



Australian Government  
Australian Transport Safety Bureau

# Flight path management and descent toward the lower limit of controlled airspace involving Airbus A320, VH-VND

On approach to Melbourne Airport, Victoria | 11 February 2015



Investigation

**ATSB Transport Safety Report**  
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#### **Addendum**

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# Safety summary

## What happened

On 11 February 2015, an Airbus A320 aircraft, registered VH-VND and operated by Tiger Airways, was conducting a scheduled passenger service from Hobart Airport, Tasmania to Melbourne Airport, Victoria.

At about 1750 Eastern Daylight-saving Time, about 9 NM (17 km) north of Melbourne Airport, and after the flight crew had been cleared by air traffic control to conduct a visual approach, the aircraft descended below the minimum safe altitude, though the aircraft remained in controlled airspace.

During the descent, both flight crew became pre-occupied with other tasks inside the flight deck, which had the effect of increasing their workload and distracting them from monitoring the aircraft's flight path and altitude. About two minutes after commencing descent on the visual approach, the flight crew levelled the aircraft after realising that it appeared to be low on profile. A safety alert issued by air traffic control soon followed, where in response, the aircraft was climbed to intercept the recommended visual approach descent profile. The remainder of the flight was uneventful and the aircraft landed on runway 16 at Melbourne Airport.

## What the ATSB found

The ATSB found that after being vectored off the expected pre-planned shortened arrival route, and then cleared for a visual approach, a combination of increased workload and distraction diverted the flight crew's attention from monitoring the aircraft's descent. During the descent, the captain elected to intercept the final approach course by entering a radial intercept waypoint into the aircraft's auto-flight system, which differed from the first officer's more familiar plan to conduct a localiser intercept. This had the effect of diverting both crew members' attention to inside the flight deck, as they discussed and demonstrated the intercept and resulting flight mode reversions. The aircraft continued to descend below the normal approach profile and entered the 500 ft vertical buffer at the base of the control area step. This reduced separation with terrain and any aircraft operating outside controlled airspace.

The flight crew's mental model of the approach was not consistent with the actual flight path of the aircraft. This affected their ability to fly a normal descent profile and remain within the required control area step.

The flight crew miscalculated and did not adequately communicate the aircraft's descent from 3,000 ft during the conduct of a visual approach. This limited their awareness of the descent rate and the below-profile altitude of the aircraft during a critical phase of flight.

## Safety message

Flight crew should be mindful that during higher workload phases of flight, such as during approach and landing, introducing tasks that divert both flight crew members' attention from monitoring the aircraft's flight profile and altitude should be minimised. Further, if tasks that bring attention into the flight deck are required to be completed during a visual approach, pilots must ensure that at least one pilot monitors the aircraft's flight path profile and energy state. Setting an appropriate lower altitude limit may be an effective risk control to alert flight crew and/or prevent the aircraft's descent below a desired altitude. Communication and confirmation of any changes to the aircraft's flight modes are also important during this period.

# The occurrence

On 11 February 2015, an Airbus A320 aircraft, registered VH-VND (VND) and operated by Tiger Airways Australia Pty. Ltd. (Tigerair), was operating a scheduled passenger service from Hobart Airport, Tasmania to Melbourne Airport, Victoria. The flight, including departure and climb from Hobart, was uneventful until shortly prior to the commencement of descent into Melbourne.

## Descent preparation and descent from flight level 360

At about 1710 Eastern Daylight-saving Time,<sup>1</sup> and prior to commencing the descent, the flight crew were issued a clearance from air traffic control (ATC) to conduct a WAREN EIGHT ALPHA standard arrival route (STAR) for runway 16<sup>2</sup>(see *Appendix A*). In preparation for the arrival, the first officer, who was pilot flying (PF),<sup>3</sup> entered the STAR into the aircraft's auto-flight system.

After completing other normal pre-descent flight deck preparation, the flight crew recalled that they conducted an approach and landing briefing, which included a review of the prescribed arrival route and any potential flight restrictions including controlled airspace limits and terrain along the intended flight path. Following the briefing, ATC advised the flight crew that they could expect track shortening. The PF sought clarification about the expected track shortening, to which ATC responded to expect 'SANDR direct ROCKDALE approximately' (see *Appendix A*). ATC also advised the arrival was to be flown at maximum speed and that any STAR speed restrictions were cancelled.

The PF reported amending the previously entered active flight plan to reflect the expected vectoring. The PF stated that a more accurate computed descent profile would be displayed by having the expected track shortening and the associated instrument approach as the active flight plan. At that time, they also selected the complete STAR as the secondary flight plan.

The PF recalled reviewing the controlled airspace limitations along the modified flight planned route. This revealed that the programmed altitude limitations along the flight path would maintain the aircraft within the limits of the controlled airspace steps. The captain reported that as the area along the expected track-shortened route was familiar, the control steps for the arrival along that route were not fully briefed.

After the descent preparations were complete, the PF commanded the aircraft's auto-flight system to descend the aircraft from flight level (FL) 360<sup>4</sup> to FL 250 using a managed descent flight mode. In this mode, the aircraft followed a pre-computed profile that allowed for aircraft deceleration and airspace restrictions along the active flight planned route.

Upon commencing the descent, ATC re-cleared the flight crew to descend and maintain 9,000 ft and to expect a left circuit for runway 16. To assist the flight crew with descent planning, ATC advised the flight crew that they had 46 track miles remaining to the runway.

After being cleared by ATC for further descent, the flight crew descended to 5,000 ft and advised that they were maintaining that altitude and reported visual.<sup>5</sup> ATC followed with a stepped descent clearance to 3,000 ft and provided information to the flight crew that they would be vectored for a turn onto base leg of the circuit in 3 NM (6 km).

<sup>1</sup> Eastern Daylight-saving Time: Coordinated Universal Time (UTC) + 11 hours.

<sup>2</sup> Runway number: the number represents the magnetic heading of the runway.

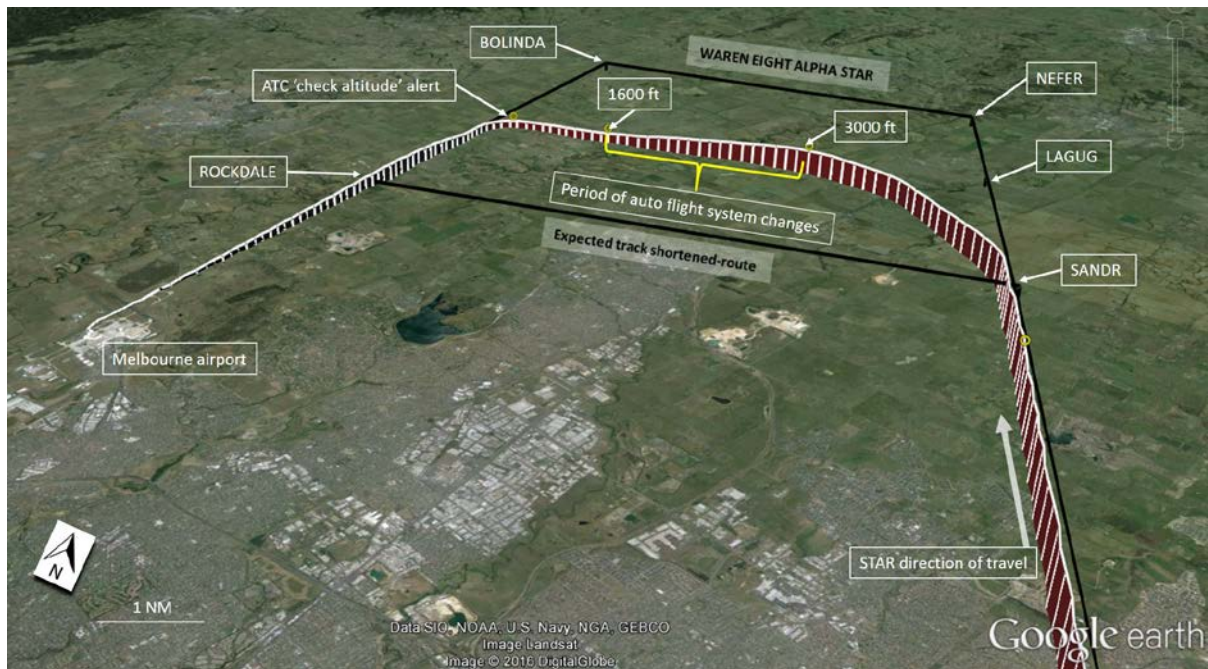
<sup>3</sup> Pilot Flying (PF) and Pilot Monitoring (PM): procedurally assigned roles with specifically assigned duties at specific stages of a flight. The PF does most of the flying, except in defined circumstances; such as planning for descent, approach and landing. The PM carries out support duties and monitors the PF's actions and aircraft flight path.

