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Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY REPORT
Aviation Occurrence Investigation AO-2010-035
Final

Incorrect aircraft configuration, VH-VWW Singapore Changi International Airport 27 May 2010

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Abstract

At 1845 Singapore Time on 27 May 2010, an Airbus A321-231, registered VH-VWW and operating as Jetstar flight JQ57, was undertaking a landing at Singapore Changi International Airport. The aircraft was not in the correct landing configuration by 500 ft height above the aerodrome and, as required by the operator's procedures in the case of an unstable approach, the crew carried out a missed approach.

The investigation identified several events on the flight deck during the approach that distracted the crew to the point where their situation awareness was lost, decision making was affected and inter-crew communication degraded. In addition, it was established that the first officer's performance was probably adversely affected by fatigue.

The investigation did not identify any organisational or systemic issues that might adversely impact the future safety of aviation operations. However, following this occurrence, the aircraft operator proactively reviewed its procedures and made a number of amendments to its training regime and other enhancements to its operation.

FACTUAL INFORMATION

At 1422 Singapore Time[1] on 27 May 2010, an Airbus A321-231 aircraft (A320), registered VH-VWW and operating as Jetstar flight JQ57, departed Darwin Airport, Northern Territory on a scheduled service to Singapore Changi International Airport. The first officer (FO) was the pilot flying (PF) and the captain was the pilot not flying (PNF) for the sector.

The aircraft was at the top of descent for an Instrument Landing System[2] (ILS) approach at about 1840. Singapore Air Traffic Control (ATC) issued an approach clearance to runway (RWY) 20R and radar vectored[3] the aircraft to the north to avoid thunderstorm activity to the east and west of the airport.

ATC then issued a series of step-down descent clearances and instructions to reduce the aircraft's speed in order to manage traffic separation and arrivals at the airport. The FO requested the captain to activate the approach

1 Singapore Time (SGT) was Coordinated Universal Time (UTC) + 8 hours.

2 A standard ground aid to landing, comprising two radio guidance beams: the localizer (LLZ), for direction in the horizontal plane; and the glideslope, for vertical plane direction, usually at an inclination of 3°.

3 A radar vector is a heading issued by ATC as part of radar navigation guidance.

phase before the FO selected 'managed speed'[4] and progressively decelerated the aircraft to 160 kts and selected Flap 2.

At this point, ATC instructed the flight crew to descend to 2,500 ft above mean sea level (AMSL) and to turn onto a heading of 230° to intercept the localizer (LLZ) for RWY 20R. The FO complied and the aircraft was cleared for the approach. On intercept with the LLZ, the FO reported 'becoming visual' to the captain and the crew commented on the density of buildings and lights in residential Singapore. The captain recalled that after becoming visual with the runway, they were able to remain visual for the rest of the approach.

The captain reported going 'heads out' at that time and focussing outside the aircraft. This is permitted and encouraged in the operator's procedures; however, the procedure emphasises that constant monitoring of the aircraft's performance and flightpath is essential.

Once established on the LLZ, the FO disconnected the autopilot (A/P). The recorded data indicated that a master warning (MW) continuous chime was activated for 6 seconds, coincident with the A/P disconnection. An Electronic Centralised Aircraft Monitor (ECAM)[5] AUTO FLT A/P OFF message was activated and remained displayed on the Engine/Warnings Display (E/WD) monitor. The FO stated that he believed the ECAM message was activated by his not pushing the Sidestick Takeover Push Button twice within 1.5 seconds.[6] Neither pilot remembered the MW continuous chime.

Somewhere between 2,500 ft and 2,000 ft in the descent, the crew heard noises associated with incoming text messages on the captain's mobile phone. The FO requested that a missed approach altitude of 5,000 ft be set into the Flight Control Unit (FCU)[7] and, after not getting a response from the captain, repeated the request. The FO stated that he attempted to use the 'RAISE'[8] method from the operator's Operations Manual to communicate with the captain.

The FO recalled that, after still not getting a response from the captain, he looked over and, on seeing the captain preoccupied with his mobile phone, set the missed approach altitude himself. The captain stated that he was in the process of unlocking and turning off his mobile phone at that time and did not hear the call for the missed approach altitude to be set in the FCU.

Shortly after, the captain alerted the FO to the ECAM message 'AUTO FLT A/P OFF'. The FO requested the captain to clear the ECAM message and stated that he found the captain bringing it to his attention distracting.

