Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Report – 200505683

Final

Loss of Pressurisation
15 km north-west of Jindabyne, NSW
9 November 2005
VH-VBI
Boeing Company 737-7Q8

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Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Published by: Australian Transport Safety Bureau
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ISBN and formal report title: see 'Document retrieval information' on page iii.

DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication date	No. of pages	ISBN
200505683	February 2007	19	1 921164 41 7

Publication title

Loss of Pressurisation – 15 km north-west of Jindabyne, NSW - 9 November 2005 VH-VBI Boeing Company 737-7Q8

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Abstract

On 9 November 2005 at 0834 Eastern Daylight-saving Time, a Boeing Company 737-7Q8 aircraft, registered VH-VBI, was being operated on a scheduled passenger service from Sydney, NSW to Melbourne, Vic. The aircraft was at an altitude of 40,000 ft (Fight Level 400) when the pilot in command (PIC) noticed the cabin rate of climb indicator suddenly indicate a maximum rate of climb. The PIC disengaged the autopilot and commenced an emergency descent to an altitude of 10,000 ft. When levelled at 10,000 ft, the crew observed that the cabin had repressurised, so they elected to maintain 10,000 ft and continue the flight to Melbourne. There were no reported injuries to passengers or crew.

The PIC reported feeling upset in the stomach and discomfort in the ears before noticing that the cabin rate of climb indicator showed a sudden increase in cabin altitude. Flight data recorder information showed that the aircraft descended to approximately 500 ft below the assigned altitude for 50 seconds. The co-pilot contacted air traffic control and requested an emergency descent to 10,000 ft; when the clearance was obtained the PIC continued the descent.

The PIC attempted to inform the cabin crew of the emergency descent but the announcement was not heard on the passenger address system in the cabin. The cabin crew reported that not all passengers had put their oxygen masks on after the masks were deployed.

The crew observed that at approximately FL300 the cabin altitude was stabilising. At approximately FL230 the cabin altitude was 9.000 ft and the cabin altitude warning ceased. At approximately FL160 when the cabin altitude was 4.000 ft, the pilot elected to reduce the rate of descent and the cabin supervisor was advised by the copilot that the oxygen masks could be removed. The aircraft levelled off at 10,000 ft approximately 11 minutes after the descent was initiated.

The examination of the pressurisation system revealed that the sudden increase in cabin altitude was due to the positive pressure relief valves opening at a lower pressure than required.

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. Accordingly, the ATSB also conducts investigations and studies of the transport system to identify underlying factors and trends that have the potential to adversely affect safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements. The object of a safety investigation is to determine the circumstances in order to prevent other similar events. The results of these determinations form the basis for safety action, including recommendations where necessary. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations.

It is not the object of an investigation to determine blame or liability. However, it should be recognised that an investigation report must include factual material of sufficient weight to support the analysis and findings. That material will at times contain information reflecting on the performance of individuals and organisations, and how their actions may have contributed to the outcomes of the matter under investigation. 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.

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. While the Bureau issues recommendations to regulatory authorities, industry, or other agencies in order to address safety issues, its preference is for organisations to make safety enhancements during the course of an investigation. The Bureau prefers to report positive safety action in its final reports rather than making formal recommendations. Recommendations may be issued in conjunction with ATSB reports or independently. A safety issue may lead to a number of similar recommendations, each issued to a different agency.

The ATSB does not have the resources to carry out a full cost-benefit analysis of each safety recommendation. The cost of a recommendation must be balanced against its benefits to safety, and transport safety involves the whole community. Such analysis is a matter for the body to which the recommendation is addressed (for example, the relevant regulatory authority in aviation, marine or rail in consultation with the industry).

