Aviation Safety Investigation Report 199500461

Boeing Co
B737

21 February 1995

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Aviation Safety Investigation Report

199500461

Occurrence Number:	199500461	**Occurrence Type:**	Incident
Location:	37km WSW Canberra		
State:	ACT	**Inv Category:**	4
Date:	Tuesday 21 February 1995		
Time:	0720 hours	**Time Zone**	ESuT
Highest Injury Level:	None		

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:	0647 ESuT		
Destination:	Canberra ACT		

Approved for Release: Thursday, November 28, 1996

FACTUAL INFORMATION

History of the flight

The aircraft had been cleared to descend to 5,000 ft visual. Canberra Approach asked the pilot to maintain maximum speed for traffic sequencing. The pilot agreed to maintain approximately 315 Kt.

At a radar distance of 23 NM from Canberra, as the aircraft was passing approximately 6,000 ft, the crew received a Ground Proximity Warning System (GPWS) "TERRAIN, TERRAIN" warning. This was followed immediately by a GPWS "PULL UP" warning which remained active for about four seconds. The pilot immediately initiated a climb but the TERRAIN warning persisted for a further 10 seconds during which time the aircraft climbed 300 ft.

At this time, Canberra Approach observed the Secondary Surveillance Radar (SSR) Mode C readout climb from 5,800 ft to 6,000 ft and asked the crew to confirm that the aircraft was climbing. The pilot confirmed this and reported that the crew had received a GPWS warning. The approach controller asked the crew to report their flight conditions and the pilot replied "visual on top". The approach controller then issued instructed the crew to keep the aircraft within the radar terrain clearance chart parameters until they could see the ground.

The aircraft landed without further incident.

Crew

In later discussion, the pilot in command stated that he was attempting to comply with the request from Canberra Approach to maintain a maximum speed descent. He believed that the aircraft would pass the 20 NM range circle indicated by the aircrafts Distance Measuring Equipment (DME), above 6,000 ft which was the lower limit of controlled airspace at that distance. He though that it had done so as the aircrafts DME indicated 17 NM from Canberra when GPWS warning was received. The first officer, who was the handling pilot during the incident, stated that he checked the DME reading when the warning was received. At 17 DME, the lower limit of controlled airspace was 5,000 ft.

Flight data recorder information

The flight data recorder (FDR) data confirmed that the aircraft was descending through 6,000 ft when the GPWS activated. FDR data also confirmed the GPWS warnings and the 300 ft climb.

Recorded values of latitude and longitude revealed that the GPWS warnings were activated as the aircraft overflew Bulls Head, spot height 4,482 ft, approximately 20 NM on the 240 degree radial from Canberra VOR. The data confirmed that a valid Mode 2A Excessive Terrain Closure GPWS warning had occurred and the crew had taken the appropriate actions to remove the aircraft from the GPWS activation envelope.

The FDR data showed the aircraft on descent at an airspeed of approximately 315 Kt on a heading of 078 degrees magnetic when the GPWS warning occurred. Recorded radar altimeter data indicated showed rates of closure with terrain in excess of 9,000 feet per minute (fpm). The radar altitude reduced from 2,658 to 2,044 ft in a three-second period.

ANALYSIS

GPWS parameters

The GPWS will give a Mode 2A warning if the aircraft is flying with less than 25 degrees of flap and there is an excessive rate of closure with rising terrain. If the airspeed exceeds 250 kts, the upper boundary of the radio altitude envelope is 2,450 ft with a rate of closure of 5,105 fpm and the lower boundary is 50 ft with a rate of closure of 2,063 fpm for a "TERRAIN, TERRAIN" warning. Within this envelope is the envelope triggering the "WHOOP WHOOP PULL UP..." warning.

The combination of the aircrafts rate of descent and the rising terrain on the western side of the Bulls Head resulted in a rate of closure in excess of 9,000 fpm and a radar altitude of 2,044 ft which was within the GPWS inner operating envelope.

Pilots intentions and results

The pilots intentions were to maintain the maximum speed during descent and to pass the 20 DME range circle just above 6,000 ft, continuing descent to 5,000 ft when inside the 20 DME circle. Both radar and FDR data revealed that the aircraft descended below 6,000 ft beyond the 20 DME circle and thus operated outside controlled airspace (OCTA) for a short time.

An aircraft operating at an altitude which is the published lower limit of controlled airspace is operating OCTA. Another aircraft, about which the air traffic services held no information, could have been operating OCTA at the altitude reached by the B737.

As both pilots reported that the aircrafts DME indicated 17 NM from Canberra when the GPWS warning was received, the DME equipment may have been faulty.

SIGNIFICANT FACTORS

1. While the pilot was attempting to maintain a maximum speed descent for air traffic control sequencing purposes, the aircraft descended below the lower limit of controlled airspace.

2. The combination of the aircrafts rate of descent and rising terrain placed the aircraft within the GPWS warning envelope.