Australian Government

Australian Transport Safety Bureau

Traffic management occurrence involving Airbus A320, VH-VQS and Beech Aircraft Corporation BE 76, VH-EWL

Ballina/Byron Gateway Airport, New South Wales | 14 January 2016

Investigation

ATSB Transport Safety Report

Aviation Occurrence Investigation

AO-2016-003

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Addendum

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Safety summary

What happened

On 14 January 2016, whilst taking-off from Ballina/Byron Gateway Airport, Airbus A320, registered VH-VQS (VQS) and operated by Jetstar Airways, came in close proximity to Beech Aircraft Corporation BE-76 Duchess, registered VH-EWL (EWL). The Duchess was conducting navigation training in the vicinity of the runway and was noticed by the flight crew of VQS during the take-off roll and below the maximum speed from which they could stop. The take-off was continued and while manoeuvring to maintain separation from EWL, the crew of VQS received master warning/caution alerts regarding the aircraft’s configuration. The crew also commenced flap retraction at low altitude and turned contrary to operator-prescribed departure procedures before departing for Melbourne. There were no injuries or damage to equipment recorded during the occurrence.

What the ATSB found

The ATSB found that despite an increase in passenger numbers and a mixture of traffic, Ballina/Byron Gateway Airport operated without the support of air traffic information and/or services. While recognising that a direct comparison between airports is difficult, Ballina also experienced a higher number of incidents relating to communication and separation issues compared to airports with similar traffic levels. The ATSB also found that a number of non-standard operating practices and procedures led to a breakdown of crew resource management and the ability to adequately manage the dynamic situation by the crew of VQS. Finally, the ATSB found that the level of communication between the crews of VQS and EWL was inadequate to develop a shared mental model of what each crew was intending to do to ensure separation.

What's been done as a result

Following a recommendation by the Civil Aviation Safety Authority (CASA), the operator of Ballina/Byron Gateway Airport implemented a certified air/ground radio service (CA/GRS) to provide weather services and traffic information at the airport. This service commenced in March 2017 and operates daily between 0800 and 1800 local time. The CASA Office of Airspace Regulation is planning a post-CA/GRS implementation review in mid-2017 to assess its effectiveness.

Additionally, Jetstar Airways have proposed to increase their annual audit schedule of common traffic advisory frequency operations, reviewed their jump seat policy when operating in such aerodromes to assist in distraction management, and altered their training matrix to further include exercises pertaining to levels of assertion and upwards managing by first officers

Safety message

Operations at non-controlled airports remain a safety watch priority for the ATSB. This occurrence highlights that traffic separation in that environment relies on a clear and shared plan between involved aircraft.

Adherence to standard operating practices and procedures promotes a shared understanding of crew’s actions by making them ordered and predictable to the other pilots. As well as reducing the likelihood of task omission or duplication during times of high workload, standardised practices and procedures decrease the mental demand on flight crew when carrying out a set of complex steps, allowing for better processing of unexpected events.

Contents

The occurrence

On 14 January 2016, Airbus A320, registered VH-VQS (VQS) and operating as Jetstar 465 taxied for departure runway 06[1] at Ballina/Byron Gateway Airport, New South Wales. The flight was a scheduled passenger service originally scheduled to depart for Melbourne, Victoria at 1330 Eastern Daylight-saving Time[2] but had been delayed until 1404 by previous schedule disruptions. The flight crew consisted of a captain, who was pilot flying (PF) and a first officer (FO) who was pilot monitoring (PM).[3] Both had been called out as part of a reserve duty and had operated the previous flight from Melbourne.

As VQS taxied, a Beech Duchess BE-76, registered VH-EWL (EWL), was conducting navigation aid training in the Ballina area. EWL had commenced a practice RNAV Z instrument approach (appendix A) for runway 06, with the intention of conducting a missed approach manoeuvre from a point approximately 660 ft above the landing threshold. EWL had an instructor and a student on board, with the student pilot hand flying the practice approach and responsible for communicating on the radio. As part of the exercise, the student was using a hood that inhibited vision outside the cockpit, simulating a reduced visibility approach, while the instructor maintained a visual lookout. The approach was also conducted with a simulated single engine failure.

At 1406, while VQS was taxied towards the holding point prior to entering runway 06, the instructor of EWL reported being on a 5 nautical mile (9 km) final passing 2,000 ft and estimating the missed approach point at 1412.[4] The captain of VQS confirmed with the pilots of EWL that they intended to conduct a missed approach rather than land and, at 1407, the FO broadcast that they were entering the runway and backtracking. The FO reported that, as the aircraft backtracked, EWL was sighted on a long final approach and that the captain and FO were confident of maintaining adequate separation during the take-off. The instructor in EWL reported expecting the crew of VQS to delay commencement of the take-off until EWL was in the missed approach. However, the captain of VQS advised that the intent was to depart prior to EWL reaching the missed approach point. That intention was not conveyed to the pilots of EWL.

As VQS taxied and EWL was conducting the practice approach, a third aircraft, a Boeing B737-800, registered VH-VUE (VUE) and operating as Virgin 1141, approached the Ballina area from the south with the initial intention of carrying out an RNAV X instrument approach and landing on runway 06 (appendix B). All three aircraft communicated on the Common Traffic Advisory Frequency (CTAF)[5] in order to coordinate separation assurance between the aircraft. During this process, the crew of VUE elected to discontinue tracking for the RNAV X approach, and instead join the traffic pattern from overhead the runway at 3,000 ft before conducting a visual circuit to runway 06. As part of the communication, the instructor in EWL also agreed to conduct a left turn on reaching the missed approach point to assist with separation. Additionally, the crew of VQS agreed to remain below 2,000 ft on departure until clear of VUE.

Once VQS had entered the runway, there were no further exchanges on the CTAF between the crew and EWL. However, there were exchanges between the crews of VQS and VUE to confirm that VUE would be maintaining 3,000 ft and that VQS would not climb above 2,000 ft on departure

1 Runway number: the number represents the magnetic heading of the runway.

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

3 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 aircraft flight path.

4 AIP ENR 1 – GENERAL RULES AND PROCEDURES, Section 1.1 – GENERAL RULES, paragraph 21 RADIO COMMUNICATION AND NAVIGATION REQUIREMENTS, subparagraph 21.1 Summary of Report and Broadcast Requirements, sub paragraph 21.1.5 stated that: 'When a pilot becomes aware that a previously notified position estimate is more than two (2) minutes in error, the pilot must report and, where necessary, broadcast a corrected estimate.'

5 Common Traffic Advisory Frequency (CTAF): A designated frequency on which pilots make positional broadcasts when operating in the vicinity of non-controlled aerodromes.

until both aircraft had adequate separation. These radio exchanges contributed to the decision by the crew of VQS to hold in the line-up position for 41 seconds while EWL continued the approach. Both the captain and FO of VQS were heard transmitting on the CTAF. Although the PF making radio calls was contrary to that role (see the section titled *Standard operating procedures*), the FO indicated that the captain's reason for making the transmissions as PF may have been to expedite understanding of the intentions of the crew of VUE.

At 1410, the captain of VQS commenced the take-off roll and shortly after the FO transmitted an 'all stations' radio call to announce the take-off. Although the crew had previously calculated and briefed the use of a reduced thrust take-off power setting as per standard operating procedure, the captain actually selected take-off/go-around (TOGA) power. By using TOGA, the engines were commanded to provide the maximum available thrust for the environmental conditions (see the section titled *Take-off performance*). The FO stated that the commencement of the take-off at that time and the selection of TOGA thrust were unexpected. However, as TOGA thrust was in excess of that required for take-off, the FO did not challenge this selection. Additionally, the FO assessed that the initiation of the high-energy take-off limited the opportunity for further discussion on the position of EWL.