FACTUAL INFORMATION

Sequence of events

On 9 November 2005 at 0834 Eastern Daylight-saving Time[1], a Boeing Company 737-7Q8 aircraft, registered VH-VBI, was being operated on a scheduled passenger service from Sydney, NSW to Melbourne, Vic. The aircraft was at an altitude of 40,000 ft (Flight level 400 (FL400)) when the pilot in command (PIC) noticed that the cabin rate of climb gauge suddenly indicated a maximum rate of climb. The PIC disengaged the autopilot and initiated an emergency descent to an altitude of 10,000 ft. When at approximately FL230 the crew observed that the cabin altitude was 9,000 ft. When at approximately FL160 the PIC elected to slow the rate of descent and continue the flight to Melbourne at 10,000 ft. There were no reported injuries to passengers or crew.

The PIC was the pilot flying at the time of the incident. The PIC reported feeling upset in the stomach and discomfort in the ears before noticing that the cabin rate of climb indicator showed a sudden increase in cabin altitude. The PIC alerted the copilot's attention to the change in cabin altitude.

The PIC reported that he 'disengaged the autopilot to get the aircraft descending'. The PIC commanded the copilot to put his oxygen mask on and also donned his own oxygen mask. Flight data recorder (FDR) information, indicated that the aircraft descended 500 ft initially, to FL395, and maintained that level for 50 seconds before continuing descent. During that period, the copilot contacted air traffic control (ATC) and requested an emergency descent to 10,000 ft, rather than declaring PAN[2] and commencing descent immediately. Once the clearance was obtained, the PIC continued the descent.

During the descent, the crew observed that the cabin altitude was still climbing, so the copilot was instructed to manually deploy the passenger oxygen masks. The PIC attempted to inform the cabin crew of the emergency descent, but the announcement was not heard on the passenger address system. The cabin crew reported that not all passengers put their oxygen masks on after the masks were deployed.

The initial rate of descent varied from approximately 2,000 ft/min to 4,000 ft/min, until the aircraft descended through approximately FL360, when the average rate of descent increased to approximately 6,000 ft/min. The PIC engaged the autopilot as the aircraft descended through approximately FL255.

The crew observed that at approximately FL300 the cabin altitude was stabilising at 15,000 ft with the cabin rate of climb returning to zero. As the aircraft descended through approximately FL160 the cabin altitude was down to 4,000 ft. At this point the pilot elected to reduce the rate of descent and the copilot advised the cabin

1 The 24 hour clock was used in this report to describe the local time of day, Eastern Daylight-saving time (EDsT), as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

2 PAN - radio code indicating uncertainty or alert.

supervisor (CS) that the oxygen masks could be removed. The aircraft levelled off at 10,000 ft approximately 11 minutes after the descent was initiated. The crew noted that there had not been a master caution warning to indicate a pressurisation problem and that the cabin pressure controllers were operating normally throughout the descent.

An examination of the pressurisation system revealed that the sudden increase in cabin altitude was due to the positive pressure relief valves opening at a lower pressure than required. The 'Pressurisation system' section of this report deals with the effect of the positive pressure relief valves on the cabin altitude.

Flight crew experience

The PIC had accrued a total of 6,400 hours, of which 3,700 hours were on 737 aircraft and 1,700 hours were as PIC. Prior to his employment by the operator, he was employed as a first officer with a regional airline.

The PIC had endorsement training on the 737 aircraft by a third party provider. This training consisted of three weeks of ground training followed by simulator training. The PIC had described the training as very suitable for a pilot who had not flown jet aircraft previously. He described the training provided by the operator as very good and that he was trained by experienced training captains. He had flown as a first officer for approximately two years before being promoted to captain.

The PIC's command training consisted of two simulator proficiency checks with another command trainee, five weeks of line training with a training captain, a simulator proficiency check with a first officer and a final line check.

The copilot had accrued a total of 16,500 hours, of which approximately 1,400 hours were on 737 aircraft. He also had endorsements on Boeing Company 767 and 727 aircraft. His previous employment had been as a first officer with a freight operator and an Australian airline.

The crew were on the third day of a four day duty period. They had reported for duty between 0500 and 0700 for the previous three days. Both pilots reported that they were well rested prior to reporting for duty on the day of the occurrence.

