

**Aviation Safety Investigation Report
199401875**

**Boeing Co
B737
Boeing Co
B737**

14 July 1994

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NOTE: All air safety occurrences reported to the ATSB are categorised and recorded. For a detailed explanation on Category definitions please refer to the ATSB website at www.atsb.gov.au.

The Bureau did not conduct an on scene investigation of this occurrence. The information presented below was obtained from information supplied to the Bureau.

Occurrence Number:	199401875	Occurrence Type:	Incident
Location:	Cullerin (65km N Canberra)		
State:	NSW	Inv Category:	3
Date:	Thursday 14 July 1994		
Time:	1620 hours	Time Zone	EST
Highest Injury Level:	None		
Aircraft Manufacturer:	Boeing Co		
Aircraft Model:	737-377		
Aircraft Registration:	VH-CZK	Serial Number:	23663
Type of Operation:	Air Transport Domestic High Capacity Passenger Scheduled		
Damage to Aircraft:	Nil		
Departure Point:	Melbourne VIC		
Departure Time:	1544 EST		
Destination:	Sydney NSW		
Aircraft Manufacturer:	Boeing Co		
Aircraft Model:	737-376		
Aircraft Registration:	VH-TAZ	Serial Number:	23491
Type of Operation:	Air Transport Domestic High Capacity Passenger Scheduled		
Damage to Aircraft:	Nil		
Departure Point:	Melbourne VIC		
Departure Time:	1546 EST		
Destination:	Sydney NSW		

Approved for Release: Tuesday, April 23, 1996

FACTUAL DATA

VH-CZK and VH-TAZ were both enroute from Melbourne to Sydney on the same track. CZK departed Melbourne at 0544 UTC and was cruising at flight level(FL)330. TAZ departed Melbourne at 0546 and was cruising at FL350. Both aircraft transferred from Melbourne Sector 2 to Melbourne Sector 7 at 0613. CZK was instructed to hold at Cullerin and was cleared to descend when ready to FL240 with a requirement to be at FL240 by Cullerin. TAZ was also instructed to hold at Cullerin and cleared to descend when ready to FL250 with a requirement to be at FL250 by Cullerin. At this time the two aircraft were separated by 18 NM with a closing speed of 20 kts. Both aircraft had previously been issued with standard arrival route (STAR) clearances for Sydney when they transferred from Departures Control to Sector 2.

At 0614 CZK reported leaving FL330 on descent and at 0617 TAZ reported leaving FL350 on descent. At 0617 the distance between the two aircraft had closed to 7 NM and the closing speed had increased to 125 kts. At 0618 the aircraft were 4 NM apart with a closing speed of 160 knots and approximately 4,000 ft vertical separation.

At 0618.44 CZK was instructed to cancel holding at Cullerin, resume the Rivet one STAR, hold at 70 NM Sydney and descend to FL220. At 0619.06 CZK was instructed to reach FL220 by 70 NM Sydney. The first requirement to reach FL240 by Cullerin was not cancelled. By this time the two aircraft were 2 NM apart with a closing speed of 182 kts and 2,800 ft of vertical separation.

At 0619.30 when the radar blips for the two aircraft merged the vertical separation was 2,300 ft, and when the blips parted as TAZ overtook CZK, vertical separation was 1,600 to 1,800 ft. When TAZ was 2 NM ahead of CZK both aircraft were at FL256 just short of Cullerin. CZK was at FL248 at Cullerin instead of FL240 as instructed.

At 0620.28 the controller noticed for the first time the minimal longitudinal and vertical separation between the two aircraft and instructed TAZ to maintain FL260. TAZ did not respond so the instruction was repeated at 0620.40. Again there was no response and the instruction was repeated at 0620.47. By the time TAZ responded it had descended below FL260. The controller then asked CZK "do you have the traffic sighted in your twelve o'clock at five miles". At this time TAZ was estimated to have been only 2 to 3 NM in front of CZK.

The high closing speed that developed between the aircraft resulted from CZK slowing down in preparation for entering the holding pattern. CZK did not notify the controller of a variation to standard descent profile as required by AIP/OPS CTL 9 and the controller did not notice the speed differential developing between the aircraft.

When the holding requirement for CZK at Cullerin was cancelled and the new holding instruction to be at FL220 by 70 NM Sydney was issued, the crew of CZK believed the Cullerin descent requirement was no longer current. The controller did not restate, nor was he required to restate, that the first descent requirement was still current. CZK did not reach FL240 by Cullerin.

Neither aircraft were fitted with a traffic alert and collision avoidance system (TCAS).