As EWL was on short final and approaching the missed approach point over the landing threshold of runway 06, the instructor noticed VQS commence the take-off roll and then heard the associated radio call from the FO of VQS on the CTAF. The instructor told the student to look up from under the hood because it was felt that VQS should not be commencing take-off. There were no radio exchanges between the two aircraft at that time and the instructor recalled that EWL was just short of the runway as VQS rotated. The instructor stated that they were satisfied with continuing as planned and that they did not lose sight of, nor overtake VQS.

The captain of VQS stated that as the aircraft accelerated towards 100 kt, they noticed a proximate traffic symbol on the navigation display (see the section titled *Traffic alert and collision avoidance system*). This symbol indicated an aircraft approximately 400 ft above and directly behind VQS, which the captain believed to be EWL. The captain pointed this out to the FO and sought confirmation of the position of the traffic while continuing with the take-off. The FO reported that in response, after rotation, the FO assessed the traffic alert and collision avoidance system (TCAS)[6] display and advised the captain that the aircraft was about '1 mile' (nautical mile, 1.9 km) behind and 400 ft above their aircraft. The captain advised not being happy to fly through EWL's level.

VQS rotated at approximately 134 kt, which coincided with the calculated maximum speed at which the crew could initiate a rejected take-off and stop the aircraft within the runway confines (see the section titled *Take-off performance*). Neither the captain nor the FO reported discussing rejection of the take-off following identification of the TCAS traffic and the captain recalled that, given the length of the runway, they did not want to abort. Calculations by Jetstar Airways identified that had the take-off been rejected just prior to V_1[7], the aircraft could have been stopped 239 m from the runway end.

The captain of VQS rotated the aircraft to an initial take-off pitch angle of approximately 10° and after lift-off, the FO commenced retracting the landing gear. At approximately 150 ft above the runway, the pitch angle was reduced to 5° and the rate of climb reduced to approximately 600 ft per minute. The captain reported taking this action in order to avoid flying through EWL's level until adequately laterally separated.

As a result of the lower pitch angle and TOGA thrust setting, the airspeed rapidly increased towards 200 kt, which was the maximum flap limit speed for the take-off configuration selected (CONFIG 2). The FO recalled calling 'speed' in order to alert the captain of the impending flap

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6 Traffic alert and collision avoidance system (TCAS): a type of airborne collision avoidance system.

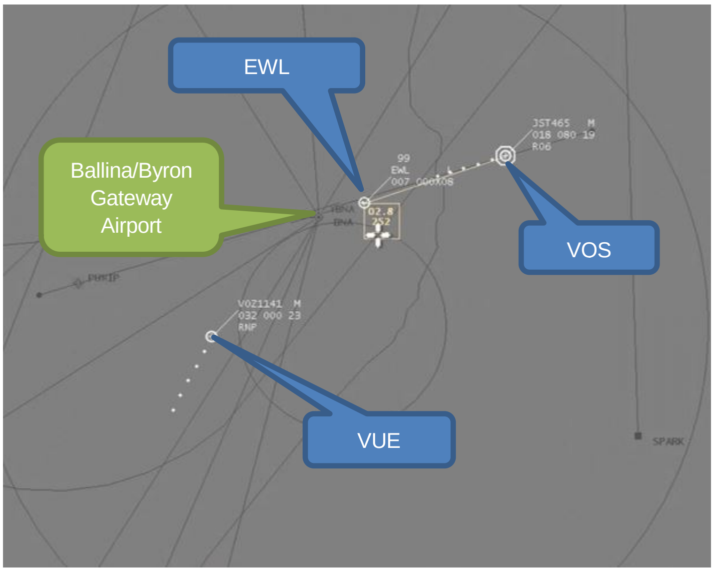
7 V_1: the critical engine failure speed or decision speed required for take-off. Engine failure below V_1 should result in a rejected take-off; above this speed the take-off should be continued.

overspeed and that the captain reacted by retarding the thrust levers to idle power. The captain then called for the FO to retract the flap to the CONFIG 1 position, which had a higher maximum limiting speed. The FO carried out this action.

The aircraft master warning activated due to the thrust lever being retarded below take-off thrust while the landing gear was not down and locked and the aircraft was at a low altitude. The master caution also activated as a result of the autothrottle system disengaging when the thrust was manually reduced (see the section titled *Aircraft alerting systems*).

The crew of VQS stated that on assessing that the aircraft was clear of EWL and accelerating away (Figure 1), they manually re-established a normal climb out pitch attitude and thrust setting. At approximately 1,700 ft VQS conducted a right turn to intercept the outbound track, which was contrary to the left turn stipulated in the Jetstar Airways departure procedures. The remaining flight to Melbourne was normal.

Figure 1: A screenshot of the radar display depicting the positions of VQS (JST 465) and EWL in the vicinity of Ballina. VUE (VOZ 1141) is also seen approaching from the south-west



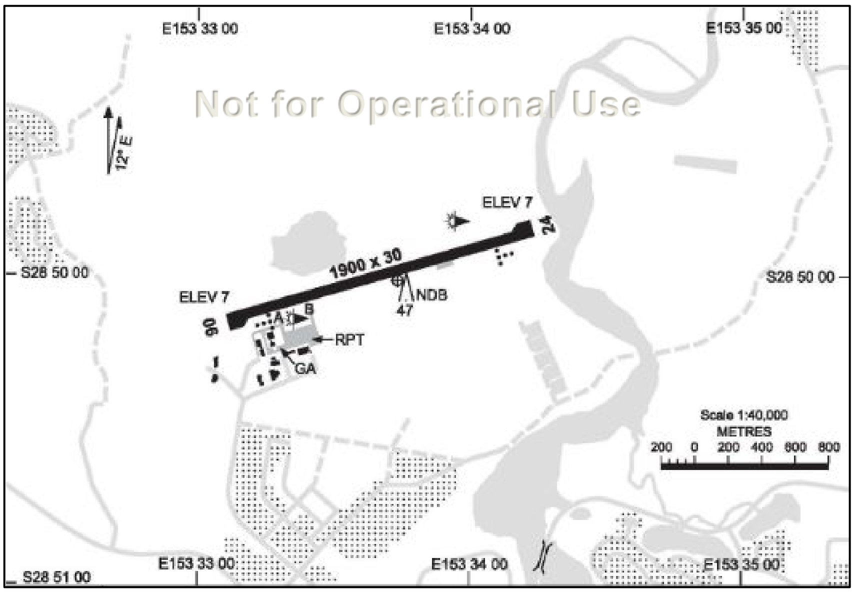
Source: Airservices Australia, modified by the ATSB

Context

Ballina/Byron Gateway Airport

Ballina/Byron Gateway Airport (Ballina airport) was a certified aerodrome with a single, sealed 1,900 m long and 30 m wide runway. The runway was orientated in a 062°/242° magnetic (north-east/south-west) direction with an elevation of 7 ft above sea level. The airport did not have taxiways parallel to the runway for use when positioning aircraft for departure or after arrival. Therefore, aircraft were often required to backtrack on the runway prior to take-off and after landing. The airport had GPS-based instrument approaches and a non-directional beacon ground-based navigation aid. Runway 06 was designated as a right-hand traffic pattern and circling to the north of runway 06/24 was not permitted for aircraft conducting instrument approaches. These requirements were due to the higher terrain to the north of the runway (Figure 2).

Figure 2: Navigational chart depicting the Ballina airport runway and position of the regular public transport (RPT) apron areas. Note there are no taxiways running parallel to the runway



Source: Airservices Australia

Traffic services

At the time of the occurrence, Ballina airport did not have a control tower and was not supported by air traffic control and/or traffic advisory facilities. It was equipped with a fire command centre and provided fire and rescue services when high capacity aircraft were operating at the airport.