Emergency descent procedures

The PIC reported that, realising that the aircraft cabin altitude was climbing, his immediate concern was to start the descent and that the quickest way to achieve it was to disengage the autopilot and 'nose it over'. The initial part of the descent was manually flown until the aircraft passed approximately FL250, when the PIC engaged the autopilot. The Boeing 737 Flight Crew Training Manual (FCTM) did not mandate, but recommended the use of the autopilot for a rapid descent manoeuvre.

The FCTM also stated:

> RAPID DESCENT- This manoeuvre was designed to bring the airplane down smoothly to a safe altitude in the minimum time, with the least possible passenger discomfort.

> If the descent was performed because of a rapid loss of cabin pressure, crew members should place oxygen masks on and establish communication at the first indication of a loss of cabin pressurisation. Verify cabin pressure was uncontrollable, and if so begin descent. If structural damage exists or was suspected, limit airspeed to current speed or less. Avoid high manoeuvring loads.
>
> Perform the procedure deliberately and methodically. Do not be distracted from flying the airplane. If icing conditions are entered, use engine anti-ice and thrust as required.

Additionally the FCTM stated that:

> Both pilots should verify that all recall items have been accomplished and call out any items not completed.

The aircraft Quick Reference Handbook (QRH) provides crews with the procedures to be followed in the event of a rapid depressurisation and subsequent emergency descent (Appendix A). These checklists are considered to be recall items. The QRH described recall items as:

> Recall items are critical steps that must be done from memory and are placed within a box.

The manufacturer was requested to provide a simulator profile of their preferred emergency descent technique for comparison to the event profile (Appendix B). The manufacturer noted that the FCTM recommends the use of the level change mode of the autopilot to accomplish a rapid descent, to be completed in the following order:

1) Set the desired altitude on the Mode Control Panel (MCP)
2) Select level change
3) Close the thrust levers
4) Smoothly extend the speed brakes to the flight detent
5) Set the desired Mach or airspeed in the MCP speed window
6) If needed, change the selected Mach to airspeed
7) As the desired level-off altitude is approached, the aircraft will level off and maintain the MCP selected speed
8) Smoothly return the speedbrake lever to the down detent during the level-off manoeuvre.

The simulator data was derived by following the procedure outlined above. The comparison of the simulator and actual descent profiles indicated that FL380 was reached at about the same time. From that point the simulator descent reached lower levels approximately 10 seconds before the actual descent until FL210. At that level the actual profile went below the simulator profile until FL160 when the pilot elected to reduce the rate of descent. From this point on, the two profiles diverged. The simulator profile reached 10,000 ft approximately 7 minutes after the descent was commenced. This was 4 minutes earlier than during the actual descent (see Appendix B).

Operator training manual

The operator set out its check and training requirements for flight crew in Volume D1 of its Operations Manual, which complied with *Civil Aviation Order 82.5 Appendix*[3].

The operator did not conduct its own type rating training; all intake pilots were required to hold an Australian ATPL with a Boeing Company 737-300 to 800 type rating.

As part of a pilot's recurrent training requirements, they were to complete a multi-choice aircraft systems and performance refresher exam once a year, with the pass mark set at 70%.

The simulator training program included all major failures of aircraft systems and associated procedures, over a three year period. The simulator checks consisted of four sessions of 4 hours duration every 12 months. They were usually conducted as two 4 hour sessions every 6 months.

The first session consisted of a Line Operational Evaluation (LOE) exercise of about 90 to 120 minutes, followed by recurrent training exercises required by the operator's simulator program. The operator's training policy was that all recurrent training and checking exercises would emphasise the training component, but that all exercises would be evaluated, so were referred to as LOE.

The checking manual provided a background to the need to conduct LOE and stated:

> a) Research over recent years has shown that the primary cause of most accidents was not a lack of technical/manipulative proficiency of procedural knowledge, but rather was the result of ineffective situation management and crew coordination. This deficiency was traced to a lack of emphasis on situation management and crew coordination during initial and Recurrent Training, and an over emphasis on individual technical skills. The introduction of fully capable aircraft simulators has enabled this deficiency to be rectified by allowing exercises to be conducted that check technical/manipulative skills, procedural knowledge, and crew coordination in the familiar environment of a typical line flight. This training was generally referred to as Line Orientated Flight Training, or LOFT.