<sup>4</sup> 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 360 equates to 36,000 ft.

<sup>5</sup> Visual (pilot usage): used by a pilot to indicate acceptance of responsibility to see and avoid obstacles while operating below the minimum vectoring altitude or the minimum safe altitude / lowest safe altitude.

At 1748, which coincided with the aircraft being located at about the SANDR waypoint, ATC advised the flight crew that the STAR was cancelled and to turn left onto a heading of 290°M (Figure 1). To comply with ATC heading and descent instructions, the flight crew used the aircraft's heading and vertical speed/flight path angle (V/S FPA) mode selectors, both located on the aircraft's Flight Control Unit (FCU). The use of the aircraft's selected modes allowed the flight crew to vary the aircraft's lateral track and descent manually.

**Figure 1: Recorded flight route of VH-VND showing approximate period where flight plan modification and mode changes were conducted**



Source: Google Earth modified by ATSB

About one minute after turning onto a heading of 290°, ATC instructed the flight crew to turn further left onto a heading of 260°. While on that heading, ATC advised the flight crew that they were 6 NM (11 km) to the left of the runway 16 centreline and requested the flight crew to report the runway in sight.

At about 1749, the flight crew reported being visual with the runway. At 1749:46 ATC instructed them to turn further left onto a heading of 240° to intercept final, and cleared them to conduct a visual approach<sup>6</sup> for runway 16. The flight crew were also instructed to change radio frequency and to contact Melbourne tower when established on final approach.

The captain reported inputting a radial intercept waypoint into the aircraft's auto-flight system after being cleared to conduct the visual approach. This method of intercepting the localiser using a radial intercept waypoint was preferred as it provided more accurate tracking guidance. The method of inserting a radial intercept waypoint was a valid procedure highlighted in the operator's flight crew operating manual (FCOM) for conducting an intercept (see the section titled *Approach procedures*) during a visual approach.

### Visual approach from 3,000 ft

At 1749:51, the PF armed the approach mode (APPR)<sup>7</sup> and engaged both autopilots, as the intent was to conduct a visual approach with an intercept of the instrument landing system (ILS) from the

<sup>6</sup> AIP ENR 1.1 Subsection 12.8.6 stated that a pilot of an IFR flight conducting a visual approach by day must descend as necessary to remain not less than 500 ft above the lower limit of the controlled airspace.

<sup>7</sup> Approach mode (APPR): the approach push-button parameter indicates a pressing of the APPR push-button on the FCU. This has the effect of arming the autopilot and/or flight director to capture approach guidance.

current heading. The PF also set a missed approach altitude of 4,000 ft in the altitude select window on the FCU, which was in accordance with the altitude setting requirements for the conduct of a visual approach in the Tigerair operations manual part B.

At 1749:54, when the aircraft was about 5 NM (9 km) from the extended runway centreline or about 10 NM (18 km) in a direct line from the runway, the PF commanded the aircraft to descend from 3,000 ft by using the vertical speed (V/S) mode. The captain reported being aware that the V/S mode was being used, but unaware of the descent rate that followed.

The flight crew made a number of selections on the FCU and aircraft configuration changes in the period from 1749:55 to 1751:15. At 1750:17, the ILS approach mode (ILS) disarmed and the lateral flight mode changed to the navigation (NAV) mode. This was likely the result of the flight crew selecting a direct to command in the auto-flight system after the ILS had already been armed. This initiated a series of automatic flight mode reversions.

The period of time for which both flight crew reportedly went 'heads in' (that is, both pilots had their attention inside the cockpit) the flight deck to program and discuss the radial intercept, flight mode reversions and auto-flight system changes was uncertain, but likely occurred from 1750:25 to 1751:14.

After the incident, the captain reported that by conducting the radial waypoint inbound intercept, the PF needed to go 'heads in' to confirm the new flight plan entry, which was probably not ideal for that phase of flight. The PF perceived this period was already one of high workload. Table 1 highlights the key events during that time.

**Table 1: Relevant recorded flight data from VH-VND after the flight crew commenced the visual approach from 3,000 ft**

Time	Pressure altitude (ft) (QNH corrected)	Selected vertical speed changes	Glideslope deviation (see operational information)	Localiser deviation	Aircraft configuration	Relevant flight mode changes and selections
1749:51	3050					Heading (HDG), Localiser (LOC) armed
1749:54	3040	-1000 ft/min	2.2 dots high	3.4 dots left		V/S
1750:02	3000	-1400 ft/min	1.7 dots high		Flap 1	
1750:08	3040				Gear down	
1750:17	2770					NAV armed
1750:25	2610					LOC armed
1750:30	2510	-1300 ft/min	1.1 dots high			
1750:36	2420				Flap 2	
1750:41	2270	-1400 ft/min	ON SLOPE	3.2 dots left		
1750:44	2220	-1300 ft/min	0.3 dots low			HDG
1750:52	2040	-1200 ft/min	0.9 dots low	3.2 dots left		
1750:55	1960	-1000 ft/min	0.8 dots low	3.2 dots left		
1751:00	1860	-800 ft/min	1.1 dots low	3.1 dots left		
1751:03	1810					NAV armed
1751:14	1650		3.3 dots low	3.4 dots left	Flap 3	

1751:15	1640	0 ft/min	3.6 dots low	3.4 dots left		V/S pushed to level off
1751:44	1600		3.2 dots low			
1751:51	1610	0 ft/min	4.8 dots low	3.8 dots left		NAV
1752:23	1630	+1000 ft/min	5.1 dots low	ON LOC		V/S
1752:31	1650					LOC armed
1752:35	1650		4.7 dots low	ON LOC		LOC capture
1752:45	1860					LOC
1753:23	2000		ON SLOPE	ON LOC		G/S / LOC

Source: Operator quick access recorder (QAR) data modified by the ATSB

At 1751:15, about 1 minute and 21 seconds after commencing descent from 3,000 ft, the captain reportedly pressed the V/S push-button on the FCU to level the aircraft. The captain reported observing the aircraft’s flight profile at that time being ‘a bit low’, and was more consistent with the expected runway intercept altitude from a track-shortened SANDR direct to ROCKDALE (ROC) route. At 1751:24, the flight crew established communication with Melbourne tower after changing to the tower frequency.

At 1751:42, the Melbourne approach controller became aware of the aircraft’s altitude of 1,600 ft and attempted to contact the flight crew. This attempt to alert the flight crew to the low altitude failed as the flight crew had changed to the tower frequency earlier than instructed. The approach controller then instructed the tower controller to alert the crew of the aircraft’s low altitude, which the tower controller did.

At 1751:59, the tower controller issued a safety alert<sup>8</sup> to the flight crew to check their altitude, as the aircraft was below profile altitude and had entered the 500 ft vertical buffer at the base of the control area (CTA) step, reducing separation with terrain and any aircraft operating outside controlled airspace.