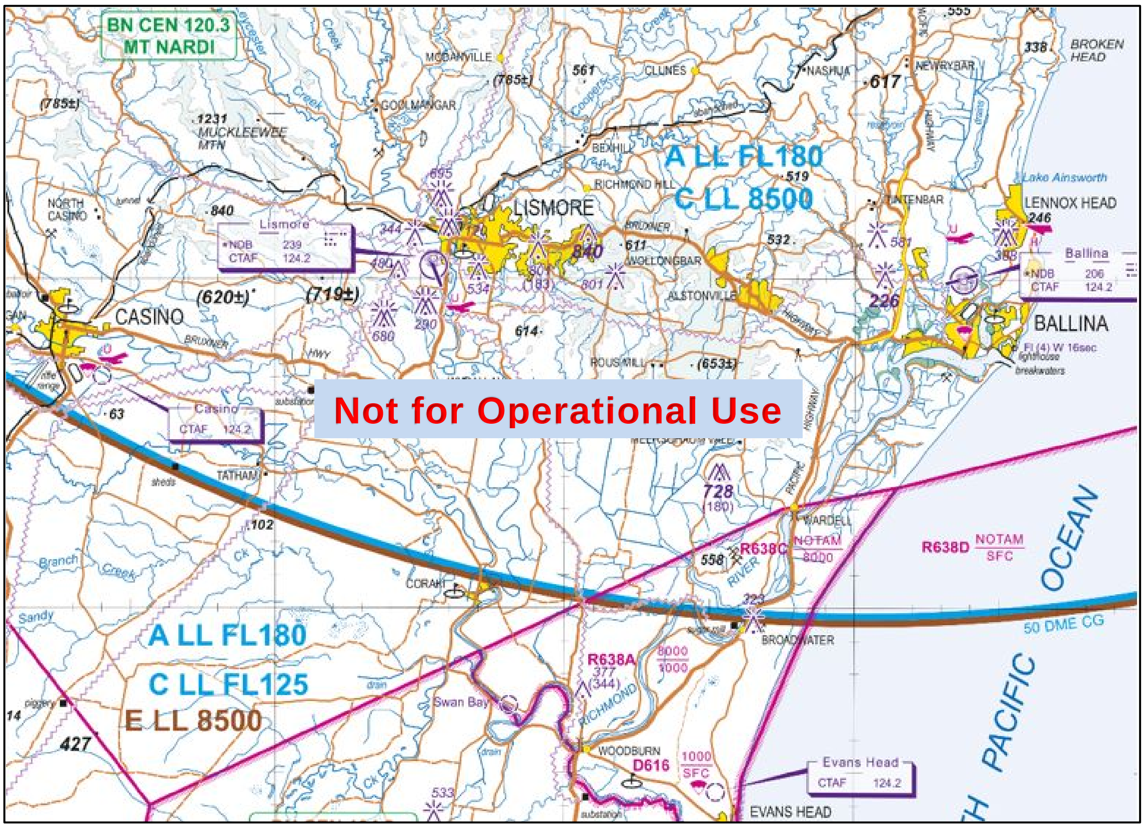
Civil radar around Ballina was capable of tracking aircraft that were equipped with a transponder above about 5,000 ft. Military radar and automatic dependant surveillance broadcast systems were not used by civil air traffic services in the Ballina area.

Airspace and traffic separation

Airspace above Ballina was classified as class G (non-controlled) below 8,500 ft. Above this altitude, the airspace changed to class C (controlled), where air traffic information and separation control were provided. Restricted airspace is located approximately 5 NM (9 km) south of the airport, which is activated by a notice to airmen when military high-speed jet aircraft were using that airspace and/or live-firing exercises where underway.

As well as prescribed traffic patterns for aircraft to follow in the immediate vicinity of the runway, the primary method of traffic separation at Ballina airport was visual. This relied on flight crew being able to use ‘see and avoid procedures’, which were stipulated in various regulations and guidance material for non-controlled aerodromes. See and avoid also relies on voice communication using the Common Traffic Advisory Frequency (CTAF). Due to their close proximity, the Ballina airport CTAF was shared with Casino and Lismore airports. As such, a pilot using this frequency would be affected by all radio transmissions from traffic at any one of these airports (Figure 3).

Figure 3: An extract of the Visual Terminal Chart of the Ballina area. The Casino and Lismore airports are depicted and share the CTAF of 124.2 MHz with Ballina airport. Also depicted in magenta are the restricted areas to the south Ballina, and the lower limit of the class C controlled airspace overhead those airports of 8,500 ft (in blue)



Source: Airservices Australia

Passenger numbers and traffic movements

An aeronautical study of activity at Ballina airport by the Civil Aviation Safety Authority’s (CASA) Office of Airspace Regulation[8] was released in July 2015. Using statistical data from the Bureau of Infrastructure, Transport and Regional Economics for the period 2009-2014, the study identified an average increase in passenger numbers at Ballina airport between 2009 and 2014 of six per cent per annum. Over the same period, the number of regular public transport movements increased by an average of four per cent per annum.

More recent data from Airservices Australia (annualised to September 2016) identified that, while the number of air transport movements had remained constant, there has been a five per cent increase in passenger numbers to 486,600. That is consistent with the increased use of larger aircraft, such as the Airbus A320, Boeing 737-800 and large turboprop aircraft.

The CASA study also identified that the total number of aircraft movements increased initially by five per cent per annum until 2013 and then by 12 per cent per annum. One-third of the projected 12 per cent increase was attributable to greater regular passenger transport services. The

8 www.casa.gov.au

remaining increase was attributable to a mixture of VFR[9] traffic, including training flights (including aircraft conducting circuit training), helicopter operations, private and charter operations and intermittent parachute operations.

The CASA study also found that, when compared with other airports with similar traffic levels, Ballina recorded the highest number of reported safety incidents between 2009 and 2014 relating to separation and communication issues, and almost double the number of reported incidents as the next highest airport (Table 1). The study also noted that a direct comparison between airports was difficult as '…every aerodrome is different and supports different levels and mixes of air traffic.'

More recent data detailing the aviation activity at Ayers Rock, Port Hedland and Ballina for the year ending September 2016 is shown in Table 2. Of note, both the total movements and air transport movements at Ballina had reduced from the year ending December 2014, while the passenger numbers increased.

Table 1: Number of reported separation and communication incidents for similar airports

	Movements December 2014			Airspace Related Incidents: 2009 to 2014 within 20 NM			Current ATS
	Total Movements	Passenger Transport Movements	Passengers				
Non-controlled				Separation	Communication	Total	
Ballina	19,004	7,271	437,940	11	9	20	CTAF
Ayers Rock	17,700	5,000	284,600	0	0	0	CA/GRS
Gladstone	22,624	17,154	506,856	5	6	11	CTAF
Newman	12,146	10,065	436,551	2	6	8	CTAF
Port Hedland	14,200	12,805	577,293	3	4	7	AFIS
Controlled							
Coffs Harbour	26,878	9,410	394,539	9	0	9	ATC
Hamilton Island	18,180	7,779	502,951	8	0	8	ATC

Source: Airservices Australia and ATSB data provided to the Office of Airspace Regulation

Table 2: Aviation activity at Ayers Rock, Port Hedland and Ballina airports for the year ending September 2016

	Total movements	Air transport movements	Passenger numbers
Ayers Rock	18,200	5,500	365,100
Port Hedland	12,282	10,485	424,741
Ballina	12,200	6,300	486,600

Source: Airservices Australia

Certified air/ground radio service

A certified air/ground radio service (CA/GRS) is an aerodrome radio information service that provides pilots with weather and traffic information. CASA Advisory Circular AC 139-27 *Guidelines for certified air/ground radio services* stated that:

> The primary purpose of a CA/GRS is to enhance the safety of air transport operations by the provision of relevant traffic information. A CA/GRS is beneficial in that the pilot receives traffic information in specific terms for their flight(s), which enhances their ability to see and avoid potentially conflicting traffic.