Emphasis was placed on managing non-normal situations and the training manual included the following section on situation management:

> a) There have been many accidents caused by poor Situation Management by crews who became unnecessarily preoccupied with a simple system failure, and who failed to detect aircraft flight path changes which resulted in flight into terrain, with the aircraft being destroyed and occupants fatally injured.

The operator provided first officers upgrading to command status with 20 hours of simulator training in five sessions. The final session was to be conducted as a

3 CAO 82.5- Conditions on Air Operators' Certificates Authorising Regular Public Transport Operations in High Capacity Aircraft Training and Checking Organisation.

proficiency check and instrument renewal, after the trainee had completed approximately 20 sectors of command line training. The training manual stated that:

> Strong emphasis shall be placed on flight management and the appropriate use of crew resource management (CRM) principles.

The training and checking personnel were responsible for reviewing standard operating procedures (SOPs), policy, documentation, and recommending changes that would ensure their accuracy and relevancy to line operations.

The Fleet Manager Standards was responsible for the monitoring of line operations to ensure that crews operated the aircraft in accordance with the operator's required standards.

Cockpit voice recorder

The aircraft was fitted with both a flight data recorder (FDR) and a cockpit voice recorder (CVR). The ATSB analysed the data from both recorders as part of the investigation.

The PIC and copilot response to the event and subsequent actions were recorded by the CVR. The CVR was an important resource during the investigation of the crew response to the depressurisation and the ATSB provided the crew with the opportunity to access the CVR information.

The initial response to the pressurisation problem was from the PIC, who noted that the cabin altitude rate of climb indicator was indicating a 4,000 ft/min rate of climb. The sound of the autopilot being manually disengaged was audible prior to the sound of the crew oxygen masks being fitted.

After the oxygen masks were fitted by the PIC and copilot, the PIC announced 'emergency descent', and soon after the cabin altitude warning horn sounded, indicating that the cabin altitude exceeded 10,000 ft. The PIC commanded the copilot to deploy the cabin oxygen masks several times prior to intra cockpit communications being established following the donning of their own oxygen masks. The PIC then announced an emergency descent to the cabin crew. It was not possible to determine from the CVR which channel was used to make the announcement, but the cabin crew reported after the incident that they did not hear the emergency descent announcement in the cabin.

There were two attempts to carry out the checklist procedures during the descent, but on both occasions the PIC attention was focussed on verifying cabin pressure indications. There was no indication from the CVR that the crew reviewed the checklist procedure for a rapid depressurisation or emergency descent prior to the aircraft levelling at 10,000 ft. The PIC did ask if all the recall items had been carried out for an emergency descent and the copilot responded with 'affirm'. The copilot stated later that he had conducted a silent review of the checklist to ensure all items were actioned. The checklist was eventually read out by the copilot 14 minutes after the initial indications of the depressurisation occurred.

As the aircraft passed FL227, the cabin altitude warning horn ceased, indicating that the cabin altitude was no longer above 10,000 ft. The cabin altitude warning horn was not silenced by the crew.

As the cabin repressurised, the aircraft's rate of descent was reduced. As the aircraft descended through approximately FL160, the copilot advised the cabin supervisor (CS) that the oxygen masks could be removed. The CS then advised the passengers that they could remove their masks. The aircraft was level at 10,000 ft 6 minutes later.

