Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Investigation – AO-2007-044

Preliminary

Missed Approach

Melbourne Airport

21 July 2007

Airbus A320-232, VH-VQT

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Abstract

While the crew conducted a go-around the aircraft failed to go into the Speed Reference System (SRS) mode and the aircraft descended below decision height.

The investigation is continuing.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

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.

Purpose of safety investigations

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

It is not the object of an investigation to determine blame or liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

FACTUAL INFORMATION

The information contained in the preliminary report is derived from initial investigation of the occurrence. Readers are cautioned that there is the possibility that new evidence may come to light that alters the circumstances as depicted in this report.

History of the flight

On 21 July 2007, an Airbus A320-232 aircraft, registered VH-VQT, was being operated on a scheduled international regular public transport service between Christchurch, New Zealand and Melbourne, Australia.

Following an uneventful flight from New Zealand, the crew were conducting an instrument landing system (ILS) approach to runway 27 at Melbourne. Weather conditions were forecast to include fog, which had subsequently eventuated and was likely to necessitate an instrument approach to the minimum altitude on the approach. The likelihood of the crew having to conduct a missed approach was high, as aircraft ahead of VQT had already conducted missed approaches because of the low visibility and fog. The crew had been aware of these conditions prior to departure and had flight planned accordingly. They had also conducted a briefing on the likelihood of having to conduct a missed approach prior to commencing the descent into Melbourne.

At the decision height on the ILS approach, the crew did not have the prescribed visual reference and commenced a missed approach. During the initial part of the missed approach, the crew were not aware that the aircraft had not transitioned to the expected flight guidance modes[1] for the missed approach. When the aircraft did not respond as expected, the crew took manual control of the aircraft. The crew were subsequently processed by air traffic control (ATC) for another approach to Melbourne Airport. This second approach also resulted in the crew conducting a missed approach and the aircraft was subsequently diverted to Avalon Airport, where it landed uneventfully. During the second missed approach, the aircraft systems functioned correctly.

Incident notification

The aircraft operator reported the incident to the Australian Transport Safety Bureau (ATSB) on 26 July 2007, and indicated that the incident had resulted in a diversion of the flight to another destination. It also indicated that the automated systems on board the aircraft did not function correctly, however the crew took manual control and the aircraft performed correctly once they did. On the basis of the information contained in the incident report, the ATSB did not assess that the circumstances met the criteria for a reportable matter under the *Transport Safety Investigation Act 2003*.

1 To assist flight crew in controlling the Airbus A320 aircraft, flight mode information is provided to flight crew on a display called the 'Flight Mode Annunciator'. The current flight mode is derived from input from various aircraft systems. Current flight modes and any change to a flight mode are displayed on this display.

On 2 August 2007, the operator commenced an internal investigation into the incident. That investigation involved examining recorded flight data that revealed the activation of an Enhanced Ground Proximity Warning System (EGPWS) warning during the first missed approach. This additional information was not provided to the ATSB at that time.

On 11 September 2007, in response to media reports of a potentially serious incident at Melbourne Airport, the ATSB contacted the operator, who provided additional information on the incident. The ATSB re-assessed it to be of sufficient seriousness to warrant the immediate initiation of an investigation.

Operating procedures and systems description

Due to the forecast and formation of fog, the crew were flying the approach using low visibility operating procedures that required the pilot-in-command to assume the role of handling pilot and the first officer to take the role of non-handling pilot. The aircraft was being flown using the autopilot system.

The A320 aircraft uses a number of flight control computers to provide guidance mode input to the autopilot to provide aircraft control. During an ILS approach, the applicable guidance modes are glideslope and localiser. These modes provide vertical and lateral guidance for the aircraft during the approach.

Engine power can be controlled by the auto-thrust system, which the crew reported was active at the time. The thrust levers can be placed in any one of four detents on the thrust lever quadrant according to the phase of flight.[2] During a normal instrument approach, the levers are in the climb (CL)[3] detent. If auto-thrust is active, then the aircraft's speed is controlled by the thrust commanded by that system. The two detents forward of the CL detent are the flexible takeoff/maximum continuous thrust (FLX/MCT)[4] detent and the takeoff/go around (TO/GA)[5] detent. (Figure 1.)