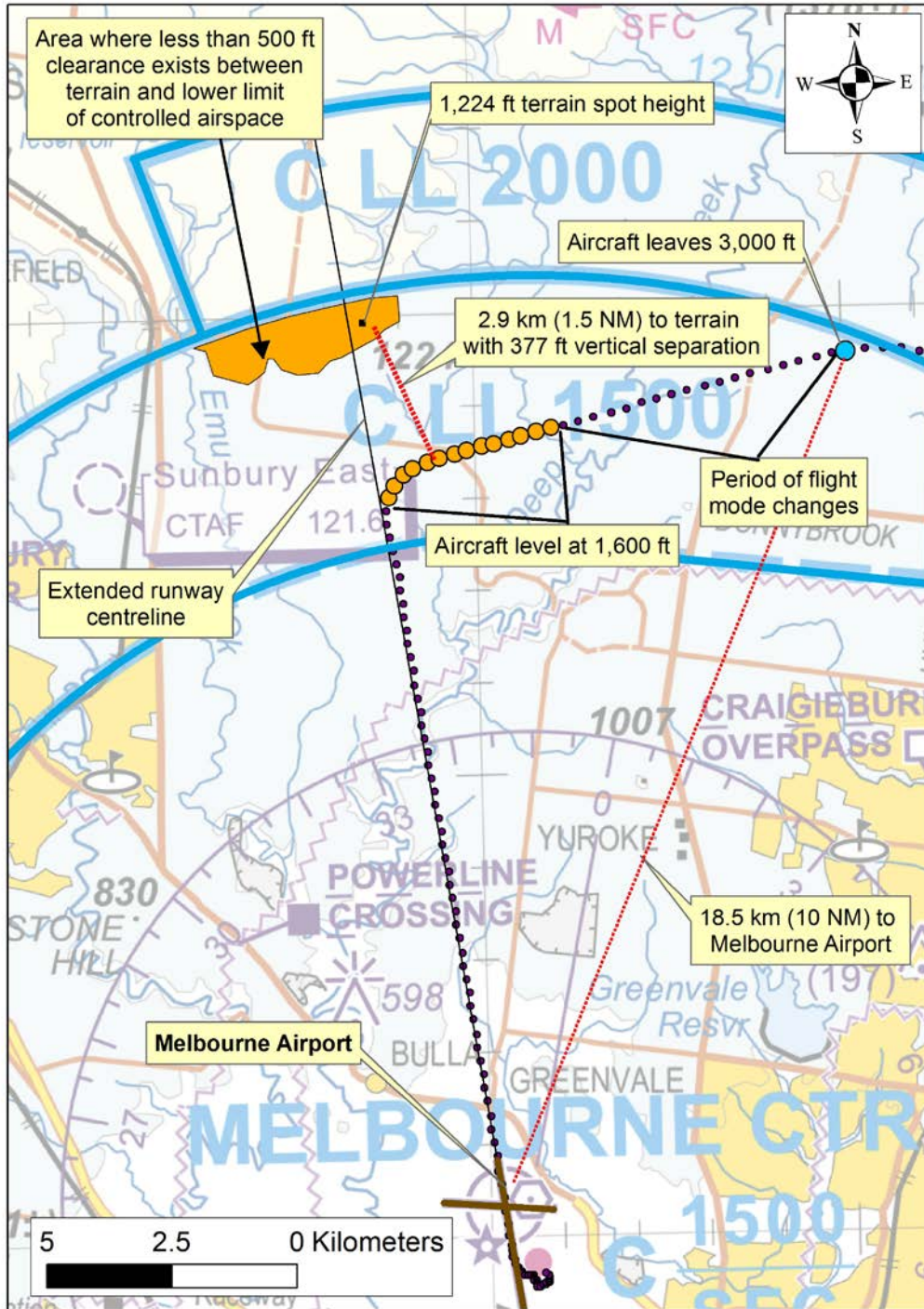
At 17:52:23, the flight crew initiated a climb to 2,000 ft where the auto-flight system subsequently intercepted the ILS glide slope and made an uneventful landing.

After landing, the captain contacted Melbourne Air Traffic Control to discuss the altitude safety alert. They advised that the aircraft had descended to 1,600 ft, which was below the required altitude for flight in that section of CTA. The minimum altitude in that section of CTA for aircraft that were not visual was 2,700 ft, and for aircraft that were visual, it was 2,000 ft as they were required to maintain a 500 ft buffer above the 1,500 ft CTA lower limit (Figure 2).

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<sup>8</sup> Safety alert: the provision of advice to an aircraft when an air traffic service officer becomes aware that an aircraft is in a position which is considered to place it in unsafe proximity to terrain, obstructions or another aircraft.

Figure 2: Flight path and altitude of VH-VND (black and orange dots) relative to the controlled area steps and terrain during the visual approach to Melbourne Airport



Source: Airservices Australia modified by ATSB



# Context

## Flight crew information

### ***Captain***

The captain held an Air Transport Pilot (Aeroplane) Licence and was appropriately qualified to conduct the flight. The captain:

- had about 14,380 hours of aeronautical experience, of which approximately 4,280 hours were on the A320/A321
- had about 7,800 hours total time in command
- held a current Class 1 Aviation Medical Certificate
- reported no recent or ongoing medical or personal issues.

### ***Training***

In 2013, the captain was certified as a ground instructor. This role was additional and separate to the captain's usual activities as a line pilot. In fulfilling this role, the captain was responsible for the provision of specialist operational training as required by the head of checking and training. The ground instructor role differed from that of a line-training captain in that the duties did not pertain to in-flight training. Additional, role-specific training and competencies were required for a pilot to be endorsed as a line-training captain.

The captain had conducted a number of approaches for runway 16 at Melbourne Airport during initial and recurrent training assessments. The approaches were mainly instrument landing system (ILS) approaches, however a visual approach for runway 16 from a track-shortened route was conducted in 2014.

### ***First officer***

The first officer held an Air Transport Pilot (Aeroplane) Licence and was appropriately qualified to conduct the flight. The first officer:

- had about 2,690 hours of aeronautical experience, of which approximately 250 hours were on the A320/A321
- held a current Class 1 Aviation Medical Certificate
- reported no recent or ongoing medical or personal issues.

### ***Training***

The first officer conducted line training on the A320 in 2014, which included conducting a number of ILS approaches for runway 16 at Melbourne Airport. Although there was no recorded evidence that a visual approach was made for runway 16 at Melbourne Airport from a track-shortened route or radar vectors, the pilot had conducted visual approaches into other major airports. The pilot completed the required training program and was approved to commence line-flying operations in January 2015.

## Aircraft information

### ***Auto-flight descent modes***

#### ***Managed descent mode***

Flight crew normally control the descent of an Airbus A320 using the aircraft's auto-flight system in either managed descent mode, or a selected descent mode. With the managed descent mode engaged, the aircraft follows a descent profile computed by the Flight Management Guidance System (FMGS), based upon the flight plan and descent conditions entered by the crew. This

mode is only available if the aircraft follows a programmed lateral navigation track (NAV). During descent in managed descent mode, the FMGS optimises the descent profile and ensures compliance with all programmed altitude constraints without crew intervention.

### ***Selected (basic) descent modes***

In a selected descent mode, the flight crew controls the aircraft descent by making appropriate selections on the Flight Control Unit (FCU). Selected descent modes include vertical speed (V/S), flight path angle (FPA), and open descent.

In V/S mode, the auto-flight system adjusts the aircraft pitch attitude to maintain a set vertical speed as selected by the crew on the FCU. The aircraft descends to the altitude selected by the crew on the FCU, disregarding any intervening FMGS-programmed altitude constraints. If an FCU altitude limit lower than the aircraft's current altitude is not set, the auto-flight system will continue descending the aircraft at the commanded vertical speed until the flight crew intervene, or there is an Enhanced Ground Proximity Warning System (EGPWS) (see the section titled *Enhanced Ground Proximity Warning System*) terrain or aircraft configuration warning alerting the flight crew to intervene. Flight crews sometimes prefer to use V/S mode to initiate further descent from a captured altitude, or incrementally change the descent rate to regain a preferred flight path profile.

### ***Approach mode***

Pushing the approach mode (APPR) push-button illuminates the APPR switch light and arms the FMGS for localiser and glideslope capture and tracking. One of the aircraft's very high frequency navigation (VHF NAV) receivers must be tuned to an ILS frequency before APPR mode can be engaged. Once armed, localiser (LOC) is displayed in blue in the roll mode column of the Flight Mode Annunciator (FMA) and, in the pitch mode column, glide slope (G/S) is displayed in blue to indicate that the APPR mode has been armed.

The localiser capture point is variable and depends on intercept angle and closure rate with the centreline. The glideslope capture point is also variable and depends on the closure rate. The APPR light remains illuminated after localiser and glideslope capture and LOC and G/S are displayed in green on the FMA as the active engaged modes. ILS identifier, approach track and ILS/distance measuring equipment (DME) distance are displayed on the Primary Flight Display (PFD) on the lower left, when both LOC and G/S are the active modes. The localiser and glideslope deviation scales are displayed when the localiser frequency is tuned and the ILS (labelled LS on VH-VND) is selected on the Electronic Flight and Information System (EFIS) control panel.

### ***Descent indications***

The aircraft's descent progress relative to the FMGS-computed descent profile is displayed by a symbol adjacent to the altitude scale representing the aircraft's vertical deviation. The symbol moves above the central position as the aircraft descends beneath the FMGS-computed profile, and below the central position as the aircraft deviates above the FMGS-computed descent profile. The vertical deviation symbol remains displayed on the PFD despite the ILS push-button being selected on the EFIS panel, until the aircraft captures the LOC and GS. Deviation from the FMGS computed descent profile is also presented as a digital value on the progress page of the multipurpose control and display unit (MCDU).