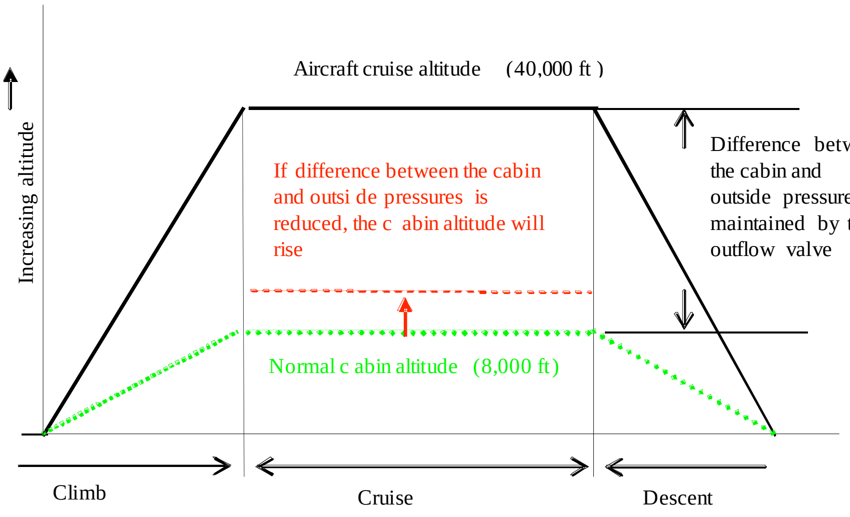
Approximately 10 minutes after the first indications of a pressurisation problem, the PIC contacted the CS to check on the condition of the cabin. The CS advised that a crew member was on oxygen and that there was a burning smell in the cabin. The PIC ascertained from the CS that there was no smoke present in the cabin and advised the CS that the flight would continue to Melbourne and that he would make an announcement to the passengers.

After the PIC made the announcement to the passengers, the copilot read the rapid depressurisation and emergency descent checklists.

Pressurisation system

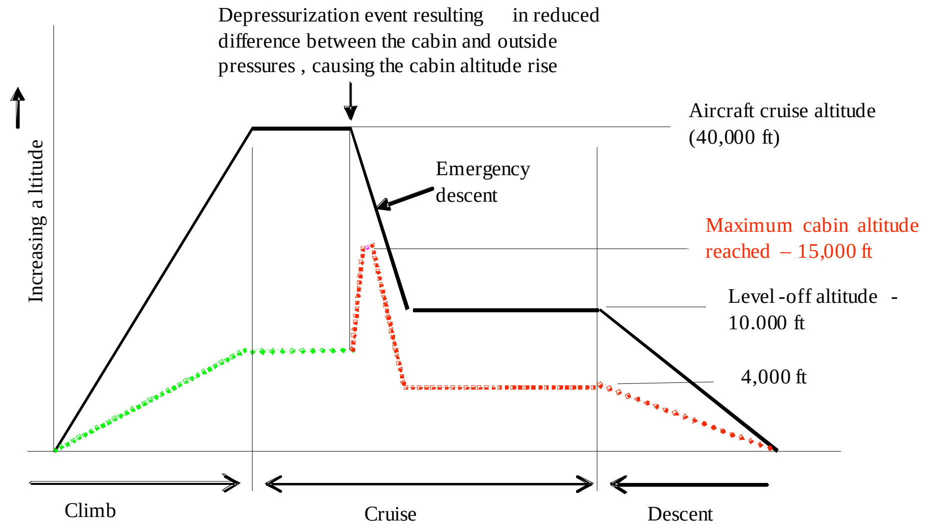
The purpose of an aircraft pressurisation system is to maintain sufficient cabin pressure for passengers to remain comfortable while the aircraft cruises at high altitudes. From the time a flight is commenced, the cabin altitude progressively climbs to a maximum of 8,000 ft. The difference between the cabin and outside pressures is maintained by varying the position of the outflow valve to control the amount of air exhausted from the cabin. The aircraft was also fitted with two positive pressure relief valves which open if the cabin differential pressure exceeds a preset limit. If the pressure difference is reduced in a sudden depressurisation event, the cabin altitude will rise (figure 1).