Both pilots stated that they heard the automated height call of 'one thousand' that was generated by the Flight Warning Computer via the radar

4 The pilot may modify any flight parameter on a short-term basis and the aircraft's Flight Management and Guidance System (FMGS) will guide the aircraft to the manually selected (or managed) speed.

5 The ECAM displays all aircraft system and status information on two multifunction display screens within the cockpit.

6 The normal A/P disconnect sequence is initiated by the PF pressing the Sidestick Takeover Push Button, which causes a Temporary Audio and Visual Warning to be heard and displayed (on the ECAM). The warnings are cancelled and cleared by a second press of the takeover push button within 1.5 seconds. If the pilot disengages the A/P with the takeover push button, the warnings are temporary. If the disengagement results from a force on the sidestick, the visual and audio warnings continue until manually cleared by the crew.

7 A standard procedure intended to set an altitude parameter for the aircraft's flight control system in the event of a missed approach.

8 An acronym for the operator-approved method of bringing any divergence from the standard operating procedures to the attention of the relevant crew member.

altimeter (RADALT)[9], and signified the aircraft's descent through 1,000 ft. The FO indicated that at this point, it was his usual practice to perform a visual scan of the cockpit instrumentation. He further stated that he felt 'something was not quite right' but could not identify what it was.

The captain reported that he did notice that the landing gear was still up and that the flaps were at 'Config 2' (Flap Configuration 2). He also stated that he was not maintaining a focus on the stable approach criteria (see the subsequent section titled *Stabilised approach criteria*) as he was the PNF. Neither crew member initiated the landing checklist.

At 720 ft RADALT, a MW and associated continuous triple chime for 'Landing Gear Configuration' activated.[10] The FO stated that, on hearing that warning, he noted a red light in the landing gear lever and an ECAM message 'LG not DN' displayed on the E/WD. In combination, that signified that the landing gear had not been selected down.

At about 650 ft RADALT, or 4.5 seconds after the commencement of the master warning chime, the landing gear was selected down. At 503 ft RADALT, or about 7 seconds after the landing gear was selected down, a 'Config 3' selection was made by the crew. The captain stated that he 'instinctively' reached out and selected gear down and 'Config 3' upon hearing the master warning.

The FO reported feeling 'confused' by the captain's action, as he was preparing to conduct a go-around. Neither the captain nor the FO communicated their intentions at that time.

At 1843.31, eleven seconds after the landing gear was selected down, a 'Too Low Gear' Enhanced Ground Proximity Warning System (EGPWS) alarm sounded. That signified that the aircraft had descended below 500 ft RADALT with the landing gear still not secured in the down position (the landing gear was still in transit to the down position at that time).

At 1843.40, the flight crew commenced a go-around. The FO made the standard 'go around flap' call and selected Take Off/Go-Around power on the thrust levers, initiating an automated go-round procedure. The recorded data showed an initial pitch-up command, consistent with the commencement of the go-around, at 392 ft. Both crew stated that they were unaware of the minimum height reached before the aircraft climbed, but believed that they initiated the go-around just below 800 ft RADALT.

The initial nose-up pitch coincided with about 4 seconds of forward movement on the captain's side stick. Two seconds later, forward movement of the captain's side stick was applied for a further 8 seconds. A radio transmission was made during that time.

The captain recalled resting his hand on the side stick during the approach but does not recall applying any pressure to the side stick or making any side stick inputs. The captain reported using the radio transmit switch on the side stick to inform ATC that the aircraft was going around. In response, ATC cleared the aircraft to maintain runway heading and to climb to 3,000 ft.

The captain stated that he thought he had selected 'Config 2' at the commencement of the go-around as per the 'go-around flap' command and the FO recalled seeing 'Flap 2' selected on the flaps lever. The recorded data showed that 'Config 3' remained selected until the aircraft was above 3,000 ft.

At 1,000 ft, the FO called for 'gear up', which was set by the captain. The FO engaged the autopilot at about 2,600 ft and, after a series of left turns, the aircraft was established on a second ILS approach for RWY 20R. A plot of the recorded data is at Appendix A.