The CA/GRS also provides an automated aerodrome information service that broadcasts the:

- preferred runway
- wind direction and speed
- runway surface conditions

9 Visual flight rules (VFR): a set of regulations that permit a pilot to operate an aircraft only in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

- atmospheric pressure at sea level (QNH)
- temperature
- cloud base and visibility
- weather information
- aerodrome operational information.

A CA/GRS does not provide definite traffic separation, as would occur at a controlled aerodrome. Instead it provides relevant information to assist pilots organise their own separation.

The CA/GRS includes a certified air/ground radio operator who meets the training and qualifications requirements to hold the regulatory approval to carry out this role. The system also contains a minimum list of service facilities and documentation required by CASA. These facilities and documentation requirements included:

- a work station with full view of the circuit area and manoeuvring area
- a very high frequency transmitter/receiver operating on the CTAF or broadcast area frequency
- an automatic aerodrome information service on a separate very high frequency transmitter
- meteorological instrumentation that complies with Bureau of Meteorology standards for aviation use
- current aeronautical documents, including notices to airmen, appropriate to instrument flight rules and visual flight rules operations within the vicinity of the aerodrome or broadcast area
- a telephone
- local CA/GRS operating procedures
- an aerodrome emergency plan.

At the time of the occurrence, Ballina airport did not have CA/GRS. Recent reviews of the airspace around Ballina by the CASA Office of Airspace Regulation identified a complex mix of air traffic and strong growth in overall passenger and operating traffic numbers. The reviews also examined the frequency and type of safety occurrences comparable to other non-controlled aerodromes.

The CASA report titled *Supplementary Airspace Review of Ballina Byron Gateway* of July 2015 recommended that the operator of Ballina airport implement a CA/GRS before the end of June 2016 to reduce the airspace risk. It also noted that CASA should continue to monitor movement numbers at Ballina with a view to designating Ballina as a controlled aerodrome as soon as the risk to traffic warranted.

In September 2016, the ATSB was informed by the operator of Ballina airport that approval had been granted for the implementation of a CA/GRS at Ballina by Airservices Australia and CASA. Certified air/ground radio operations commenced in March 2017 from the airport's fire command centre's facilities.

Aircraft systems

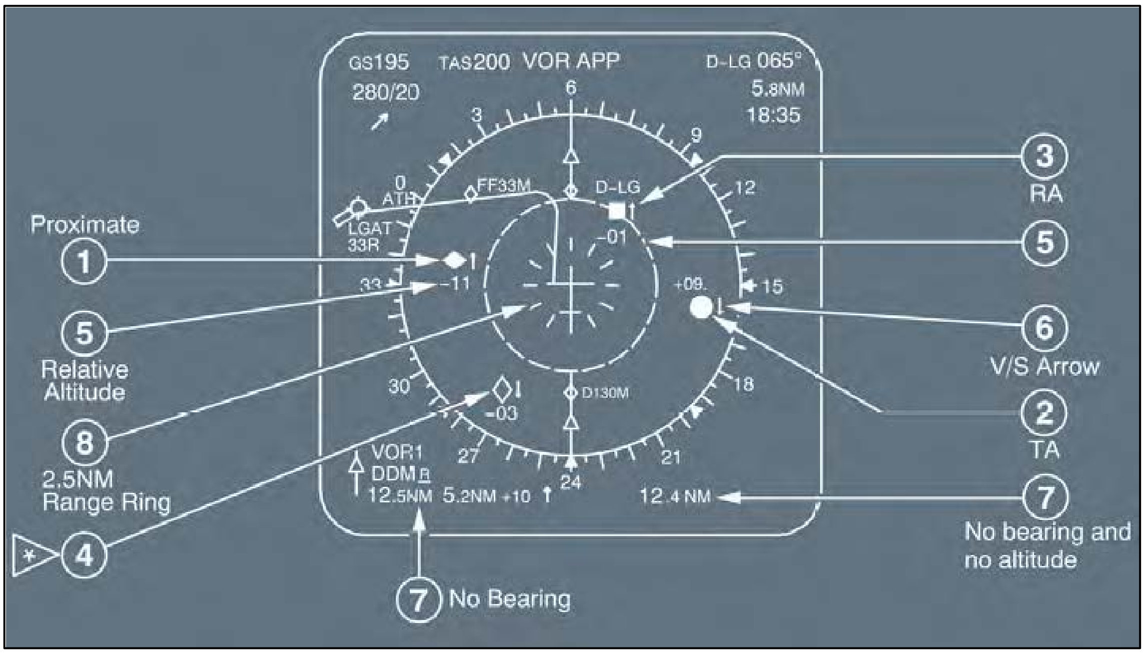
Traffic alert and collision avoidance system

The Airbus A320 is equipped with a traffic alert and collision avoidance system (TCAS) designed to detect transponder-equipped traffic within a 30-40 NM (56-74 km) radius and up to 9,900 ft above and below the aircraft (referred to as intruders). Depending on the phase of flight, and the level of sophistication of the intruding aircraft, the TCAS categorises the intruder(s) depending on the potential for conflict and/or collision. The category of the intruder determined which symbol would be used to represent the traffic on the flight crew's navigation displays (ND). In certain emergency situations the TCAS would offer instructions to the pilot through aural alerts and visual alerts on the navigation and primary flight displays to avoid a collision.

The intruder categories were represented as follows (Figure 4):

1. **Proximate** - no collision threat existed but the intruder was in the vicinity of the aircraft (closer than 6 NM (11 km) laterally and ±1200 ft vertically). The pilot would see a white filled diamond symbol on their ND depicting the position of the intruder.
2. **Traffic advisory (TA)** - a potential collision threat existed, however the closest point of separation was about 40 seconds away on the current projected flight paths. The pilot would see an amber filled circle on their ND, as well as receiving an aural alert.
3. **Resolution advisory (RA)** - a real collision threat existed and the closest point of separation was approximately 25 seconds away or less. The pilot would see a red filled square on their ND and receive vertical speed orders on their primary flight display and a series of aural alerts.
4. **Other intruders** - no collision threat existed and any non-proximate traffic with 30 NM (56 km) and a defined vertical range was depicted. The pilot would see a white outline diamond on their ND depicting the position of the intruder.
5. **Relative altitude** - in all categories the pilot would receive indications on their ND of the relative altitude of the intruder in hundreds of ft.
6. **Vertical speed arrow** - in all categories, if the intruder was climbing or descending at greater than 500 ft per minute, the pilot would see an up or down arrow on their ND.
7. **No bearing intruder** - If the bearing of a suspected TA or RA intruder was not available, it was displayed in amber or red in digital form at the bottom of the ND

Figure 4: Typical Airbus A320 navigation display depicting the various representations of TCAS intruders. The number of each representation accords with the numbered list above



Source: Airbus

TCAS inhibit

Depending on the aircraft's altitude, some of the TCAS advisories and alerts were inhibited. In particular:

- All intruders flying below 380 ft above ground level (AGL) when the own aircraft altitude is below 1,700 ft AGL.
- All RA alerts when the own aircraft was below 1,100 ft AGL and climbing, and below 900 ft AGL on descent. In this case, the RA was converted into a TA.