Figure 1: Aircraft altitude versus cabin altitude graph



During a depressurisation event, a warning horn in the cockpit will sound if the cabin altitude reaches 10,000 ft and oxygen masks will deploy if the cabin altitude reaches 14,000 ft. Since the masks provide only a limited supply of oxygen, flight crew are required to descend the aircraft to the lowest safe altitude or 10,000 ft. The difference in the cabin and outside pressures for the 737 during the occurrence is depicted below (figure 2).

Figure 2: Cabin and outside pressures during the depressurisation event



Positive pressure relief valve

The Boeing 737-7Q8 aircraft was fitted with two positive pressure relief valves that operate within preset values. The valves are located at the rear of the aircraft and are referred to as outboard and inboard positive pressure relief valves. The operator found that both valves were faulty and opened at a lower pressure than the minimum required of 8.75 PSI. The outboard valve opened at 8.40 to 8.45 PSI and the inboard valve at 8.55 to 8.60 PSI.

The operator advised that both valves were installed new on the aircraft and had accumulated 11,783 hours and 8,678 cycles respectively. They were last subjected to a maintenance check in September 2004.

There was no record of the aircraft experiencing pressurisation problems until the occurrence flight. The operator also advised that this was the first positive pressure relief valve problem on their fleet of 737 aircraft in the last 2 years.

The operator forwarded both valves to their manufacturer in the US for testing and examination. The tests confirmed that both valves were out of adjustment and operated at less pressure than required. The manufacturer confirmed that the amount of maladjustment would cause the cabin altitude to climb above 10,000 ft as experienced during the event. The manufacturer advised that both valve serial numbers were in the range of some other units manufactured in early 2002 that had experienced contaminations in their control mechanisms, causing a calibration shift. No contamination was found within the control mechanisms of either valve. The manufacturer could not confirm that contamination was the cause of the valve maladjustment or provide any other explanation for the calibration shift. The manufacturer advised that the contamination problem had been addressed and that no problems had been observed since that time.

Cabin crew action

When the depressurisation commenced, the cabin crew were involved in cleaning the cabin after a meal service and were all located in the rear galley. The cabin supervisor (CS) reported noticing that the oxygen masks located in the galley had dropped from their service units. She took her place in a crew seat, secured the mask and activated the flow of oxygen by pulling down on the mask.

The CS noticed that one crew member who had taken a seat in the rear galley with her had difficulty putting on the oxygen mask. She then noticed that the two other cabin crew members had made their way into the cabin and were making use of spare oxygen masks in the seat rows.

The CS noticed that approximately half of the passengers had not put their masks on. She reported that no announcement on the public address system regarding the situation was made. She contacted the flight crew to check on their condition and after ascertaining that they were dealing with the situation, she made a public address announcement to the passengers indicating that the aircraft had sustained a depressurisation and that the crew were conducting an emergency descent. She also indicated that all passengers should pull down on the mask nearest them, pull the lanyard to initiate the flow of oxygen and put the mask on. Following this announcement, the passengers who had previously not donned their oxygen masks were seen to do so.

After receiving advice from the copilot that the oxygen masks could be removed, the CS made an announcement to that effect. The CS noticed that one cabin crew member could not continue with their assigned duties. That crew member was placed in a cabin seat with a portable oxygen mask and bottle. An off-duty cabin attendant, who was a passenger on the flight, assisted the cabin crew with their duties.

Once the aircraft had landed, the CS was told that the reason the two cabin crew members had moved to the cabin was because they had rendered their oxygen masks inoperative during the attempt to activate them. The cabin crew reported that they were not prepared for the amount of force needed to be applied on the lanyard to activate the system and that they were not aware of the flow indicator. The CS also reported that the oxygen mask fitted to the aircraft was different from those that they regularly used during the pre-takeoff safety briefing. It was also reported that once the cabin staff were moving through the cabin to check on the welfare of the passengers, following the removal of the masks, they noticed a burning smell. They were later advised by the pilot in command that this was normal as the burning smell resulted from the activation of the oxygen generators.

The actions by the cabin crew were generally in accordance with the operator's procedures manual.