The flight crew discussed the occurrence with the Duty Captain by telephone at about 1930 that night. The Duty Captain attempted to determine the crew's fitness for duty and whether they were happy to continue their duty. The possibility of the crew being tired was raised; however, based on

9 An instrument that provides a readout of an aircraft's height above ground level.

10 The aircraft was fitted with retractable landing gear. To prevent the flight crew landing without the landing gear secured in the down position, a master warning and associated chime activated when the landing was gear not secured down and the aircraft is below 750 ft RADALT.

the information provided by the crew, there was no indication of their being fatigued. The crew resumed duty and flew the next sector from Singapore to Darwin. The captain acted as the PF and the FO as PNF for that sector.

Personnel information

Captain

The captain held an Air Transport Pilot (Aeroplane) Licence (ATPL(A)) and was type rated on the A320. He held a current medical certificate and instrument rating and had about 13,431 hours total flying experience.

The captain had flown the A320 since 2005 before moving to the A330 on 27 March 2007. In March 2008, the captain required additional training before completing his line check. In September 2008, the captain experienced difficulty in a simulator check flight and, after discussions with the operator's management, decided to return to the A320.

All of the captain's subsequent training had been completed to a satisfactory standard.

First officer

The FO held an ATPL(A), was type rated on the A320 and held a current medical certificate and instrument rating. He had 4,097 hours total flying experience and had flown the A320 since May 2008.

Aircraft information

There was no evidence that the aircraft or its systems were a factor in the occurrence.

Meteorological information

The Aerodrome Forecast (TAF) for the flight's arrival predicted a wind from 170 °(T) at 8 kts, visibility greater than 10 km, Few[11] cumulonimbus clouds with a base of 1,800 ft and Scattered cloud with a base of 2,000 ft. Temporary deteriorations in the conditions were forecast for not more than 1 hour with visibility reducing to 3,000 m, scattered thunderstorms and rain with associated cloud base 1,500 ft, and Broken cloud base 1,800 ft.

Both pilots stated that the weather had been good but that, on commencing descent into Singapore, they were required to deviate from the planned flightpath due to thunderstorm activity. Once clear of that activity, they were able to proceed to the initial approach fix and commence an ILS approach.

Weather was not considered to be a factor in the occurrence.

Tests and research

The occurrence flight was recreated by the operator's senior check and training pilots in a simulator using the recorded flight data. That simulation was observed by Australian Transport Safety Bureau (ATSB) investigators.

During the simulation, the differences between the standard autopilot disconnect and the non-standard disconnect applied in this instance were examined. The ECAM messages and associated audio and visual warnings were noted and found to align with the recorded data.

The simulator session also identified a period of about 2 minutes between about 2,800 ft and 1,000 ft in the descent where no control manipulations or systems activation was recorded. In contrast, during that period, a number of tasks should have normally been completed in preparation for landing, including:

- selecting the landing gear down

11 Cloud cover is normally reported using expressions that denote the extent of the cover. The expression Few indicates that up to a quarter of the sky was covered, Scattered indicates that cloud was covering between a quarter and a half of the sky. Broken indicates that more than half to almost all the sky was covered, while Overcast means all the sky was covered.

- selecting the flaps to 'Config 3' and then 'full'
- arming the ground spoilers
- selecting auto brake
- completing the landing checklist
- checking the flight parameters.

The completion of those items in the simulator ensured that the aircraft was configured and stabilised by 1,000 ft.

Organisational and management information

Use of the autopilot and automation

The Airbus A320 is designed to be flown using the autopilot and the aircraft's other automated systems. Aircraft manufacturers and operators have developed a number of procedures and standard calls to ensure that both pilots maintain awareness of their aircraft's mode and flightpath.

In general terms, those procedures can be divided into two categories:

- aircraft configuration, in this case the Approach and Landing Configuration
- approach procedures, which in this instance changed from an ILS to a visual approach due to the PF calling 'visual procedures' on descent.

Prior to the approach phase, crews gather information on the most appropriate approach. Normally an approach commences from 3,000 ft, with the aircraft's speed reducing to the minimum clean speed[12] before intercepting the glideslope. From that point, the wing flaps are extended progressively[13] to the required landing setting and the landing gear is selected down.

The operator's policy on the use of automation stipulates the disengagement of an aircraft's automated systems only if the relevant system's performance becomes inaccurate, unclear or inappropriate.[14] There was no indication that the aircraft's systems were a factor in the occurrence.