- All TA aural messages when the own aircraft is below 600 ft AGL in climb, and below 400 ft AGL on descent.

During take-off, all RA alerts are converted into TA alerts and all TA aural alerts are inhibited.

Aircraft alerting systems

The Airbus A320 is equipped with various sensors throughout the aircraft to monitor key parameters. These sensors feed their respective data into two System Data Acquisition Concentrators, which in turn process the data and feed it to two flight warning computers (FWCs). The FWCs check for discrepancies in the data and then display the data on the electronic centralised aircraft monitor system (ECAM). In the event of a fault, the FWCs generate the appropriate warning messages and sounds. More vital systems are routed directly through the FWCs such that failures in those systems can still be detected even with the loss of both System Data Acquisition Concentrators. The whole system can continue to operate even with a failure of one of the concentrators and one FWC.

Failures are classed by importance, ranging from level 1 failures to level 3 failures. In the event of simultaneous failures the most critical failure is displayed first. The warning/caution hierarchy is as follows:

- Level 3 failures: Warnings reflecting situations that require immediate crew action and that place the flight in danger. These are enunciated with a red master warning light, a warning (red) ECAM message and a continuous repetitive chime or a specific sound or a synthetic voice. The chime can be silenced by pressing the master warning push button.
- Level 2 failures: Cautions showing failures that require crew attention, but not immediate action and with no direct consequence to flight safety. Level 2 failures are shown to the crew through an amber master caution light, a caution (amber) ECAM message and a single chime.
- Level 1 failures: Cautions, failures and faults that lead to a loss of system redundancy and require monitoring but present no hazard. Level 1 failures are enunciated by a caution (amber) ECAM message but produce no aural warning.

Gear not down and locked master warning

In the event that the system detects the thrust levers being retarded outside a defined take-off thrust parameter and the landing gear is not down while at a low altitude, the system classifies the condition as a level 3 failure. In this case the red master warning activates to alert the crew of the condition.

Autothrottle disengage master caution

If the thrust levers are retarded after the application of take-off/go-around thrust, the autothrottle system disengages and the system generates a level 2 failure message. This activates the amber master caution alerts to notify the crew of the condition.

Take-off performance

Take-off performance is typically calculated for each flight to allow for variations such as runway length, aircraft weight and environmental conditions. To assist with these calculations, Jetstar Airways (Jetstar) provided crews with a computer tablet loaded with a program known as ‘Flysmart’, into which a series of parameters could be entered before each flight. This program then generated an optimum take-off solution including the:

- optimum flap setting
- maximum speed in which the take-off can be rejected and remain within the runway confines (V1)
- optimum speed in which to commence the take-off rotation (VR)

- optimum speed to maintain in the event the take-off is continued after the loss of thrust on one engine (V2).

To allow for minor fluctuations in temperature and/or barometric pressure between calculation of take-off performance and actual take-off time, pilots would typically increase the outside air temperature value by 1 °C and decrease the barometric pressure value by 1 hPa. This was a conservative measure designed to alleviate the need to recalculate performance data once taxiing had commenced.

Manufacturers and operators of transport category aircraft emphasise the importance of the decision to stop or continue the take-off in the event of a problem before reaching V_1. The Airbus recommendations and Jetstar training matrixes in such cases included a list of reasons to reject the take-off before V_1. This list was divided into reasons to reject below 100 kt for Airbus aircraft (80 kt for Boeing aircraft) and when above 100 kt but before V_1. The rationale behind the two lists of reasons was that at higher speed it was only desirable to reject for critical conditions that affect the immediate safety of flight and that the take-off could be continued for less serious faults.

The Jetstar Flight Crew Training Manual contained the following guidance to assist crews in the decision to reject the take-off:

> …To assist in the decision making process, the take-off is divided into low and high speed regimes, with 100 kt being chosen as the dividing line. The speed of 100 kt is not critical but was chosen in order to help the Captain make the decision and to avoid unnecessary stops from high speed:
>
> - Below 100 kt, the Captain will seriously consider discontinuing the take-off if any ECAM warning/caution is activated.
> - Above 100 kt, and approaching V1, the Captain should be “go-minded” and only reject the take-off in the event of a major failure, sudden loss of thrust, and any indication that the aircraft will not fly safely, any red ECAM warning, or any ECAM caution listed below:
>   - F/CTL SIDESTICK FAULT
>   - ENG FAIL
>   - ENG REVERSER FAULT
>   - ENG REVERSE UNLOCKED
>   - ENG 1(2) THR LEVER FAULT
>
> …

To ensure these reasons for continuing or rejecting a take-off were highlighted in the crew’s mind, and that all crew members shared the same mental model, it was compulsory to brief these reasons and required actions before every take-off.

The decision to stop or continue the take-off in the event of an impending traffic conflict before V_1 was not covered in these reasons, either below or above 100 kt.

FLEX temp/take-off/go-around

The calculated performance data also included a temperature known as a ‘FLEX’ temperature, which could be programmed into the aircraft to provide a reduced take-off power setting. With the exception of specific environmental conditions and certain runway conditions listed in the Jetstar manuals, reduced power take-off settings were encouraged whenever available to decrease engine wear and fuel burn while still meeting the required take-off parameters.

Once the FLEX temperature was calculated and entered into the aircraft’s systems, the desired thrust setting was achieved by the pilot pushing the thrust levers into the FLEX detent of the thrust lever quadrant at the commencement of the take-off roll. This signalled the autothrottle system to set the desired power. Alternatively, the pilot could push the thrust levers beyond the FLEX detent into the take-off/go-around detent. This would cancel the reduced thrust and provide maximum available engine thrust for the environmental conditions.

Standard operating procedures

Standard operating procedures encompass such things as the standardised and coordinated order in which a series of steps are undertaken (scan action flows) and checklists to ensure that the required steps are completed correctly. These scan action flows and checklists are described in the Jetstar Flight Crew Training Manual, Flight Crew Operations Manual amplified and supplementary procedures and the Quick Reference handbook.

In order to achieve a balanced workload and encourage a shared crew mental model, the standard operating procedures were typically divided into areas of responsibility. This ensured that each crew member was aware of their actions dependent on the phase of flight, and increased their ability to predict other crew members' actions. This awareness and predictability increased the likelihood that a deviation from standard operating procedures would be detected.

In two pilot operations, the areas of responsibility were typically divided into the pilot flying role (PF) and pilot monitoring roles (PM). The PF was primarily responsible for guidance of the aircraft in the air and, on some aircraft, while taxiing. The PM was responsible for monitoring the aircraft's progress and carrying out supplementary support tasks, such as the activation of switches at the PF's request and communicating on the radio. Crew resource management principles dictate that during all phases of flight, each crew member has a clear understanding of the role for which they are responsible.

In the event that these areas of responsibility need to change, it is essential that this be communicated clearly. In the event of a complete change from PF to PM, standard phrases such as 'handing over' and 'taking over', or 'you have control' and 'I have control' are commonly used. In the event that the roles are partially amended, the area amended is clearly communicated such as 'your radios' or 'I have the radios'.

A clear understanding of each crew member's area of responsibility reduces duplication, omissions, and/or the risk of a loss of shared mental model.

Crew resource management

Crew resource management is a skill developed by flight crew through training that focuses on using all available resources to assist decision making while avoiding or managing error (Harris, 2011). It is underpinned by good communication and appropriate use of available resources, including those outside of the flight deck, such as air traffic control.

Cockpit gradient

The term 'cockpit gradient' describes the relative level of authority that exists between various crew members, and the way this authority influences communication and decision making. It is widely accepted that the pilot in command has ultimate responsibility in terms of decision making. However, depending on the cockpit gradient, other crew members are encouraged or discouraged from influencing these decisions through their own inputs.