In this case, the vertical deviation indicator would have been inaccurate as the indications related to the current aircraft altitude relative to the pre-programmed track-shortened route. The track-shortened route was the active flight plan during most of the visual approach. Other available sources of information to assist the flight crew with determining a more appropriate descent profile were limited, but included:

- cross-referencing other data sources such as the DME displayed on the PFD
- monitoring the glideslope indication when within range

- referencing the runway offset distance displayed on the navigation display (ND)
- using the range ring on the ND to determine the approximate runway intercept distance
- requesting Air Traffic Control (ATC) for the derived radar distance to the runway from the current intercept heading
- using the runway PAPI or T-VASIS guidance when within range.

**Figure 3: Example of a navigation display (ND) with distance information and cross track error displayed**



Source: Tigerair FCTM, modified by ATSB

### **Enhanced Ground Proximity Warning System**

The aircraft was fitted with an EGPWS. The EGPWS considers a range of data and in-flight parameters, and provides a distinctive warning to flight crew if the aircraft enters a potentially hazardous position in relation to the earth's surface. No EGPWS warnings were triggered during this occurrence.

### **Meteorological information**

The flight crew reported that the weather conditions at the time of the incident did not adversely affect the ability to conduct the flight. The flight crew confirmed that visual conditions existed prior to leaving 3,000 ft for the visual approach.

## Operational information

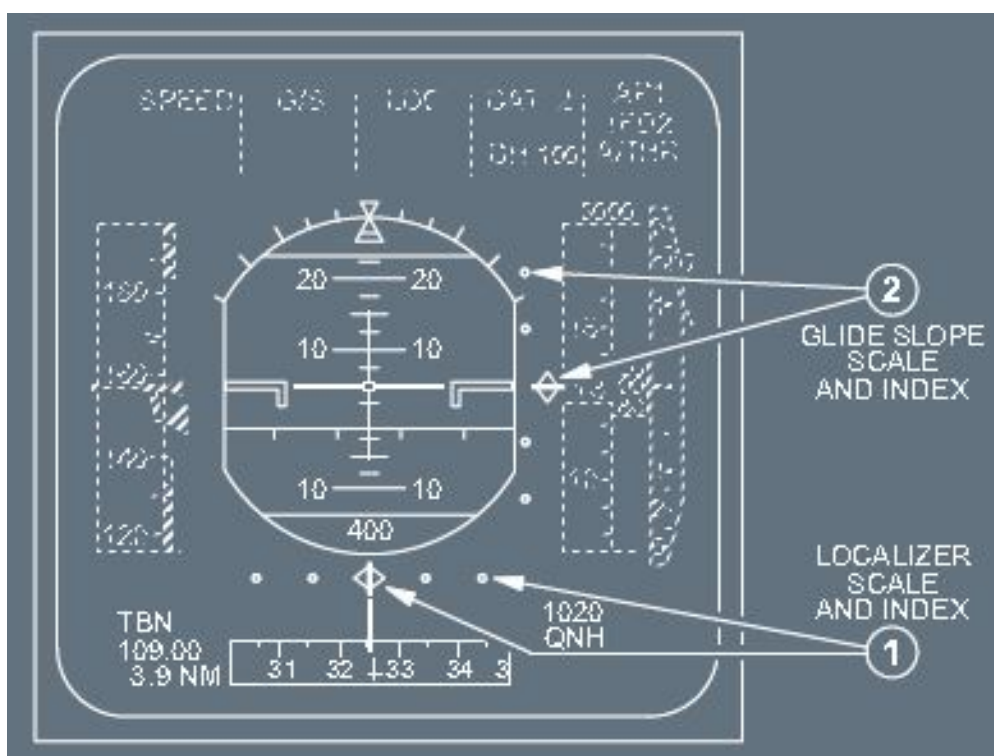
### Navigation

#### Operation of the Instrument Landing System (ILS)

The ILS provides lateral and vertical position data necessary to align the aircraft with the runway for approach and landing. The system uses angular deviation signals from the glideslope antennas (located approximately 1,000 ft from the touchdown point on the runway) and the localiser antennas (located past the far end of the runway). The glideslope signals provide the angular deviation from the nominal glide path (usually 3°) and the aircraft's auto-flight system generates fly-up or fly-down commands to enable the flight crew to track the glide path down to the touchdown point on the runway. Glideslope deviation is displayed on the PFD in units of dots, where one dot equates to 0.4° deviation from the glide path.

The localiser signals provide the angular deviation from the runway centreline and the autopilot generates fly-left or fly-right commands to track the centreline until the landing roll is completed. Localiser deviation is displayed on the PFD in units of dots where one dot equates to 0.8° deviation from the localiser.

**Figure 4: Primary flight display showing an example of instrument landing system (ILS) scale indications**



Source: Tigerair FCOM

### Approach procedures

#### Standard Arrival Route (STAR) information

To program a STAR such as the WAREN EIGHT ALPHA arrival into the FMGS, the flight crew were required to select the appropriate arrival from the MCDU flight plan arrivals page. After selecting the arrival, a relevant approach such as the runway 16 ILS approach is selected and appended to the STAR. This inserted additional en route waypoints such as the final approach fix (FAF) to the flight plan and would later provide localiser and glideslope guidance when within the capture area. Manual selection of the ROCKDALE (ROC) Non-directional beacon (NDB) waypoint was required to amend the flight plan route to comply with ATC clearances and other enroute constraints, before briefing the arrival and the approach.

Selection of the full WAREN EIGHT ALPHA STAR included tracking to intercept the final approach path for runway 16 at a greater distance than the track-shortened route from SANDR to ROCKDALE. To intercept a 3° profile from the track-shortened route, the aircraft would intercept final approach at about 4 NM (7 km) from the runway at an altitude of about 1,680 ft.

In contrast to the track-shortened route, the calculated runway intercept distance if the flight crew maintained a heading of 240° after flying radar vectors to the north, was about 9 NM (17 km). The profile altitude required for a recommended 3° profile at that distance was about 3,500 ft.

### ***Visual approach***

The operator's flight crew operating manual (FCOM) outlined the standard operating procedure for the conduct of a visual approach. It included general information about conducting the approach on a nominal 3° glideslope, using visual references. The method for conducting a visual approach included:

- the autopilot is off
- both flight directors are off
- the use of flight path vector ('the BIRD')<sup>9</sup> is recommended
- autothrust use is recommended with managed speed.

The flight crew training manual (FCTM) highlighted that, although the approach should be flown visually, having the cross track error distance displayed on the ND provided the pilot with a visual cue as to the lateral position of the aircraft to the runway centreline. The cross track error could be obtained by performing a direct to (DIR TO) radial inbound intercept on the last available waypoint (such as ROCKDALE or the ILS FAF) positioned on the extended runway centreline.

Although the FCTM recommended that the visual approach be conducted by amending the FMGS flight plan to include a radial inbound intercept, the company's operations manual Part A stated that any flight path changes to the FMGS below 10,000 ft should be avoided where possible. Instead, it highlighted that using basic flight modes (selected modes) in the terminal area was preferred where a visual procedure could not be planned. This ensured that flight crew's primary focus of attention was monitoring the aircraft's flight path, the surrounding terrain, and potential aircraft conflicts, by having 'two heads up' at all times. Further, it was highlighted that flight crew must not rely solely on the FMGS, but should reference all applicable navigation aids to ensure safe navigation in the terminal area.

The missed approach altitude setting requirements for a visual approach was highlighted in the Tigerair operations manual Part B. It stated that for visual approaches, the missed approach altitude for the instrument missed approach procedure for the landing runway must be set.

### ***Final approach course intercept***

The FCTM highlighted to flight crew that, to ensure a smooth interception of the final approach course, the aircraft's ground speed should be appropriate for the runway intercept angle and the distance remaining to the runway (Appendix B). In an attempt to ensure a smooth interception of the extended runway centreline, the Captain elected to input a radial inbound waypoint. The FCTM stated that where ATC provided radar vectors, the flight crew would use the direct to radial inbound (DIR TO RADIAL IN-BND) function. This would:

- ensure proper flight plan sequencing
- provide a comprehensive ND display
- assist lateral interception
- allow for the vertical deviation to be computed on reasonable distance assumptions.

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<sup>9</sup> Flight path vector on the Primary Flight Display is used to monitor the descent profile (often referred to as the BIRD).

When intercepting the final approach course using this method, the flight crew should correctly sequence the flight plan before pressing the approach push-button. If the localiser was armed or engaged before a DIR TO was actioned, the armed flight mode would revert to NAV, meaning that the localiser would have to be rearmed, which could increase workload. In this occurrence, the PF had pressed the approach push-button before the DIR TO was actioned.