The Airbus A320 Flight Crew Operating Manual (FCOM) stated that the autopilot disengaged advisory on the ECAM, and associated audio and visual warnings, only appeared if the autopilot was disengaged by a means other than by pressing the takeover push button on the side stick. The recorded data showed that the autopilot was disconnected by forward movement of the side stick.

ILS approach standard operating procedures

The standard calls and procedures for application during an ILS approach are based on each crew member having specific tasks, either as the PF or the PNF. According to the operator's Operations Manual, the PF controls the aircraft through the flight controls or autopilot and the PNF monitors the PF, actions items and assists with other duties at specific times or when requested by the PF. Both pilots are required to monitor the aircraft's progress and ensure the correct aircraft configuration at each phase of flight. The PF is responsible for initiating the landing checklist.

Stabilised approach criteria

The Flight Safety Foundation has been at the forefront in the development of a series of stabilised approach criteria in response to a number of hard landing, runway overrun or other approach and landing accidents.[15] Some of the contributing factors in those accidents and incidents have included:

- excessive speed
- incorrect flaps configuration
- a rushed approach resulting in crew overload or task shedding

12 The slowest permitted speed without the wing flaps and slats being extended.

13 Through 'Flap Configuration 2' to 'Flap Configuration 3'

14 Operations Manual 01 Administration, Section 4.19.2: *Aircraft Management – Automation.*

15 Flight Safety Foundation Approach and Landing Reduction Tool Kit: Briefing Note 7.1 – Stabilized Approach. Flight Safety Digest, August – November 2000.

- high rates of descent which were not able to be corrected.

In essence, an approach is considered 'stabilised' if the aircraft is on the correct lateral and vertical flightpath and is in the desired landing configuration; all flight parameters such as airspeed, pitch attitude, bank angle, and so on are in limits; and the landing checklist has been completed. Not below heights for the attainment of those criteria are set at 1,000 ft for an approach in instrument meteorological conditions (IMC) and 500 ft when in visual meteorological conditions (VMC).

If the pre-determined criteria were not satisfied at the stipulated altitude, crews were required to carry out a missed approach.

The operator's Operations Manual 1 - Administration, section 6.4.11 titled *Stable approach* stated that:

> The final landing flap selection shall normally be made prior to reaching 1000 ft height above airport (HAA). All approaches should be fully configured and stabilised by 1000 ft HAA in both IMC and VMC. However the following limits below must be adhered to:
>
> - In VMC, if the approach is not stable by 500 ft HAA, a go-around must be initiated.

Portable electronic devices policy

The operator's policy on portable electronic devices was laid down in Operations Manual 1 - *Administration* and required crew to follow the same procedures as affected passengers. That was, devices such as mobile phones were permitted for use in-flight once the seat belt sign was extinguished after takeoff only if 'Flight Mode' (non-transmitting) was selected prior to flight, and only until top of descent.

The captain stated that after the crew finished their flight planning duties in Darwin and proceeded to the aircraft, he received a phone call from the airline's operations group informing him of a change in the weather at Singapore and that he would need to take on more fuel. The captain reported that he kept his phone turned on while in the cockpit at Darwin in case operations needed to contact him again. Prior to departure, he unintentionally omitted to turn the phone off and, during the approach, a number of messages were received from a Singapore mobile phone service provider.

Phone records showed that there were no texts sent or answered by the captain during the approach. Inquiries with the captain's Australian mobile phone service provider determined that messages sent to and received by a phone from another network would not be recorded by the other provider. Similarly, no record of those messages was kept by the Australian provider. By the time the captain was interviewed as part of this investigation, he had erased the messages from his phone.

The investigation was unable to obtain the exact timings of the mobile phone messages.

Monitoring

The operator's procedures required all crew members to be aware of the PF's intentions with respect to an approach and to ensure that any diversions from procedures, air traffic clearances or the intended flightpath were immediately drawn to the PF's attention.[16] Also, as part of the operator's stabilised approach criteria, the PNF was required to monitor the approach path, rate of descent and airspeed to ensure that they remained within specific tolerances during an approach. The PNF was required to immediately notify the PF of any excursions and both pilots were to monitor the approach.

Additional information

Fatigue management

Fatigue management was used by the operator to mitigate any crew fatigue-related issues. In this case, the pilots had operated a flight to Darwin, arriving at about 0030 Singapore Time that morning. Both had spent their rest period in a hotel in Darwin, which was used by the airline

16 The specific duties of the PF and PNF and importance of effective monitoring were discussed in ATSB investigation AO-2009-066, which is available at www.atsb.gov.au

operator for crew accommodation. The crew had checked into the hotel at 0100.