A 'level' cockpit gradient is where all crew members have equal weighting in their input and influence towards a decision. However care must be taken to ensure the gradient is not too 'flat' and it is clear as to who is 'in charge'.

A 'steep' cockpit gradient is when the pilot in command has an overwhelming influence in decision making, with little input sought from the other crew members. A steep gradient can 'inhibit communication, coordination and the cross-checking of errors' (Harris, 2011).

Levels of assertion

In order to standardise and provide a graduated method in which a junior crew member, such as a first officer, communicates pertinent information to a more senior crew member, a number of acronyms have been developed. These are designed to enable junior crew to pass information in a way that emphasises its importance and the associated level of concern. In particular, they also include any observed deviations from standard operating procedures. For example, Jetstar has adopted the acronym ‘R.A.I.S.E’, which emphasises the importance of:

R - Relay information:	"There's a strong tailwind here on base."
A - Ask a question:	"Do you think you should start the final turn early?"
I - The 'I' statement:	"I am concerned that we'll cross over to the other runway path."
S - Solution statement:	"Increase your bank angle."
E - Emergency statement:	"Captain, you must act now!"

If the situation is still unresolved, then the pilot-not-flying must take control of the aircraft using the phrase "I have control".

Depending upon the urgency of the situation, it may be necessary to skip some stages, or enter the process at a later stage.

Safety analysis

Introduction

On departure from Ballina/Byron Gateway Airport (Ballina airport), New South Wales an Airbus A320 commenced take-off while a Duchess BE-76 was conducting instrument approach training in close proximity and nearing the missed approach point for the same runway. The A320 crew noticed the Duchess before reaching the V_1 decision speed, however the take-off was continued. During manoeuvres shortly after take-off to remain below the altitude of the Duchess, the crew of the A320 received master warning/caution alerts and commenced flap retraction at a low altitude. The A320 was then turned in a direction contrary to the prescribed noise abatement departure procedure.

The following analysis will examine the operating environment at the non-controlled Ballina airport, and the human performance factors involved in the occurrence.

Air traffic facilities

At the time of the occurrence, Ballina airport was a non-towered (non-controlled) airport with no traffic control or advisory services.

Passenger numbers at Ballina airport had increased steadily over a number of years to in excess of 486,000 per annum by September 2016. That increase in passenger numbers occurred in the context of the airport also having a mix of non-passenger transport services (see the section titled *Passenger numbers and traffic movements*).

Direct comparisons of occurrence data between airports can be problematic due to differences in the levels and types of traffic that operate in the associated airspace, and the variance in incident reporting by operators. However, compared with other non-controlled aerodromes, in the period 2009–2014 no other Common Traffic Advisory Frequency (CTAF) airspace had a higher total number of separation and communication incidents than Ballina airport. Ballina had approximately double the number of those incidents compared to the next highest similar airport. In addition, the two CTAFs with a high ratio of non-passenger transport movements (Ballina and Gladstone) recorded the highest number of separation/communication incidents.

The data also supports that the availability of a certified air/ground radio service or an aerodrome flight information service, neither of which were available at Ballina, reduces the separation/communication risk. Non-controlled airports equipped with a certified air/ground service, such as Ayers Rock, Northern Territory recorded little if any separation/communication incidents. Like Ballina, Ayers Rock also facilitated passenger transport movements and a large number of visual flight rules traffic. Similarly, airports equipped with an aerodrome flight information service, such as Port Headland, Western Australia recorded approximately 65 per cent fewer incidents compared with Ballina. Of note, in the period examined, Ballina recorded 26 per cent fewer aircraft movements, but approximately 32 per cent greater overall passenger numbers.

The ATSB also examined the broader suitability of the airspace surrounding Ballina airport. This included consideration of comments made in the Civil Aviation Safety Authority (CASA) Supplementary Airspace Review for Ballina conducted in July 2015, and additional information sought from CASA and Airservices Australia (Airservices) during the investigation. Airservices and CASA commented that since 2009 no aircraft separation incidents were recorded above 5,000 ft above mean sea level within 20 NM (37 km) of Ballina airport in Class G airspace. They also stated that existing radar or radar-like surveillance around Ballina is currently limited to 5,000 ft and this was unlikely to improve in the near future.

In response to a recommendation of the 2015 CASA review, Airservices examined the introduction of Class E airspace below Class C airspace in the vicinity of Ballina. Airservices determined that there would be no significant safety benefit to support the establishment of Class E airspace below Class C airspace. Airservices also identified that introducing Class E airspace would provide pilots with less time to comply with CTAF requirements when entering or leaving Class E airspace. CASA also consulted with passenger transport operators that regularly used Ballina Airport and determined that they also did not support the lowering of Class E. CASA did not recommend any changes to the existing airspace architecture at that time.

CASA is planning a post implementation review in mid-2017, which will, in part, assess any airspace risks since the introduction of the Certified Air/Ground Service. CASA will also continue to monitor aviation activity and incident reports around Ballina to determine if any changes in the volume or complexity of aviation activity generate the need for further airspace review.

Development of the occurrence

Take-off preparation

When the flight crew of A320, VH-VQS (VQS) entered and backtracked for departure on runway 06 the estimate provided by the pilots of Duchess, VH-EWL (EWL) indicated that there was about 5 minutes gap between the aircraft. Additionally, as the crew of VQS entered the runway EWL was sighted on a long final approach and the crew assessed that sufficient separation would be maintained between the two aircraft during the take-off. Once VQS was lined up however, its crew could no longer visually assess EWL's position, as it was behind them.

The captain of VQS was operating as pilot flying for the departure from Ballina. As such, the first officer (FO) was providing the pilot monitoring support duties of, including managing radio communications. However, while entering and backtracking the runway for take-off, the captain repeatedly communicated with the crew of a second, more distant aircraft, a Boeing 737 registered VH-VUE (VUE) on the CTAF.

The captain's assumption of control of the radios was not conducted as part of a normal handover/takeover procedure, nor communicated to the FO beforehand. Although there are indications that the captain's actions were an attempt to expedite a separation plan with the crew of VUE, the additional task increased their workload close to the time of departure. Furthermore, taking control of the radios without informing the FO was contrary to established crew resource management principles and removed the FO from the 'loop' regarding the division of responsibility for cockpit tasks.

The captain reported a level of frustration in relation to coordinating separation with the crew of VUE, which was also consistent with the CTAF audio recordings. It is likely that the captain's increased workload and frustration was a distraction that led to their attention becoming focused on organising a separation plan from VUE, at the expense of maintaining an awareness of the position of the more proximal EWL. Focused attention occurs when an individual becomes fixated on one source of information or task, to the exclusion of other available information (Harris, 2011).

Initial take-off roll

The time required to confirm that adequate separation existed from VUE delayed the take-off by VQS and reduced the separation from EWL. As the crew of VQS were unable to see EWL once lined up, assessing whether the delay created a traffic conflict essentially relied on radio communication.

The instructor in EWL believed that VQS would hold in the lined-up position until EWL completed the missed approach. However, the captain of VQS intended to depart prior to EWL reaching the missed approach point but did not convey that intent to the pilots of EWL. Had the pilots of EWL been advised of the intended take-off, it is likely that on seeing VQS delayed in the lined-up position, they would have perceived VQS as a traffic conflict threat. This would have provided an opportunity for the pilots of EWL to communicate with the crew of VQS and establish a different separation plan.