### ***Descent monitoring procedures***

The operator's procedures provided guidance regarding descent monitoring. This included the reference to appropriate pages on the MCDU and the use of vertical profile information on the PFD, where applicable. The descent procedure called for careful monitoring, including guidance that during non-precision approaches, appropriate distance/altitude checks will be called. This was of particular importance where an altitude/height versus range/fix was required.

### ***FMA monitoring***

The operator's procedures required the pilot flying to 'announce' the FMA following the initiation of the descent, and for the pilot monitoring to confirm that annunciation. This required the pilot flying to state the auto-flight mode change annunciated on the FMA associated with the commencement of descent, and the pilot monitoring to check the annunciation and respond. Importantly, the effect of those changes on the flight path must be monitored on basic flight instruments associated with heading, speed, altitude, V/S and the like.

## **Other occurrences**

The ATSB is aware of a number of occurrences on scheduled passenger transport flights where a flight crew have descended either below their normal flight path profile during a visual approach or below a minimum descent altitude while conducting an instrument approach. These involved different operators and different aircraft types to the occurrence involving VH-VND, but the fundamental nature of these occurrences is similar (see [www.atsb.gov.au](http://www.atsb.gov.au)).

### ***ATSB investigation [AO-2011-086](#)***

At 2019 Eastern Standard Time on 24 July 2011, a Thai Airways Boeing 777-3D7 aircraft, registered HS-TKD, was conducting a runway 34 VOR approach to Melbourne Airport, Victoria. During the approach, the tower controller observed that the aircraft was lower than required and asked the flight crew to check their altitude. The tower controller subsequently instructed the crew to conduct a go-around. However, while the crew did arrest the aircraft's descent, there was a delay of about 50 seconds before they initiated the go-around and commenced a climb to the required altitude.

The ATSB established that the captain may not have fully understood some aspects of the aircraft's automated flight control systems and probably experienced 'automation surprise' when the aircraft pitched up to capture the VOR<sup>10</sup> approach path. As a result, the remainder of the approach was conducted using the autopilot's flight level change mode. In that mode, the aircraft's rate of descent is unrestricted and therefore may be significantly higher than that required for an instrument approach. In addition, the flight crew inadvertently selected a lower than stipulated descent altitude, resulting in descent below the specified segment minimum safe altitude for that stage of the approach and the approach not being managed in accordance with the prescribed procedure.

### ***ATSB investigation [AO-2012-103](#)***

On 16 July 2012 at about 0830 New Zealand Standard Time<sup>11</sup>, an Airbus A320-232 aircraft, registered VH-VQA and operated by Jetstar Airways (Jetstar), was conducting an Area Navigation

<sup>10</sup> A ground-based navigation aid that emits a signal that can be received by appropriately-equipped aircraft and represented as the aircraft's bearing (called a 'radial') to or from that aid.

<sup>11</sup> New Zealand Standard Time (NZST) was Coordinated Universal Time (UTC) + 12 hours.

(Required Navigation Performance) approach to runway 05 at Queenstown, New Zealand. During the approach the aircraft descended below two segment minimum safe altitudes. Upon recognising the descent profile error, the crew climbed the aircraft to intercept the correct profile and continued the approach to land.

The ATSB found that, contrary to their intentions, the flight crew continued descent with the auto-flight system in open descent mode, which did not provide protection against infringing the instrument approach procedure's segment minimum safe altitudes. The ATSB also found that the flight crew was not strictly adhering to Jetstar's sterile flight deck procedures, which probably allowed them to become distracted.

The ATSB found that the Jetstar procedures did not specifically draw the flight crew's attention to unchanged auto-flight system modes during descent or prompt crew reconsideration of the most suitable descent mode at any point during descent. Additionally, the Jetstar's procedures allowed the crew to select the altitude to which they were cleared by air traffic control on the flight control unit altitude selector, irrespective of intervening altitude constraints. This combination of procedures provided limited protection against descent through segment minimum safe altitudes.

### ***ATSB investigation [AO-2013-047](#)***

On 8 March 2013, the flight crew of a Qantas Airways Limited (Qantas) A330 aircraft, registered VH-EBV, was conducting a visual approach to Melbourne Airport, Victoria. The captain was the pilot flying with autopilot engaged.

Soon after being cleared for the approach, on descent through 3,000 ft, the captain set an altitude target of 1,000 ft in the auto-flight system and selected the landing gear down, the first stage of wing flap and 180 kt as the target speed. The descent was continued in auto-flight open descent mode and reached a maximum descent rate of 2,200 ft/min. As the aircraft was descending through about 1,800 ft, the first officer advised the captain that they were low. The captain reduced the rate of descent by selecting auto-flight vertical speed mode but a short time later the enhanced ground proximity warning system (EGPWS) provided 'TERRAIN' alerts followed by 'PULL UP' warnings. The crew carried out an EGPWS recovery manoeuvre and subsequently landed via an instrument approach.

At the time of the EGPWS alert, the aircraft had descended to 1,400 ft, which in that area was 600 ft above ground level, with 9 NM (17 km) to run to touchdown. This was 100 ft below the control area lower limit and 1,900 ft below a normal 3° descent profile.

### ***ATSB investigation [AO-2014-003](#)***

While on approach to Melbourne, Victoria, a Jetstar Airways (Jetstar) Airbus A320 aircraft left 3,000 ft on descent, entering the 500 ft buffer above the lower limit of controlled airspace. When the aircraft passed 2,500 ft, the aircraft left controlled airspace. The aircraft again re-entered controlled airspace as it reached the airspace with a lower limit 1,500 ft, 11 NM south of Melbourne. The elapsed time from the point the aircraft left 3,000 ft to the point it re-entered controlled airspace was about 1 minute and 15 seconds. The aircraft was outside controlled airspace for about 45 seconds. There was no conflict with other known air traffic and the approach continued normally from 2,100 ft following intercept of the intended descent profile.

This incident highlighted the need for clear procedural guidance and careful auto-flight system management under conditions where the transition from a STAR to an instrument approach procedure is interrupted. Furthermore, under these conditions, awareness of the position of the aircraft relative to the intended vertical profile, relevant controlled airspace boundaries and lowest safe altitudes assumes elevated significance. The incident also highlights the importance of seeking clarification if an ATC instruction or clearance appears incomplete.

# Safety analysis

## Introduction

While conducting a visual approach into Melbourne Airport, Victoria on 11 February 2015, the flight crew of an Airbus A320 aircraft descended below the nominal 3° descent profile and entered the 500 ft vertical buffer at the base of the control area (CTA) step. This reduced separation with nearby terrain and with any aircraft operating outside controlled airspace. The flight crew were alerted to the aircraft's low altitude by air traffic control after levelling the aircraft close to the lower limit of controlled airspace. The flight crew subsequently climbed the aircraft to regain a normal approach profile by capturing the Instrument Landing System (ILS) glide slope. The approach continued and an uneventful landing was made onto runway 16. This analysis will examine the factors that contributed to the abnormal descent, and review the risk controls as they apply to visual approaches.

## Approach and descent management

Prior to descent, the flight crew were cleared by Air Traffic Control (ATC) to commence an arrival to Melbourne by flying the WAREN EIGHT ALPHA standard arrival route (STAR). The flight crew reported fully briefing the arrival and associated ILS approach, which included reviewing the arrival route, CTA steps and surrounding terrain. Soon after, however, the STAR clearance was amended to a track-shortened route which brought the final runway intercept closer, to about 4 NM (7 km) from the threshold, with an on-profile intercept altitude of about 1,680 ft. Although the flight crew did not fully re-brief the entire track-shortened route at that time, they reported reviewing any applicable restrictions/limitations and calculated the aircraft's descent based on those requirements.

As the aircraft approached the SANDR waypoint, however, the flight crew were radar vectored to the north of the expected track-shortened route, which positioned the aircraft in an area that was unplanned by the flight crew. It also meant that there was little time to re-brief and review the surrounding terrain and to identify the higher CTA step that the aircraft was being vectored into. During the radar vectoring, ATC was responsible for terrain clearance and flight within controlled airspace; on completion of the vectors, however, ATC had instructed the flight crew to resume own navigation and that they were cleared for the visual approach. This transferred the responsibility for terrain clearance and flight within the CTA steps back to the crew. Despite ATC giving the flight crew a position fix from the extended runway centreline, it was likely that this information alone was insufficient, and the flight crew had lost awareness of the altitude that would be required to remain above the vertical buffer for the CTA steps.