The captain stated that he felt well rested prior to commencing duty that day but had been woken twice at about 0630 and 0830 by fire alarm tests.

The FO reported going to sleep at about 0130 on the morning of the occurrence and being woken by a phone call from housekeeping at about 0430. He had dozed until getting up at 0630 to go for a jog and did not get any other sleep prior to crew sign on at 1315.

The FO stated that he did not feel tired or fatigued before the flight. However, he reported feeling tired on descent into Singapore and that he disengaged the autopilot during the approach in order to hand-fly the aircraft and 'wake [him] up'. During the return flight to Darwin, the FO had two periods of controlled rest.[17]

Both pilots reported having attended fatigue risk management training and felt satisfied that they were able to judge their own level of fatigue and fitness in respect of being able to perform their duties. Both crew reported having adequate sleep in the 72 hours prior to the commencement of their duty period.

The organisation's fatigue management system and the crew's rosters, fatigue biomathematical model figures and sleep histories were examined to assess the crew's level of fatigue. That examination determined no issues in relation to crew fatigue prior to the commencement of the duty period on 26 May 2010. However, following commencement of this duty period, the FO's rest period between operating the Darwin and Singapore sectors on 27 May 2010 was interrupted, and the FO did not avail himself fully of the rest opportunity.

Distraction and prospective memory

Situation Awareness is a human perceptual state in which information is gained from the environment through a number of processes. These processes are generally agreed to be the perception of environmental elements, the comprehension of their meaning and the projection of the consequences for their status of a change in a variable (such as time).[18]

Prospective memory can be defined as the intention to perform an action in the future, coupled with a delay between recognising the need for that action and the opportunity for its performance.[19] A distinguishing feature of prospective memory is the need for an individual to remember that they need to remember something.

ANALYSIS

Stable approach criteria

The incorrect aircraft configuration approaching 500 ft in visual meteorological conditions meant that the operator's stable approach criteria were not satisfied and that it was appropriate for the flight crew to initiate a go-around. The 'Landing Gear Configuration' and enhanced ground proximity warning system 'Too Low Gear' alerts activated correctly to signal the circumstances of the aircraft.

The effects of a number of cockpit distractions combined with fatigue to adversely affect the first officer's (FO) configuration of the aircraft for the approach and landing. Normally, it could be expected that the captain, as the pilot not flying (PNF), would have been monitoring the situation and have intervened to correct the situation.

Monitoring

The lack of effective monitoring by the captain meant that the non-standard disconnection of the

17 Where a crew member remains on the flight deck but naps for a period of up to 30 minutes under certain conditions.

18 Endsley, M.R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors,* vol. 37(1), pp 32-64.

19 Dismukes, K. (2006). Concurrent task management and prospective memory: pilot error as a model for vulnerability of experts. In Proceedings of the Human Factors and Ergonomics Society 50th Annual Meeting - 2006, 909-913.

autopilot by the FO, and 'AUTO FLT A/P OFF' alert on the Electronic Centralised Aircraft Monitor (ECAM) remained undetected until later in the approach. Once visual with the runway, the captain's focus external to the aircraft also adversely affected his monitoring role.

The mobile phone messages acted to compound the captain's distraction from the monitoring and support roles during the latter stages of the approach. That would likely explain the captain's inaction when asked by the FO to set the missed approach altitude and the captain's report that he did not hear the FO's requests for that support.

Distraction and prospective memory

Air traffic control's request to slow the aircraft earlier in the approach than anticipated, the discussion by the crew of the Singapore skyline, the receipt of the text messages and the late detection of the autopilot-related ECAM alert distracted the crew. That distraction degraded their situation awareness to the extent that they did not identify the incorrect aircraft configuration. These actions, coupled with a lack of effective monitoring by both crew and the FO's fatigue, appear to have impacted their prospective memory. As a result, the landing checklist and gear down procedure were intended but missed. These omissions are an indication of a loss of stage-two situation awareness: comprehension, and stage-three situation awareness: projection. That would explain the crew not returning to the relevant checklist and satisfactorily configuring the aircraft for the approach and landing.