The FO reported not expecting the captain to commence take-off and, as such, did not transmit the take-off ‘rolling’ call to alert other traffic of the impeding take-off until after the VQS was already moving. This was contrary to normal practice, where the radio call was carried out prior to advancing the thrust levers. Based on the estimate provided by the crew of EWL, at the commencement of the take-off roll there was about 2 minutes before EWL arrived overhead the runway threshold. However, given position estimates are only required to be updated when considered to be more than 2 minutes in error, the time and therefore separation between the two aircraft may have been significantly less.

The instructor in EWL reported only realising that the crew of VQS intended to take-off on noticing the aircraft moving. The instructor reacted by getting the student pilot to look up and confirm the instructor’s interpretation of the situation. Shortly after, the instructor heard the take-off call by the crew of VQS. Although the instructor reported being satisfied with continuing the approach, had the take-off call taken place prior to VQS moving, the instructor in EWL would have had time to alert the crew of VQS early in the take-off. This would have reduced the risk of a traffic conflict.

The captain commenced the take-off without first confirming that the FO was ready and before the FO completed the take-off radio call. Additionally, the use of Take-Off/Go-Around thrust was also decided and actioned by the captain without communicating with the FO. This was contrary to the pre-flight briefing where a FLEX temperature take-off was discussed, calculated and entered into the aircraft systems.

The actions to commence the take-off that was contrary to plan was possibly motivated by the desire to expedite the take-off due to concern with the proximity of EWL. However, doing so reduced the shared understanding of what the captain was intending to do, and made managing these unexpected actions more difficult. They were also indicative of an elevated cockpit gradient. It is likely that these non-standard practices and procedures resulted in the FO experiencing a series of unexpected actions over a short period of time. This resulted in surprise, distraction and increased workload for the FO.

Research shows that surprise is a response to an unexpected action that results from a mismatch between one’s mental expectations and what is actually happening (Rivera and others 2014). If a pilot is not expecting something to go wrong, the level of surprise can result in taking no action, or the wrong action (Martin and others 2012). As the FO was surprised by the decision to commence the take-off, it is likely their ability to recognise and respond to the traffic conflict was affected. As a result, there was no opportunity for the FO to question the decision to continue the take-off. Instead the FO focussed on supporting the captain. While there is insufficient evidence to determine whether this contributed to the development of this occurrence, avoiding distraction and a breakdown in shared crew mental modelling reduces the risk of a breakdown in standard operating procedure.

Take-off and initial climb

The captain of VQS became aware of EWL’s proximity after observing it on the traffic alert and collision avoidance system (TCAS) at approximately 100 kt during the take-off roll. While that was below the V_1 decision speed and sufficient runway was available, there was no indication that actions associated with a rejected take-off were initiated by the captain. Furthermore, when the captain advised the FO of the traffic and requested proximity information, the FO did not encourage the captain to stop the take-off.

Jetstar Airways guidance material advised that above 100 kt and nearing V_1 the captain should give preference to continuing the take-off, unless there was a major technical malfunction. In that context, the unexpected proximal traffic would probably not have been previously considered, nor pre-briefed, by the crew as a reason to abort the take-off. Additionally, the increased acceleration associated with the use of Take-Off/Go-Around thrust, and the exchange between the flight crew assessing the displayed position of EWL, would have provided limited time to assess and initiate a rejected take-off.

Use of the RAISE model (see the section titled *Levels of assertion*) provides a method to recognise and identify a threat, assess the level of threat and then decide which step to use to achieve the appropriate level of assertion. Although there was no indication that the FO supported a rejected take-off, it is likely that the FO's ability to express an appropriate level of assertion to encourage the captain to stop was impeded by the available time.

The captain advised that, given the available runway length, they were concerned about aborting the take-off and felt that the best course of action was to become airborne and remain below EWL's altitude and until sufficient lateral separation was established. That option provided a means of separation between the two aircraft. However, as EWL was by now close to the missed approach point at low altitude, it required VQS to level off shortly after take-off. That, in turn led to non-standard handling of the aircraft and the activation of a number of master warning/caution alerts.

Findings

From the evidence available, the following findings are made with respect to the traffic management occurrence involving Airbus A320, registered VH-VQS and operated by Jetstar Airways, and a Beech Aircraft Corporation Duchess BE-76, registered VH-EWL that occurred at Ballina/Byron Gateway Airport, New South Wales on 14 January 2016. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance. A safety issue is an event or condition that increases safety risk and (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.

Contributing factors

- **Despite a steady overall increase in passenger numbers and a mixture of types of operations, Ballina/Byron Gateway Airport did not have traffic advisory and/or air traffic control facilities capable of providing timely information to the crews of VH-EWL and VH-VQS of the impending traffic conflict. It is likely the absence of these facilities, which have been shown to provide good mitigation at other airports with similar traffic levels, increased the risk of a mid-air conflict in the Ballina area. [Safety Issue]**
- In addition to conducting the pilot flying role, the captain of VH-VQS assumed control of the radio to ensure separation with the incoming aircraft VH-VUE. This increased the captain's workload, resulting in reduced positional awareness of the more proximal VH-EWL and a subsequent traffic conflict with that aircraft.

Other factors that increased risk

- The non-adherence to standard operating procedures by the captain of VH-VQS, although possibly influenced by a desire to expedite the take-off, was consistent with a steep cockpit authority gradient. This resulted in a lack of crew shared understanding and distraction, removing the opportunity for the first officer to identify the impending traffic conflict.
- Despite a positive separation plan between VH-VUE and the two other aircraft, no such plan was established between the pilots of VH-EWL and the crew of VH-VQS. This led to the pilots of VH-EWL expecting VH-VQS to remain in the line-up position until after VH-EWL had completed the missed approach and therefore not perceived as a conflict threat.
- The radio call to inform Ballina/Byron Gateway traffic that VH-VQS was rolling was transmitted after the take-off roll had commenced. This limited the opportunity for the instructor in VH-EWL to process the situation and ensure adequate separation.
- The decision by the crew of VH-VQS to remain below VH-EWL’s operating altitude after take-off, although intended to assure adequate separation until sufficient lateral separation was established, resulted in non-standard handling of the aircraft and the activation of a number of master warning/caution alerts.

Safety issues and actions

The safety issue identified during this investigation is listed in the Findings and Safety issues and actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

The initial public version of these safety issues and actions are repeated separately on the ATSB website to facilitate monitoring by interested parties. Where relevant the safety issues and actions will be updated on the ATSB website as information comes to hand.

Air traffic facilities at Ballina/Byron Gateway Airport

Number:	AO-2016-003-SI-01
Issue owner:	Operator-Ballina/Byron Gateway Airport
Operation affected:	Aviation: Air transport, general aviation and airport operation
Who it affects:	All aircraft operations that utilise Ballina/Byron Gateway Airport

Safety issue description:

Despite a steady overall increase in passenger numbers and a mixture of types of operations, Ballina/Byron Gateway Airport did not have traffic advisory and/or air traffic control facilities capable of providing timely information to the crews of VH-EWL and VH-VQS of the impending traffic conflict. It is likely the absence of these facilities, which have been shown to provide good mitigation at other airports with similar traffic levels, increased the risk of a mid-air conflict in the Ballina area.

Response to safety issue and/or Proactive safety action taken by Ballina/Byron Gateway Airport

The operator of Ballina/Byron Gateway Airport gained approval from the Civil Aviation Safety Authority (CASA) to implement of a certified air/ground radio service (CA/GRS) to provide weather services and traffic information at the airport. This service commenced operation in March 2017. The CASA Office of Airspace Regulation is planning to assess its effectiveness via a post-implementation review in mid-2017.

ATSB comment in response

The ATSB is satisfied that CA/GRS will effectively mitigate the safety issue identified in the report. CASA's planned post-implementation review of the service is welcomed by the ATSB.