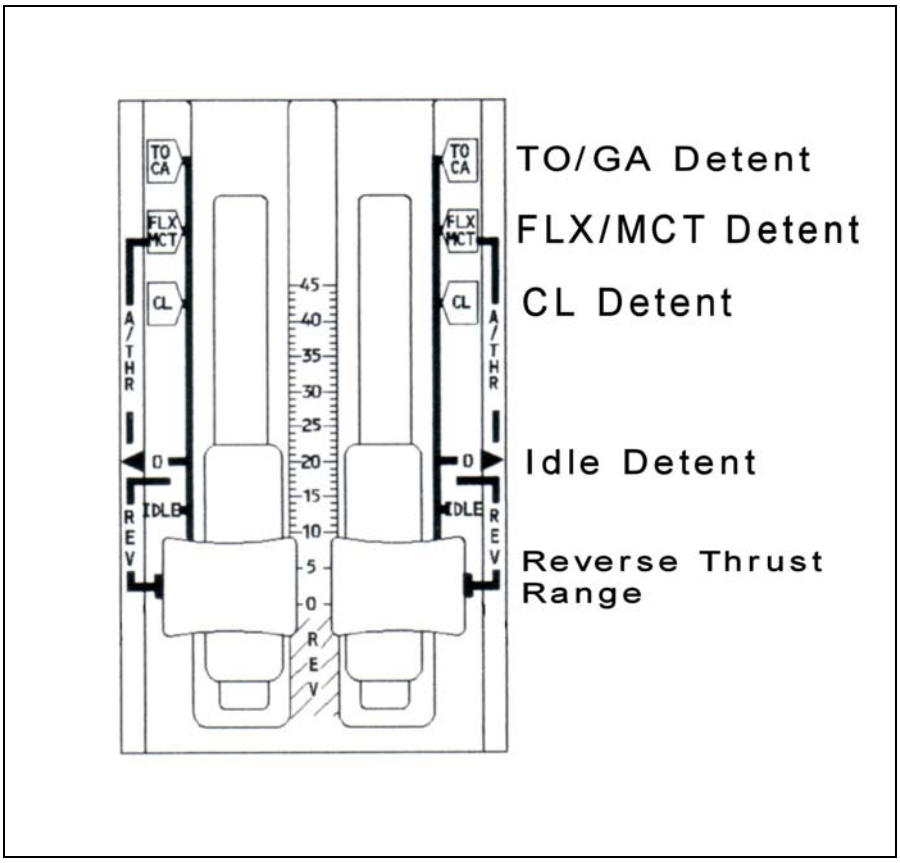
2 The A320 thrust control system does not require the pilot to continuously manipulate the thrust levers, rather the pilot places thrust levers in the appropriate detent and thrust is commanded in response to flight control computer and auto-thrust system inputs.

3 The CL detent provides power up to maximum climb thrust from the engines.

4 The FLX/MCT detent provides maximum continuous thrust from the engines or is used when conducting a flexible temperature takeoff procedure. A flexible temperature takeoff is a procedure whereby a slightly reduced takeoff thrust is commanded when full take-off power is not required.

5 The TO/GA detent provides maximum take-off thrust from the engines.

Figure 1: A320 thrust lever positions



At the decision height for the approach[6], if the crew are not visual with the runway environment, they are required to conduct a missed approach. This involves the handling pilot advancing the thrust levers from the CL detent[7] to the TO/GA position and positively rotating the aircraft to a climb attitude. It also involves a number of callouts from the crew in response to the manoeuvre, and subsequent actions to reconfigure the aircraft to a climb configuration.

Movement of the thrust levers to the TO/GA position provides inputs to the flight control computers to initiate a change to the flight guidance modes. In a missed approach, the applicable modes are speed-reference-system (SRS) and go-around track (GA TRK). In the go-around manoeuvre, the SRS system provides guidance to maintain the speed which existed at the commencement of the missed approach procedure, while GA TRK provides lateral tracking guidance. The engines had already been commanded to provide thrust to allow the aircraft to climb away in the missed approach in response to the pilot advancing the thrust levers.