Fatigue and decision making

The FO's reported tiredness at the top of descent was probably due to his disrupted sleep on the night before the flight. The lack of any additional sleep prior to signing on for duty increased the risk of fatigue, with the result that his decision making abilities would be adversely affected and that any distraction might impact his normal duties. That included his appropriately configuring the aircraft for landing.

The FO's less than ideal interaction with the captain during the approach, which would have been exacerbated by the FO's level of fatigue, further degraded his situation awareness and decision making. Rather than attempting to wake himself up by disengaging the autopilot and manually flying the approach, the FO may have been better prepared for the approach had he attempted to take a nap prior to signing on, or availed himself of controlled rest during the flight to Singapore.

Despite the disruptions to his sleep, there appeared to be adequate opportunity for the FO to take the rest he required to operate the aircraft the next day. The organisational aspects of fatigue management did not appear to materially contribute to the issue of fatigue.

Crew resource management

The receipt of the text messages on the captain's phone, and the retrospective action by the captain to bring the autopilot disconnection ECAM to the FO's attention, distracted the FO to the extent that the existing crew resource management effectively broke down. That would explain the captain not setting the missed approach altitude when asked by the FO; the FO, as the PF, not anticipating the necessary changes in the aircraft's configuration; the omission by the FO to initiate the landing checklist; and the non-standard communication between both crew members.

The maintenance of effective crew resource management would have increased the likelihood of the crew maintaining situation awareness and completing the approach in accordance with the operator's standard operating procedures. Had that been the case, it is highly unlikely that the occurrence would have taken place.

FINDINGS

From the evidence available, the following findings are made with respect to the incorrect aircraft configuration occurrence at Singapore Changi International Airport on 27 May 2010 involving an Airbus A321-231 aircraft, registered VH-VWW. They should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- The flight crew continued the approach despite not being able to satisfy the

operator's stabilised approach criteria prior to the stipulated 500 ft in visual meteorological conditions.

- A number of distractions during the approach degraded the crew's situation awareness and resulted in the crew not detecting the incorrect aircraft configuration.
- The captain did not appropriately monitor the aircraft's configuration or the actions of the first officer.

Other safety factors

- The lack of effective intra-crew communication accentuated their loss of situation awareness.
- The first officer's decision making was probably affected by fatigue.

SAFETY ACTION

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.

The investigation did not identify any organisational or systemic issues that might adversely impact the future safety of aviation operations. However, the following proactive safety action was advised.

Jetstar

In response to this incident and its own investigation, Jetstar advised that it has:

- Reviewed its stable approach criteria and amended the relevant text in its operations manual from 'should be fully configured by 1,000 ft Height Above Airport (HAA)' to 'must be fully configured by 1,000 ft HAA'.
- Stipulated that landing checklists are to be completed by 1,000 ft HAA.
- Committed to a review of its stabilised approach reference landing checklist.
- Arranged to develop a crew resource management training video for inclusion in its training program. The video will use this incident as an example, emphasise crew complacency as a key threat, and examine the precursors for any complacency within regular public transport operations.
- Committed to redesigning its training system to include a:
  - remedial process for poor non-technical performance,
  - system for ensuring that the non-technical aspects of flight crew training are tailored on an individual basis.
- Enacted quarterly reviews by the standards department of all pilots' non-technical scores. Pilots with sub-standard scores will have peer review and feedback sessions and remedial training will be conducted as required on a case-by-case basis.
- Arranged for the development of a human factors (HF) training video that will be incorporated into the 2012 HF recurrent training program.

SOURCES AND SUBMISSIONS

Sources of information

The main sources of information during the investigation included:

- the flight crew
- the aircraft operator
- the Bureau of Meteorology
- Singapore Air Traffic Control.

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 the aircraft operator, the flight crew, the Air Accident Investigation Branch of Singapore and the Civil Aviation Safety Authority.

Submissions were received from the aircraft operator, the Air Accident Investigation Branch of Singapore and the first officer. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

The Air Accident Investigation Branch of Singapore submission included the following suggested change in Analysis section *Distraction and Prospective memory*:

> Remove 'Air traffic control's request to slow the aircraft earlier than anticipated, the'.

As it could be interpreted as either that air traffic control should have requested the slow down later, or it is a distraction from the point of view of the crew alone during a period of high workload.

The ATSB did not consider that the section could be misconstrued and this section of the report was not amended.

APPENDIX A: MISSED APPROACH SEQUENCE OF EVENTS