Research report

In July 2006, the ATSB published a report titled: 'Depressurisation Accidents and Incidents Involving Australian Civil Aircraft 1 January 1975 to 31 March 2006.' The report is available on the ATSB's web site www.atsb.gov.au or from the Bureau on request.

In general, the results of the study showed that there is a high chance of surviving a pressurisation system failure, provided that the failure is recognised and the corresponding emergency procedures are carried out expeditiously. Aircrew should maintain a high level of vigilance with respect to the potential hazards of cabin pressurisation system failure.

ANALYSIS

Flight crew response to events

The crew's response to the rising cabin altitude, to commence an emergency descent, was reasonable considering that the reason for the pressurisation system abnormality was not obvious. The pilot in command (PIC) considered that manually descending the aircraft would provide a quicker descent to a lower altitude. The aircraft descended to approximately FL395 and maintained that level for 50 seconds while the copilot contacted air traffic control (ATC) and requested an emergency descent to 10,000 ft. Once the clearance was obtained, the PIC continued the descent. A more appropriate response would have been for the copilot to advise ATC of the event by declaring a PAN and commencing descent immediately.

The delay in establishing effective intra cockpit communication, the likely incorrect selection of the communication channel on the audio panel, and the interruptions to actioning of checklist items were indications that the PIC was possibly overloaded. The manufacturer's comparison of the Boeing Company 737 profile from the occurrence and a simulator profile, demonstrated that the autopilot descent profile was about 10 seconds quicker in reaching lower levels than the actual descent flown by the PIC. The use of the autopilot for an emergency decent, as recommended by the manufacturer, would have provided a more rapid descent and would also have reduced the PIC's workload during the emergency.

The flight crew attempted to identify the cause of the depressurisation while the aircraft was descending to 10,000 ft. There were no indications to the crew in the cockpit of why the pressurisation system was not functioning correctly or why the cabin was repressurising during the descent. Despite these uncertainties and the aircraft being at approximately FL160, the PIC elected to reduce the rate of descent, extending the time before the aircraft reached the safe altitude of 10.000ft. At the same time, the copilot advised the cabin supervisor (CS) that the oxygen masks could be removed. As the cause of the problem was unknown, a more prudent action would have been to maintain the rate of descent and requirement to use oxygen masks until the aircraft was established at 10,000 ft.

The cabin crew response to events

The actions of the cabin crew were generally in accordance with those prescribed in their procedures manual. When one cabin crew member was unable to resume duties following the event, an off-duty cabin attendant travelling as a passenger on the flight, assumed that role. That ensured that a normal complement of cabin crew was available for the remainder of the flight.

The reports from some cabin crew of not being aware of the likelihood of a burning smell when the oxygen units were activated, the amount of force needed to activate the system, the differences in the aircraft's masks and those used during demonstration and the inability of some to determine whether the oxygen was flowing were indicators of possible deficiencies in cabin crew training.

Operator oversight of operations

The crew had been trained to operate the aircraft in accordance with the operator's Operations Manual Part D1. The manual emphasised the importance of crew resource management (CRM) skills in the handling of non-normal situations and of operating according to standard operating procedures (SOPs). The effectiveness of the training provided by the operator should be able to be assessed during the recurrent simulator program and by reviewing crew actions after a non-normal event occurs during line operations. However, the application of the training was inconsistently applied during the incident and was possibly an indicator of deficiencies in the operator's oversight of standards on line operations.

Passenger awareness and reaction

This occurrence highlights the need for all passengers, regardless of how familiar they are with air travel, or how often they travel, to be attentive during the pre-takeoff safety briefing. For over half of the passengers to be prompted to put their masks on following the depressurisation, indicated that they may have been unprepared to deal with the emergency. A pre-takeoff safety briefing was mandated and served to prepare passengers for situations such as the one experienced in this occurrence.

Pressure relief valves

The examination of the positive pressure relief valves was unable to identify any reason for the maladjustment that allowed the valves to operate at less than the required pressure.