6 The decision height for the runway 27 ILS approach at Melbourne Airport is 200 feet above ground level.

7 The CL detent corresponds to a thrust lever angle of 22 degrees.

A review of recorded flight data and crew interviews revealed that, after moving the thrust levers to commence the missed approach, the aircraft appeared to not respond correctly and the flight control computers remained in the localiser and glideslope modes. Both crew members recalled hearing and feeling an increase in engine thrust and there appeared to be an apparent pitch up in response to the procedure.

The pilot-in-command reported that, when the aircraft did not respond appropriately, he disconnected the autopilot system and attempted to fly the aircraft manually. He reported that he input pitch control to command an appropriate nose-up pitch attitude. However, the aircraft initially continued to descend. Further control inputs from the pilot-in-command resulted in the aircraft commencing to climb, and the crew commanded retraction of the landing gear and reconfigured the aircraft for climb.

Once the aircraft had commenced climb, the crew contacted ATC and were radar vectored for another instrument landing system approach to runway 16 at Melbourne Airport. The approach to this runway also resulted in the crew not achieving the required visual reference at the decision height, and another missed approach was conducted. During the second missed approach, the aircraft systems functioned correctly. Following that missed approach, the crew diverted the aircraft to Avalon Airport where a normal landing was carried out.

The crew reported that prior to commencing the flight from New Zealand, they were both adequately rested.

