue status:	Open - Safety action pending
Issue status justification:	The safety issue is pending the outcome of safety actions to be completed by CASA

Proactive safety action taken by the Civil Aviation Safety Authority

Action number:	AO-2020-062-PSA-01
Action organisation:	Civil Aviation Safety Authority
Action date:	28 January 2021
Action status:	Monitor

On 28 January 2021, the Ballina Airport broadcast area was expanded from a radius of 10 NM to 15 NM, excluding a section defined by a 30 NM arc from the Gold Coast distance measuring equipment. The Civil Aviation Safety Authority (CASA) stated that the purpose of this change was 'to reduce residual airspace risk in the vicinity of Ballina'.

On 20 December 2021, CASA advised the ATSB that the most recent Ballina Airport airspace review (expected to be completed in February 2022) utilised Airservices Australia data that included transiting aircraft, but that it was limited to aircraft that had submitted a flight plan and/or

been detected by secondary surveillance radar. CASA also advised that a new initiative by the Australian Government aimed to increase the uptake of automatic dependent surveillance broadcast (ADS-B) equipment in general aviation, through a rebate to eligible aircraft operators, would improve aircraft detection.

On 28 January 2021 CASA advised that, while it had considered readily available data for transiting aircraft in airspace review risk assessments, it was also developing an airspace risk modelling system (ARMS). According to CASA, this new system was expected to be implemented in March 2022 and provide an enhanced capability to consider transiting aircraft using a historical database of flight trajectory data.

ATSB comment

The ATSB acknowledges the proposed safety action, which has the potential to adequately address this safety issue. As this will largely depend on the conclusions of the current Ballina Airport airspace review and the effectiveness of the new ARMS, the ATSB will monitor and assess their effect on the safety issue.

Proactive safety action taken by Airservices Australia

Action number:	AO-2020-062-PSA-02
Action organisation:	Airservices Australia
Action date:	12 August 2021
Action status:	Released

On 12 August 2021, a surveillance flight information service (SFIS) began operating within the 15 NM Ballina Airport broadcast area. The SFIS, provided by Airservices Australia on the shared common traffic advisory frequency (CTAF), replaced the certified air/ground radio service. The service is available to all aircraft within the Ballina Airport broadcast area between 2200-0800 coordinated universal time.

The SFIS is not a separation or sequencing service, and pilots remain responsible for complying with all regulations and responsibilities applicable to operating in non-controlled Class G airspace and on the shared CTAF.

General details

Occurrence details

Date and time:	28 November 2020 – 1129 EDT	
Occurrence category:	Incident	
Primary occurrence type:	Separation issue	
Location:	22 km south-west of Ballina Byron Gateway Airport, New South Wales	
	Latitude: 28° 55.67' S	Longitude: 153° 21.68' E

Aircraft details – VH-VGP

Manufacturer and model:	Airbus A320-232	
Registration:	VH-VGP	
Operator:	Jetstar Airways	
Serial number:	4343	
Type of operation:	Air Transport High Capacity	
Departure:	Melbourne, Victoria	
Destination:	Ballina, New South Wales	
Persons on board:	Crew – 7	Passengers – 163
Injuries:	Crew – NIL	Passengers – NIL
Aircraft damage:	None	

Aircraft details – 24-7456

Manufacturer and model:	Jabiru Aircraft, J230D	
Registration:	24-7456	
Serial number:	J736	
Type of operation:	Private	
Departure:	Heck Field, Queensland	
Destination:	Evans Head, New South Wales	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – NIL	Passengers – NIL
Aircraft damage:	None	

Glossary

AIP	Aviation information publication
ALA	Aircraft landing area
AMSL	Above mean sea level
ATC	Air traffic control
ATSB	Australian Transport Safety Bureau
CA/GRS	Certified air/ground radio service
CASA	Civil Aviation Safety Authority
CTAF	Common traffic advisory frequency
EDT	Eastern daylight-saving time
FDR	Flight data recorder
FL	Flight level
FO	First officer
NM	Nautical mile
NSW	New South Wales
PF	Pilot flying
PM	Pilot monitoring
RA	Resolution advisory
SFIS	Surveillance flight information service
TA	Traffic advisory
TCAS	Traffic collision avoidance system
UTC	Coordinated universal time

Sources and submissions

Sources of information

The sources of information during the investigation included:

- the flight crew of VH-VGP and pilot of 24-7456
- the CA/GRO and CA/GRS service provider
- Jetstar Airways
- Ballina Byron Gateway Airport
- Avdata
- Bureau of Infrastructure and Transport Research Economics
- Civil Aviation Safety Authority
- Airservices Australia

References

Bell, M, Facci, E, & Nayeem, R 2005, *Cognitive Tunnelling, Aircraft-Pilot Coupling Design Issues and Scenario Interpretation Under Stress in Recent Airline Accidents*, 2005 International Symposium on Aviation Psychology, 45-49

Hobbs A 1991, *Limitations of the See-and-Avoid Principle*, Australian Transport Safety Bureau

Mack A & Rock I 1998, *Inattentional blindness*, MIT Press Cambridge MA

Submissions

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to:

- the crew of VH-VGP and pilot of 24-7456
- Jetstar Airways
- Ballina Byron Gateway Airport
- Civil Aviation Safety Authority
- Airservices Australia.

Submissions were received from:

- the crew of VH-VGP
- Civil Aviation Safety Authority
- Airservices Australia

The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, international agreements.

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.