To comply with the vectors north of the SANDR waypoint, the flight crew needed to revert to basic flight modes (selected modes) and forego the programmed altitude constraints that were active to limit the aircraft had it remained on the STAR. This meant that more onus was placed on the flight crew to adjust the aircraft's vertical profile manually to ensure the aircraft remained on the desired 3° visual approach flight path profile. Further, the altitude protections set on the aircraft's flight control unit (FCU) were removed when the missed approach altitude for the landing runway's instrument approach was set as per procedures. As this was higher than the aircraft's altitude, more attention was required from the flight crew to ensure the aircraft did not descend below the desired altitude.

Reverting to basic flight modes (selected modes) and deviating off the pre-programmed route also removed some of the information available to assist the flight crew in managing the aircraft's vertical profile. The vertical deviation indicator, which was available if the ILS push-button on the EFIS was not selected, was only accurate if the aircraft was on, or close to, the programmed route.



The captain reported that an alternative method of using the ILS glideslope as a reference was useful, and recalled mentioning this to the first officer, who was the pilot flying (PF) during the approach. The captain observed that during the approach, the ILS glide slope indications were active and indicated that the aircraft was initially above the glide slope, which was consistent with their expectation. As a result, the flight crew probably considered the glide slope indications to be valid and useful for flight path guidance. It was therefore likely that when not focussed on the activities associated with reprogramming the Flight Management and Guidance System (FMGS) and demonstrating the radial intercept, which resulted in flight mode reversions, the PF used the glide slope for profile guidance. This probably resulted in the early descent from 3,000 ft during the visual approach, and the multiple V/S changes made by the PF in an attempt to capture the on-slope indications. Following a glide slope indication with more track miles to fly than the straight-line distance to the glideslope antenna would, with reference to the track miles to run, result in a shallower flight path than the nominal 3° profile. This required a reduced descent rate from what would normally be expected. In addition, the PF also became more distracted as the aircraft approached the on-slope indications and the aircraft continued to descend below profile. Reference by the crew to the other available cues before commencing descent for the visual approach would have increased the likelihood of the aircraft remaining at an appropriate profile altitude until the runway intercept.

### ***Approach path profile***

The method used by the flight crew to calculate the required descent point to achieve an optimal 3° profile was not effective, as the descent had commenced early given the aircraft's actual versus intended position. Further, the PF was likely uncertain about the aircraft's profile and relative position as it descended, as indicated by the number of VS changes made, the appropriateness of those changes, and that the aircraft continued to descend well below the nominal 3° visual approach profile. The time available and the PF's capacity to calculate and re-assess the aircraft's position and descent was likely impeded by having:

- to re-assess the relative position of the aircraft and its appropriate configuration
- to perform the tasks associated with the role of PF
- to divert their attention to observe the reprogramming of the FMGS
- to observe the demonstration of the flight mode reversions
- to complete the aircraft configuration and checklists in preparation for landing
- a resulting increased workload.

The operations manual Part A recommendation was not to use FMGS or make flight plan changes in the terminal area but instead to use basic flight modes (selected modes) to conduct an intercept. This would have provided the flight crew the opportunity to prioritise their attention on more critical tasks associated with the final stages of the approach and ensured both crew were not focussed inside the flight deck at the same time. This was important as the conduct of a visual approach using selected flight modes put more onus on the flight crew for flight path management.

In addition to the increased attention required to maintain the flight path profile, the altitude setting procedure to set the missed approach altitude for the runway instrument approach removed the only altitude constraint that would automatically level the aircraft when using selected descent modes. Other alerts, however, such as the aircraft's enhanced ground proximity warning system (EGPWS), would still have been available to alert the crew to a low altitude/terrain proximity as a final defence, in the event that the aircraft's descent continued undetected.

### ***Data entry and crew co-ordination***

During the visual approach, it was likely that there was a degree of demonstration or instruction between the flight crew in relation to data inputting in relation to the radial intercept and mode awareness. Although it is possible the intention of the captain was to increase the first officer's understanding of the auto-flight system and approach management, the captain was not approved

as a line-training captain. It is also likely that the captain was required to explain the radial intercept to the first officer so the first officer could check the inputs made by the captain. It is therefore likely that, independent of an instructional focus, there was probably little consideration of the effect the instruction or explanation would have on the relatively inexperienced first officer's workload or the ability of the flight crew to manage the aircraft's descent during that phase of flight.

## Distraction

Researchers (United Kingdom Civil Aviation Authority, 2013) have found that distraction has been a major factor affecting flight crew allocation of attention when monitoring breaks down. Humans are capable of attending to more than one task through the use of selective attention techniques, however they have limited total cognitive capacity. If one of the tasks consumes all the attentional capacity of a crew member, then task shedding will occur. Distraction has been found to have been instrumental in the breakdown of monitoring in major accident investigations<sup>12</sup>. In these instances, flight crew became distracted during an important phase of flight. This distraction resulted in a breakdown in monitoring and combined with the flight crew inappropriately managing their workload, this led to the loss of the pilot flying's understanding of the state or position of the aircraft.

In the occurrence event, the captain's decision to explain the process for programming the radial waypoint intercept to the PF meant that both flight crew diverted their attention away from other flight deck tasks. While this was necessary to ensure the data entered was accurate, this distraction resulted in the flight crew's reduced performance in effectively monitoring the aircraft's descent profile shortly after commencing descent on the visual approach.

## Workload

Workload has been defined as 'reflecting the interaction between a specific individual and the demands imposed by a particular task. Workload represents the cost incurred by the human operator in achieving a particular level of performance' (Orlady & Orlady, 1999, p.203). A discussion of the effect of workload on the completion of a task requires an understanding of an individual's strategies for managing tasks.

An individual has a finite set of mental resources they can assign to a set of tasks (for example, performing a take-off). These resources can change given the individual's experience, training, and the level of stress and fatigue being experienced at the time. An individual will seek to perform at an optimum level of workload by balancing the demands of their tasks. When workload is low, the individual will seek to take on tasks. When workload becomes excessive the individual must, as a result of their finite mental resources, shed tasks.

An individual can shed tasks in an efficient manner by eliminating performance on low-priority tasks. Alternately, they can shed tasks in an inefficient fashion by abandoning tasks that should be performed. Tasks make demands on an individual's resources through the mental and physical requirements of the task, temporal demands and the wish to achieve performance goals (Hart & Staveland, 1988; Lee & Liu, 2003).

The flight crew reported that they felt their workload increased once they received vectors to the north following the SANDR waypoint. They stated that the approach requirement changed from the modified route, SANDR direct ROCKDALE (ROC) approach that they had programmed into the FMGS, and this increased their workload.

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<sup>12</sup> National Transportation Safety Board (2010). Loss of control on approach, Colgan Air, Inc., operating as Continental Connection Flight 3407, Bombardier DHC-8-400, N200WQ, Clarence Center, New York, February 12, 2009. NTSB/AAR-10/01. Washington, DC. National Transportation Safety Board (2007). Attempted takeoff from wrong runway, Comair Flight 5191, Bombardier CL-600-2B19, N431CA, Lexington, Kentucky, August 27, 2006. NTSB/AAR-07/05. Washington, DC.

The PF reported that the vector changes put them in a position where they had not been able to review the control area steps. The PF felt that by the time they had been vectored onto the final intercept heading and cleared for a visual approach, he was behind the aircraft. The increase in workload, combined with the distraction caused by both crew being involved in the re-programming of the FMGS, decreased the flight crew's ability to monitor and correctly assess the aircraft's descent profile.

## Flight path monitoring

Monitoring has been very broadly defined by the Flight Safety Foundation (2014) as: 'adequately watching, observing, keeping track of, or cross-checking.' (p.3) It has been more fully defined by the United Kingdom Civil Aviation Authority (UK CAA) (2013) as:

The observation and interpretation of the flight path data, configuration status, automation modes and on-board systems appropriate to the phase of flight. It involves a cognitive comparison against the expected values, modes and procedures. It also includes observation of the other crew member and timely intervention in the event of deviation. (p.9)

Monitoring is an extensive set of behavioural skills that all flight crew members are expected to have. This skill set is outlined in the aircraft operator's standard operating procedures. It involves the primary roles of monitoring the aircraft's flight path, communications, and the activities of the pilot flying. The difficulties that flight crew can have with maintaining effective monitoring is due to the difficulties in sustaining vigilance. Vigilance decreases as interaction with a system decreases. Therefore, as the pilot monitoring is not directly controlling the system being monitored, it can be harder for them to stay alert to changes. Flight crew members rarely receive direct feedback on the effectiveness or consistency of their monitoring, unlike the feedback they get by flying an aircraft manually.