Current status of the safety issue

Issue status: Adequately addressed

Justification: The ATSB is satisfied that the implementation of the CA/GRS will adequately address the potential for mid-air conflict identified in the safety issue.

General details

Occurrence details

Date and time:	14 January 2016 – 1404 EDT	
Occurrence category:	Incident	
Primary occurrence type:	Aircraft separation	
Location:	Ballina/Byron Gateway Airport	
	Latitude: 28° 50.03' S	Longitude: 153° 33.75' E

Pilot details – Captain

Licence details:	Air Transport Pilot (Aeroplane) Licence
Endorsements:	Command Airbus A320
Aeronautical experience:	Approximately 18,100 hours
Last flight review:	17 June 2015

Pilot details – First officer

Licence details:	Commercial Pilot (Aeroplane) Licence
Endorsements:	Airbus A320 Co-pilot P2
Aeronautical experience:	Approximately 2,300 hours
Last flight review:	31 July 2015

Pilot details – Instructor

Licence details:	Air Transport Pilot (Aeroplane) Licence
Endorsements:	BE-76 Beech Duchess
Ratings and Qualifications	Multi-engine IFR training and checking approval, approved examiner of airmen, chief pilot
Aeronautical experience:	4,100 hours

Aircraft details – VH-VQS

Manufacturer and model:	Airbus A320-232
Year of manufacture:	2005
Registration:	VH-VQS
Operator:	Jetstar Airways
Serial number:	2515
Type of operation:	Air Transport High Capacity
Persons on board:	159

Aircraft details – VH-EWL

Manufacturer and model:	Beech Aircraft Corporation BE 76
Year of manufacture:	1978
Registration:	VH-EWL
Serial number:	ME-16
Type of operation:	Flying training
Persons on board:	2

Sources and submissions

Sources of information

The sources of information during the investigation included:

- the flight crews of VH-VQS and VH-EWL
- flight data from VH-VQS
- Jetstar Airways
- Airservices Australia radar data
- the Civil Aviation Safety Authority
- the Ballina/Byron Gateway Airport operator.

References

Harris D 2011, *Human Performance on the Flight Deck,* Ashgate Surrey, England.

Martin WL, Murray, PS, Bates, PR 2012, The Effect of Startle on Pilots During Critical Events: A Case Study Analysis, *Proceedings of the 30th EAAP Conference: Aviation Psychology & Applied Human Factors,* Sardinia, Italy, pp. 388–394.

Rivera, JR, Talone, AB, Boesser, CT, Jentsch, F and Yeh, M 2014, Startle and Surprise on the Flight Deck: Similarities, Differences and Prevalence, *Proceedings of the Human Factors and Ergonomics Society 58th Annual Meeting,* Chicago, IL United States, pp. 1047–1051.

Civil Aviation Safety Authority, *Supplementary Airspace Review of Ballina Byron Gateway* PR 2010, 2011, 2013, 2015*,* ACT Australia.

Submissions

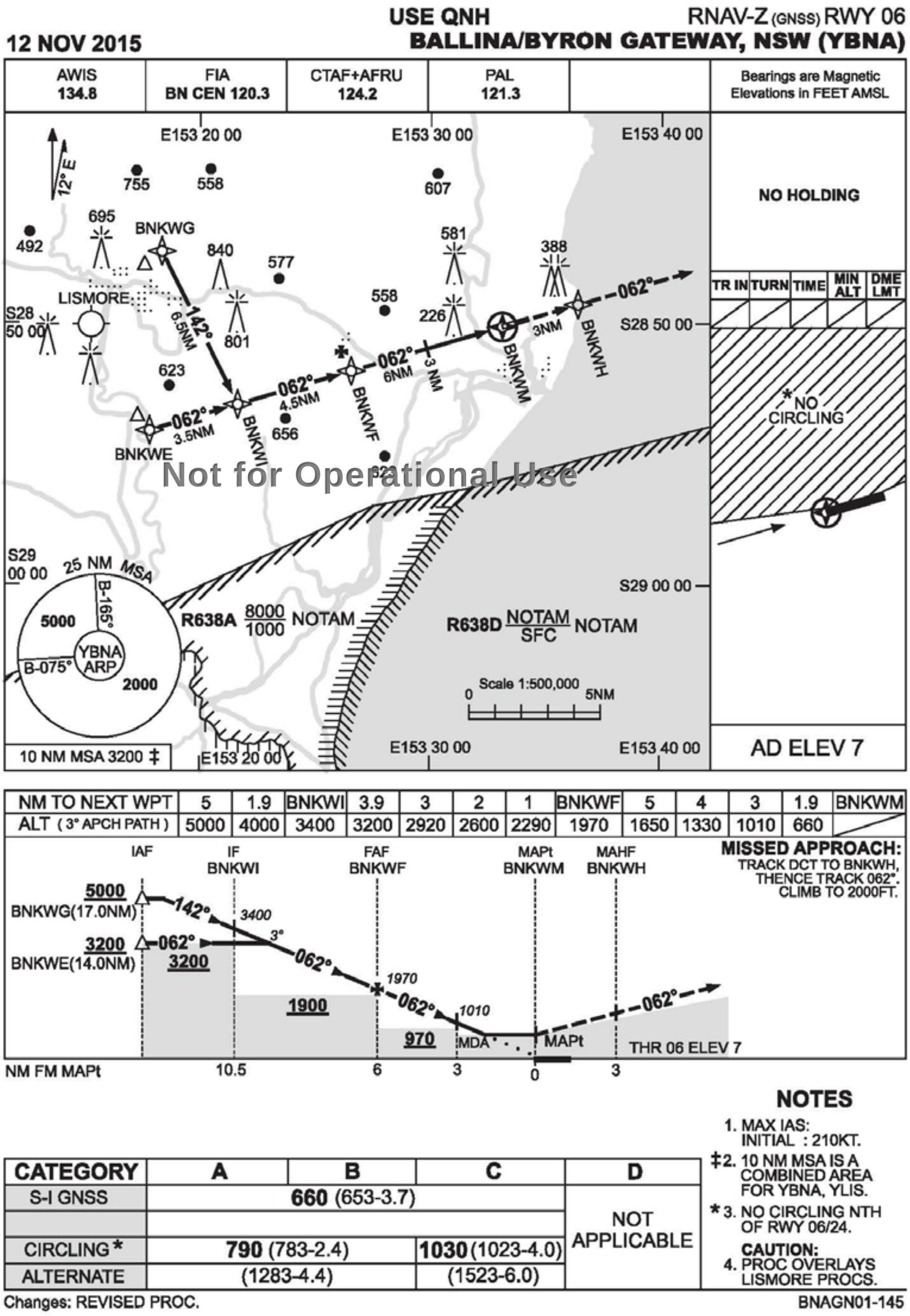
Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the flight crew of VH-VQS, Jetstar Airways, the pilot instructor of VH-EWL, the Ballina/Byron Gateway airport operator, the Civil Aviation Safety Authority, Airservices Australia and the accredited representative of the French Bureau d'Enquêtes et d'Analyses (BEA).

Submissions were received from the first officer of VH-VQS, Jetstar Airways, the Ballina/Byron Gateway airport operator, the Civil Aviation Safety Authority and Airservices Australia. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Appendices

Appendix A- RNAV-Z (GNSS) approach runway 06



Appendix B –RNAV- X (RNP) approach runway 06

Australian Transport Safety Bureau

The ATSB is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: 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 that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

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

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine 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.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation

Traffic management occurrence involving Airbus A320, VH-VQS and Beech Aircraft Corporation BE 76, VH-EWL, at Ballina/Byron Gateway Airport, New South Wales on 14 January 2016

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