ANALYSIS

When the aircraft transferred to Sector 7 they were separated by 18 NM with a closing speed of 20 kts. As both aircraft were to hold at Cullerin they were issued with descent clearances and descent requirements which were intended to establish vertical separation before turning outbound in the holding pattern. With 18 NM separation, about 60 NM to run to Cullerin and a closing speed of 20 kts, the controller would normally be confident that the aircraft could maintain sufficient longitudinal separation into the holding pattern. The controller apparently assessed this to be the case and discounted the need to pay further attention to the closing speed.

The crew of CZK did not advise the controller that the descent speed had been reduced from standard profile in preparation to enter the holding pattern. When crews wish to vary descent from standard profile by more than 10 kts or M.025, they are required to advise air traffic control in accordance with AIP/OPS CTL-9, para 20.1.

When the holding requirement for CZK at Cullerin was cancelled and new holding and descent requirements were issued, the initial requirement to be at FL240 by Cullerin was not cancelled. The crew mentally discounted the original Cullerin descent requirement when the new holding and descent requirements were issued. In such circumstances it is understandable how crews could make such an assumption simply on the basis that the descent requirement was associated with the holding requirement which was cancelled. With hindsight, it would have been prudent for the controller to have stated that the Cullerin descent requirement was still current. It may also have been prudent for the crew of CZK to clarify the matter.

When the controller finally noticed the ensuing separation problem with the two aircraft, he instructed TAZ to maintain FL260. TAZ did not respond until the instruction had been issued three times by which time it was too late to prevent loss of separation between TAZ and CZK.

Neither of these aircraft was fitted with TCAS. Had TAZ been so fitted, the crew may have received a resolution advisory as they approached CZK.

This occurrence also involves situational awareness considerations. Both crews were monitoring the same radio frequency and both should have heard transmissions to/from each other's aircraft. They were under radar control and should have been able to rely on the controller for separation advice. When the crew of CZK varied their descent profile without advising the controller, the potential arose for a reduction in longitudinal separation. Failure to comply with the Cullerin descent requirement then led to a breakdown of separation. The crew of TAZ were not aware of either of these aspects and therefore had no cues pointing to an impending problem.

CONCLUSION

Significant factors

The following factors were considered relevant to the development of the incident.

1. The controller did not believe that longitudinal separation would be a problem. Consequently he did not adequately monitor the progress of CZK and TAZ.
2. The crew of CZK did not advise the controller that they were descending at a speed well below the standard profile speed.

3. The crew of CZK incorrectly assumed that the Cullerin descent requirement was cancelled when they were issued with new holding and descent requirement instructions.
4. The status of the Cullerin descent requirement was not queried or clarified by the crew of CZK or the air traffic controller.
5. Neither aircraft was fitted with TCAS.
6. The crew of CZK did not maintain adequate situational awareness.
7. The crew of TAZ did not respond to a control instruction to limit their descent to FL260 until it was too late to prevent the loss of separation.

SAFETY ACTION

As a result of the investigation the Bureau of Air Safety Investigation issued an interim recommendation IR 950088 to the Civil Aviation Authority on 21 June 1995. It stated:

The Bureau of Air Safety Investigation recommends that the Civil Aviation Authority revise ATS phraseologies and procedures so that whenever a new requirement is issued, the status of the previous requirements is clarified.

The Civil Aviation Safety Authority response was received on 15 August 1995. It stated:

Reference IR950088

This recommendation relates to the application of subsequent altitude requirements and proposes that ATS phraseologies and procedures be modified to ensure that whenever a new requirement is issued the status of the previous requirement is clarified.

ATS agrees with this recommendation and proposes the inclusion of the following text into MATS/AIP documentation at the next opportunity:

xx.1 Except as stated in xx.2, whenever a level restriction or requirement has been imposed, and subsequently a further level/restriction is imposed, the subsequent instruction will cancel all previous restriction/requirement(s), unless:

- a. all restrictions/requirements are re-stated; or
- b. the subsequent instruction is prefixed "FURTHER REQUIREMENT";

xx.2 If a STAR or SID has been issued, the level of tracking restrictions will always remain in effect unless:

- a. the aircraft has been vectored away from the SID or STAR after commencement; or
- b. ATC advises "CANCEL STAR/SID"

MATS ONLY

NOTE Controllers should be aware that where level requirements are imposed through a letter of agreement with an adjacent sector, issuance of new requirements may invalidate previous requirements unless the procedures xx.1 and xx.2 are adhered.

The Bureau has classified this response as CLOSED/ACCEPTED.