In a study conducted to identify issues with flight crew checklist use and monitoring behaviour, researchers found that monitoring deviations were grouped into three clusters: late or omitted callouts, omitted verification and not monitoring aircraft state or position (Dismukes & Berman, 2010). In failing to monitor the aircraft state or position, the researchers found that most instances resulted from competing concurrent task demands on the crew's attention. This leaves an individual vulnerable to losing track of the status of one task while being engaged in another. Crew are taught workload management in crew resource management training but this tends to focus on priorities and distributing the workload amongst crew members and not on how to manage attention when juggling concurrent task demands.

The captain stated that once the flight crew had gone 'heads in' to re-program the FMGC, the aircraft went below the descent profile. After programming the new intercept waypoint into the FMGC, the captain looked outside and saw the aircraft was lower than expected. The captain reported that their mental model of where the aircraft should be at the time was not consistent with where the aircraft was. The captain stated that had they been more aware of the aircraft's position, they might have recognised they were below the profile. It took a little longer for the flight crew to determine they were low on profile, and it was not until the ATC altitude alert was issued that they commenced the climb.

Due to both flight crew's attention being diverted from the monitoring task after commencing descent for the visual approach, their ability to detect the aircraft's descent below profile became adversely affected. This resulted in the aircraft descending below profile altitude and entering the 500 ft vertical buffer at the base of the CTA step, reducing separation with terrain and any aircraft operating outside controlled airspace.

## Mental models and perception

Researchers have stated that an individual's mental models are representations of the world based on the individual's knowledge and built on sensation and perception (Johnson-Laird, 2010;

Wickens & Flach, 1988). Sensation is the human sensory system's ability to detect or determine changes to the sensory inputs picked up by our sensory channels (visual, auditory, haptic, etc.). Perception occurs by assigning meaning to these sensory inputs, and the transfer of this information from perception to working memory/reasoning faculties is controlled by our attentional processes. Therefore, sensation is a passive process and perception is active in that an individual will select, organise and interpret data from the senses. Mental models are shaped by perceptions and vice versa – the process is dynamic and cyclic.

An individual's ability to gather information relating to their current environment and task is critically influenced by the state of the individual's knowledge or the mental model constructed (Wickens & Flach, 1988). Individuals will use mental models to reason and infer what will happen next in their world and what actions they need to take in order to get an optimal outcome based on their understanding of how the world works within the current context (Johnson-Laird, 2010; Staggars & Norcio, 1993).

Individuals can make incorrect inferences if there is a mismatch between what is sensed and the meaning given to it through the perceptual processes. In selection or placement of perceptual attention, experienced operators generally rely on a strategy of efficient sampling of reliable information sources (Wickens & Flach, 1988).

Following the vectoring to the north, the flight crew's workload increased and they became distracted by both going 'heads in' to re-programme the FMGS. At that time, they did not get the opportunity to re-set their mental model of how the approach should proceed and they prepared the aircraft for landing too early. This is evidenced by the crew commencing descent early, selecting multiple vertical speeds which were not appropriate for their position, and configuring the aircraft for final approach.

Further evidence of the crew having an incorrect mental model of the aircraft's position is in the captain's statement that, on looking up from the FMGS re-programming task, it took 30 seconds for them to realise that the aircraft was not where they had expected it to be. This realisation was coincident with the ATC safety alert to check their altitude.

## Summary

The aircraft continued descent below the recommended visual approach profile and entered the 500 ft vertical buffer at the base of the CTA step, reducing separation with terrain and any aircraft operating outside controlled airspace. The ability of the flight crew to assess the aircraft's relative position accurately and manage the flight path profile was reduced after being vectored off the pre-programmed shortened route. The subsequent involvement of both flight crew to reprogram the FMGS and the conduct of various flight deck activities created a distraction. This increased workload, and distracted the crew from the primary task of monitoring, assessing, and managing the aircraft's approach path.

Flight crew are reminded that descending near the terminal area during a visual approach using selected flight modes requires vigilance in flight path monitoring. This is especially the case when lower altitude constraints/limits are no longer available with a selected flight mode, and the aircraft is navigated in an unplanned area, off a pre-determined route.

# Findings

From the evidence available, the following findings are made with respect to the flight path management and descent toward the lower limit of controlled airspace involving Airbus A320, registered VH-VND and operated by Tiger Airways Australia Pty Limited (Tigerair). The incident occurred about 9 NM (17 km) north of Melbourne Airport, Victoria on 11 February 2015. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

## Contributing factors

- The flight crew's mental model of the aircraft's position relative to the control area steps and terrain during the vectors north of the pre-briefed track-shortened arrival route was not consistent with what was flown. This affected the flight crew's ability to recognise they were below the required altitude.
- The flight crew's attention was diverted from the required task of flight path monitoring due to the re-programming of the Flight Management and Guidance System (FMGS) during a visual approach. This increased their workload and reduced their ability to detect that the aircraft had descended toward the lower limit of controlled airspace.
- Demonstration and discussion of flight mode reversions that occurred after re-programming the Flight Management Guidance System (FMGS) reduced the flight crew's ability to calculate and manage the aircraft's descent.

## Other findings

- The Melbourne tower controller issued a safety alert to the flight crew after they had already levelled the aircraft, prompting them to climb the aircraft back to profile altitude, which re-established terrain and traffic separation assurance.

# General details

## Occurrence details

Date and time:	11 February 2015 – 1750 EDT	
Occurrence category:	Incident	
Primary occurrence type:	Operational	
Location:	17 km NE of Melbourne Airport, Victoria	
	Latitude: 37° 31.22' S	Longitude: 144° 51.20' E

## Aircraft details

Manufacturer and model:	Airbus A320-232	
Registration:	VH-VND	
Operator:	Tiger Airways Australia Pty Limited	
Serial number:	3296	
Type of operation:	Air Transport High Capacity	
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

# Sources and submissions

## Sources of information

The sources of information during the investigation included:

- Airservices Australia
- the flight crew of VH-VND
- Tiger Airways Australia Pty. Ltd. (Tigerair)

## References

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Wickens, C.D. & Flach, J.M. (1988). Information processing. In E.L. Weiner and D.C. Nagel Eds *Human factors in aviation*. Academic Press: San Diego.

## Submissions

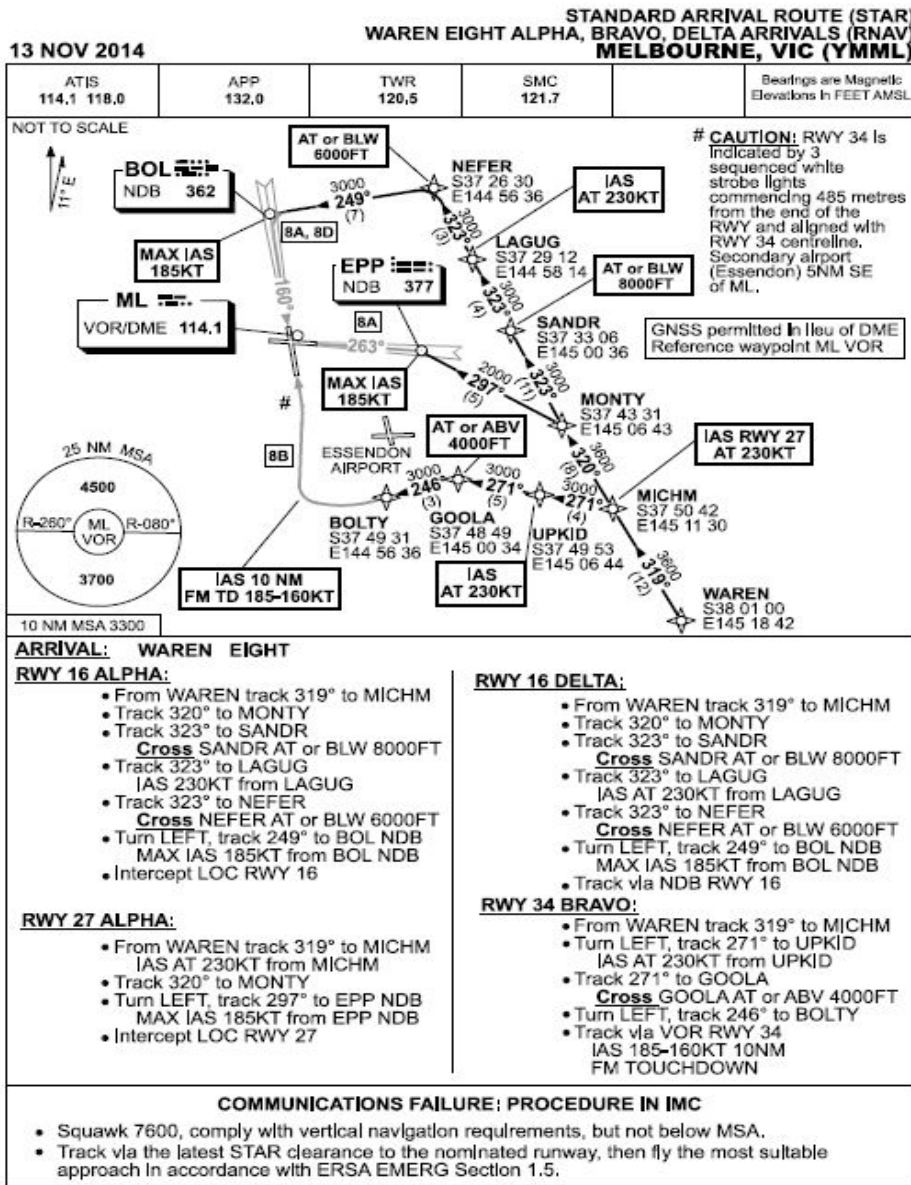
Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act 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 Airservices Australia, the Civil Aviation Safety Authority, the flight crew of VH-VND and Tigerair.