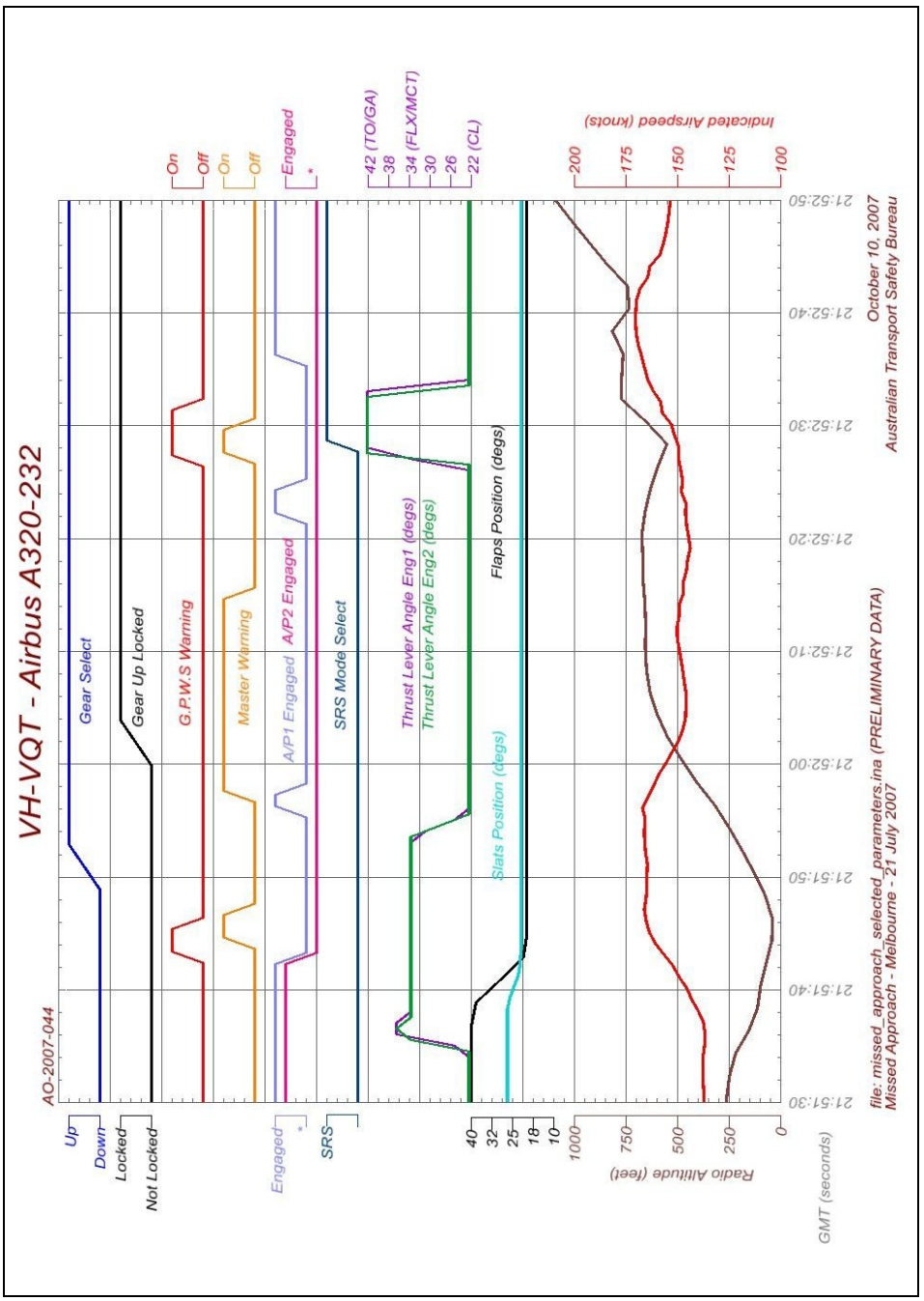
Recorded flight data

Recorded flight data from the flight had been retrieved from the onboard flight data interface management unit (FDIMU) by the operator and was provided to the ATSB. Examination of the recovered flight data indicated that at the commencement of the first missed approach, at approximately 200 ft above ground level (AGL), the thrust lever positions were moved forward of the FLX/MCT detent[8] for a short period before being retarded to that position. Simultaneously, the flaps and slats were retracted to the FLAP 3 position from the FULL position.[9] The autopilot remained engaged during the commencement of the missed approach and was disengaged shortly after the flaps had been retracted. The recorded radio altimeter height at this time was between 58 and 72 feet. Selected recorded parameters are shown at Figure 2.

8 FLX/MCT detent was at a thrust lever angle of 34 degrees.

9 FLAP 3 positions the flaps to 20 degrees and the slats to 22 degrees of extension. The FULL position has the flaps extended to 35 degrees and the slats to 27 degrees.

Figure 2: Graphical representation of selected recorded parameters during initial missed approach



Shortly after the flaps had been retracted, the data indicated that an EGPWS 'don't sink' warning activated. The aircraft continued to descend on the glideslope and the speed initially remained at approximately 140 knots before increasing. The aircraft descended to a minimum recorded radio altimeter height of 43 feet AGL. The landing gear was down at this time.

Shortly after reaching that height, the aircraft commenced a positive rate of climb, the landing gear was retracted and the aircraft commenced to climb away. Coincident with the gear retraction was a 'master warning' indicating a configuration warning.

The aircraft was climbed to approximately 650 ft AGL and remained at that altitude for approximately 17 seconds, before it commenced a shallow descent. Shortly after commencing this descent, the thrust levers were moved to the TO/GA detent[10] and coincident with that movement, another EGPWS 'don't sink' warning activated. After the thrust levers were moved to the TO/GA detent, the aircraft continued to climb and no further warnings or alerts were recorded.

The investigation is continuing and will examine the following areas:

- flight crew endorsement training
- flight crew transition and check to line training
- aircraft operating procedures
- provision of information to flight crews
- company reporting procedures
- aircraft system operation and maintenance.

Safety Action

As a result of this occurrence, the aircraft operator, as part of their ongoing investigation, has taken the following safety actions:

1. An internal message to all crews was issued, requiring the use of full take-off thrust to be used for all missed approaches. Engine thrust was not to be reduced until commanded by the flight mode annunciator.
2. A flight standing order was published, which revised the missed approach procedure and associated crew actions.

10 TO/GA detent was at a thrust lever angle of 42 degrees.