SAFETY ACTION

Operator safety action

As a result of this occurrence, the aircraft operator has:

- Issued a Flight Standards Feedback newsletter describing the incident and the actions of the crew.
- Revised Day 1 of the Recurrent Training Program 4 to include a loss of pressurisation event with emphasis on PAN calls, transponder codes, public address to the cabin and use of crew oxygen masks.
- Included discussion of the event in the emergency procedures revalidation program.

The operator also advised that they would:

- Audit the check and training personnel to ensure consistency of instruction.
- Change the Cabin – Safety Equipment and Procedures Manual Volume B3 to include the following information:
    - The differences between the actual oxygen mask that will be deployed during a depressurisation event and that used for the pre-takeoff safety briefing. To have both masks present during training to highlight the differences was also planned.
    - That after the activation, the flow of the oxygen may not be felt through the system. The activation of the system was indicated by the green flow indicator.
    - That it was normal for the activated oxygen generators to produce heat and fumes.
- Publish information on the changes to the cabin crew manual in the company safety newsletter.
- Advised that it will use this occurrence as the basis of a training exercise for cabin crew and that training staff were preparing exercises.

APPENDIX A

Cabin Altitude Warning or Rapid Depressurisation checklist

0.6

737 Operations Manual

CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION

Condition: **One or more of the following conditions:**

- The cabin altitude warning horn sounds
- There is a rapid loss of cabin pressure with airplane altitude above 14,000 feet.

OXYGEN MASKS AND REGULATORS . . . . ON, 100%

CREW COMMUNICATIONS . . . . ESTABLISH

PRESSURIZATION MODE SELECTOR . . . . MAN

OUTFLOW VALVE SWITCH . . . . CLOSE

If pressurization is restored, continue manual operation to maintain proper cabin altitude.

PASSENGER SIGNS . . . . .ON

If cabin altitude is uncontrollable:

PASSENGER OXYGEN SWITCH .ON

Activate passenger oxygen if cabin altitude exceeds or is expected to exceed 14,000 feet.

EMERGENCY DESCENT . . . . INITIATE

Accomplish the EMERGENCY DESCENT checklist if the airplane is above 14,000 feet MSL and control of cabin pressure is not possible, or cabin pressure is lost.

■ ■ ■ ■

CONFIGURATION WARNING

Condition: **An intermittent warning horn sounds when advancing thrust levers to takeoff, or a steady warning horn sounds inflight.**

Assure proper airplane configuration.

■ ■ ■ ■

0.6 D6-27370-7Q8 March 28, 2005

Emergency Descent Checklist

EMERGENCY DESCENT

Condition: **Unable to control cabin pressure with airplane above 14,000 feet MSL or conditions require a rapid descent.**

EMERGENCY DESCENT .... ANNOUNCE

The captain will advise the cabin crew, on the PA system, of impending rapid descent. The first officer will advise ATC and obtain the area altimeter setting.

ENGINE START SWITCHES.......................... ON

THRUST LEVERS .... CLOSE

Reduce thrust to minimum or as needed for anti-ice.

SPEED BRAKE .... FLIGHT DETENT

DESCENT .... INITIATE

TARGET SPEED .... Mmo/Vmo

If structural integrity is in doubt, limit speed as much as possible and avoid high maneuvering loads.

LEVEL-OFF ALTITUDE.......... LOWEST SAFE ALTITUDE OR 10,000 FT, whichever is higher

711 - 718, 720 - 724

CAUTION: When gross weight is greater than 64,864 kgs., speed brake will autostow to the 50% flight detent if airspeed exceeds 320 knots. Do not override autostow function unless airspeed is less than 320 knots.

SPEED BRAKE .... DOWN DETENT

Smoothly lower the SPEED BRAKE lever and level off. Add thrust and stabilize on altitude at desired airspeed.

CREW OXYGEN REGULATORS .... NORMAL

Flight crew must use oxygen when cabin altitude is above 10,000 feet. To conserve oxygen, position the regulator to NORMAL.

Continued on next page

APPENDIX B

Manufacturer simulator comparisons