Submissions were received from Airservices Australia, a member of the flight crew of VH-VND, and Tigerair. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

# Appendices

## Appendix A – Approach charts

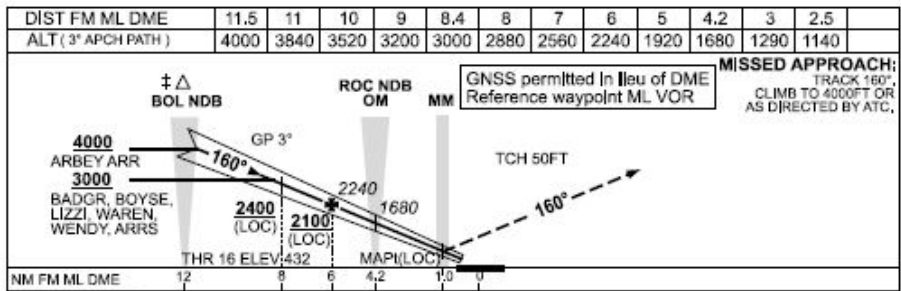
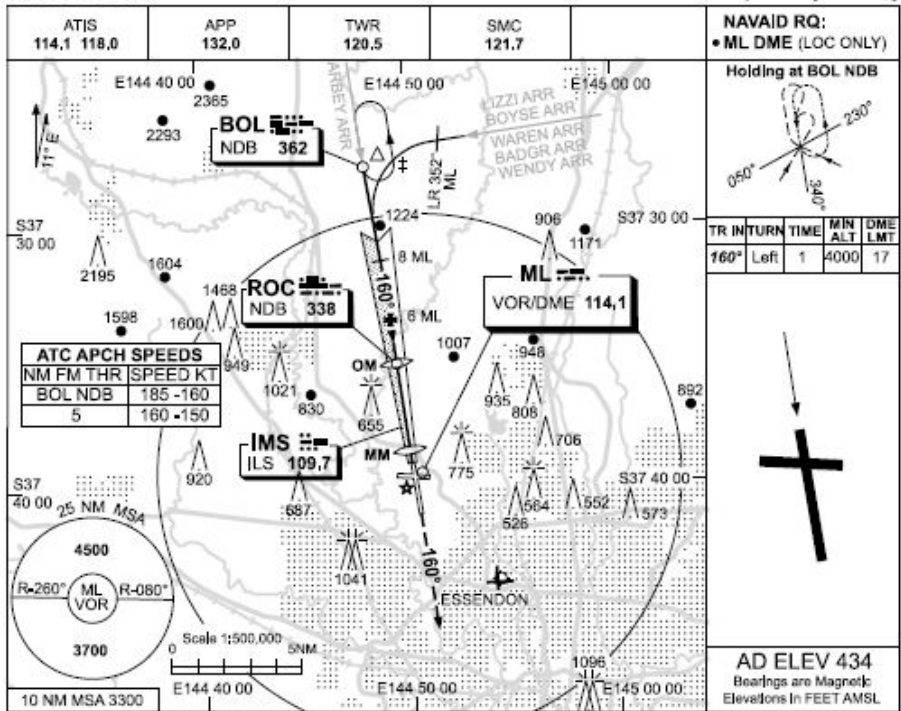


Changes: PROC NUMBER.

MMLSR06-141



**USE QNH** ILS-Y or LOC-Y RWY 16  
**21 AUG 2014** **MELBOURNE, VIC (YMML)**



**NOTES**

‡ 1. SPECIAL ALT MNM 700/2.5 KM, (NOT APPLICABLE TO LOC/DME).

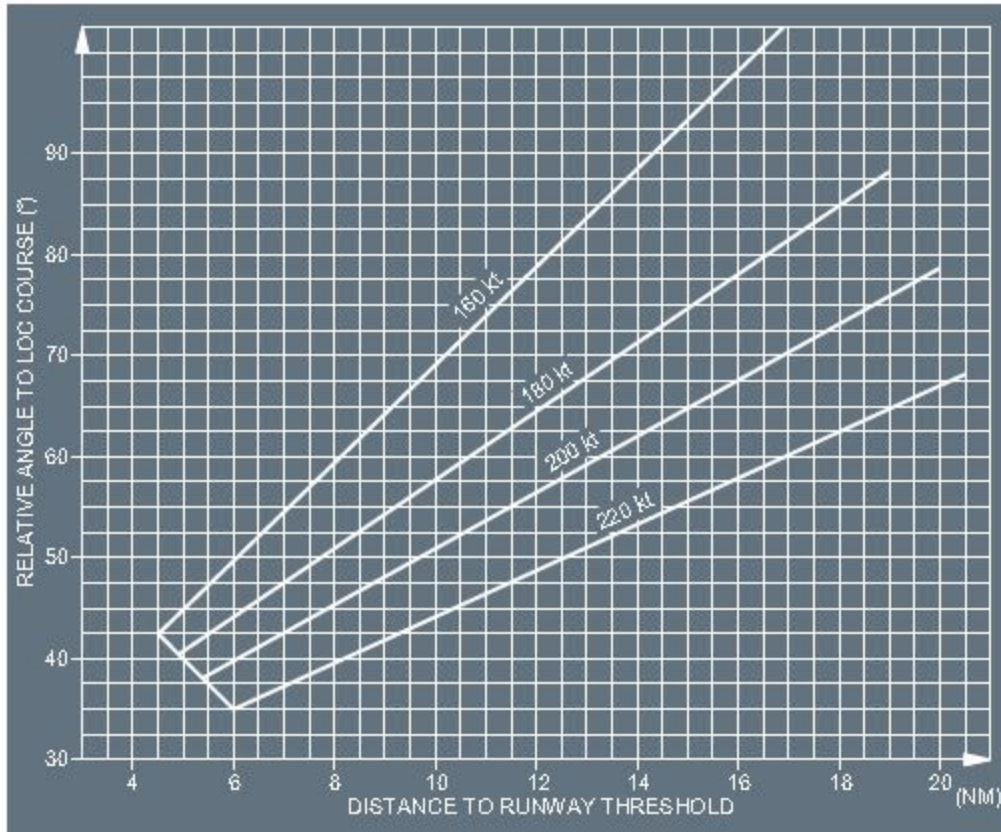
‡ 2. ACFT MAY BE RADAR VECTORED TO FNA OR JOIN PROCEDURE OFF STAR PRIOR TO FAF.

CATEGORY	A	B	C	D
S-I ILS		640 (208) 0.8	550 RVR	
S-I LOC/DME		1140 (706-3.0)		
CIRCLING	1140 (706-2.4)	1450 (1016-4.0)	1600 (1166-5.0)	
ALTERNATE ‡	(1206-4.4)		(1516-6.0)	(1666-7.0)

Changes: ATIS.

MML|01-140

**Appendix B – Graph showing angle of intercept versus distance to runway threshold that ensures aircraft will not overshoot the localiser axis by more than one and a half dots<sup>13</sup>**



Source: Tigerair Flight Crew Operating Manual (FCOM)

<sup>13</sup> One dot represents a deviation of 0.8° on the localiser scale.

## About the ATSB

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; and 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 fare-paying passenger operations.

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.

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

### About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.

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### Investigation

#### **ATSB Transport Safety Report** Aviation Occurrence Investigation

Flight path management and descent toward the lower limit of controlled airspace involving Airbus A320

AO-2015-018

Final – 23 February 2018