



GOVERNMENT OF AUSTRALIA

DEPARTMENT OF TRANSPORT

AIRCRAFT ACCIDENT INVESTIGATION SUMMARY REPORT

Publication of this report is authorised by the Secretary under the provisions of Air Navigation Regulations 283 (1)

Reference No

AS/745/1034

1. LOCATION OF OCCURRENCE

Near Caiguna, Western Australia	Height a.m.s.l. 35,000 feet	Date 14.10.74	Time (Local) 1400 hours	Zone WST
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2. THE AIRCRAFT

Make and Model Boeing 727/76	Registration VH-TJB
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3. RELEVANT EVENTS

3.1 At 1400 hours WST on 14 October, 1974 Boeing 727/76 aircraft registered VH-TJB, encountered severe turbulence during cruise at flight level 350 near Caiguna, Western Australia. Two of the fifty-one passengers were seriously injured, eighteen passengers and two flight hostesses sustained minor injury and there was damage to cabin fittings and furnishings.

3.2 The aircraft was owned and operated by Trans-Australia Airlines and, at the time of the accident, was engaged on a regular public transport service from Perth, Western Australia, to Adelaide, South Australia.

3.3 The flight was under the command of Captain Gordon Walter Savage, aged 57 years, who was the holder of a first class airline transport pilot licence endorsed for the aircraft type. His total flying experience was some 23,000 hours and he had flown 400 hours in Boeing 727 type aircraft including 150 hours in the previous days. The first officer, Ian George Haigh, and the flight engineer, David Charles Mann, held appropriate licences endorsed for the aircraft type.

3.4 The cabin crew consisted of five flight hostesses and one supernumerary flight hostess.

3.5 The Certificate of Airworthiness for the aircraft was valid and there was no reported unserviceability in the aircraft or its equipment.

3.6 The centre of gravity and the gross weight of the aircraft were within safe limits.

3.7 At the time of the accident there were cumulo-nimbus clouds in the Caiguna area with tops reaching 36,000 feet. These were aligned north-west to south-east in a deepening trough system with a centre of lowest pressure in the vicinity of Caiguna. An approaching cold front was located to the south-west and there was a strengthening sub-tropical jet stream aligned from west to east with its core at 36,000 to 38,000 feet, above the tropopause, height 34,000 feet. Vertical wind shear associated with the strengthening westerly air stream was also increasing.

3.8 Prior to his departure from Perth, the pilot was provided with a route forecast which predicted occasional cumulo-nimbus clouds in the Caiguna area with tops reaching flight level 330. The wind velocity shown in the forecast for flight level 340 was 280°/115 knots. In accordance with the then current procedures this was the highest level for which a wind velocity was shown. The velocities for the upper levels indicated the presence of vertical wind shear of the order of nine knots per thousand feet. The height of the tropopause was not shown, as is the normal practice in the absence of a specific request for this information. Although there were grounds for indicating in the forecast the possibility of Clear Air Turbulence (CAT) this was not done as the forecaster considered CAT would be moderate in intensity and severe turbulence associated with the cumulo-nimbus to be a more probable phenomenon. However, due to an error at the Perth Airport Weather Service Office in transcribing data provided by the Regional Forecasting Centre to the tabulated route forecast form, reference to turbulence associated with the cumulo-nimbus was inadvertently omitted although this was included on the same form for the adjacent route section Perth to Melbourne. As the forecast did predict that there would be cumulo-nimbus clouds, however, the pilot would be aware of the possibility of severe turbulence from this source.

3.9 The aircraft departed from Perth at 1305 hours WST. The early part of the flight was conducted in smooth air conditions at flight level 350, about 1,000 feet above an almost continuous layer of stratus cloud. The pilot did not make an announcement to the passengers recommending that seat belts be left fastened when not moving around the cabin, although the Operator suggests that pilots make this announcement as a matter of routine at the transition height during the climb. Between Norseman and Caiguna it was necessary to make two minor diversions from track to avoid isolated cumulo-nimbus tops which extended above the aircraft's level. These were sighted visually and also showed clearly on the weather radar. Flight conditions continued to be smooth. The wind velocity was found to be 280°/120 knots, substantially as forecast.

DEFINITIONS

ACCIDENT - An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all those persons have disembarked and in which

- (a) any person suffers death or serious injury as a result of being in or upon the aircraft or by direct contact with the aircraft or anything attached to the aircraft; or
- (b) the aircraft suffers substantial damage.

FATAL INJURY - Any injury which results in death within 30 days.

SERIOUS INJURY - Any injury other than a fatal injury which

- (a) requires hospitalisation for more than 48 hours, commencing within seven days from the date the injury was received; or
- (b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
- (c) involves lacerations which cause severe haemorrhages, nerve, muscle or tendon damage; or
- (d) involves injury to any internal organ; or
- (e) involves second or third degree burns, or any burns affecting more than five percent of the body surface.

MINOR INJURY - Any injury other than as defined under "Fatal Injury" or "Serious Injury".

DESTROYED - Consumed by fire, demolished or damaged beyond repair.

SUBSTANTIAL DAMAGE - Damage or structural failure which adversely affects the structural strength, performance or flight characteristics of the aircraft and which would normally require major repair or replacement of the affected component. The following types of damage are specifically excluded: engine failure, damage limited to an engine, bent fairings or cowling, dented skin, small punctured holes in the skin or fabric, taxi-ing damage to propeller blades, damage to tyres, engine accessories, brakes, or wingtips.

MINOR DAMAGE - Damage other than as defined under "Destroyed" or "Substantial Damage".

3.10 On one occasion during this part of the flight the aircraft accelerated in clear air and the pilot reduced power for a short period to resume the normal cruise Mach number of M.82. The surge in speed was not associated with a cumulo-nimbus build-up and the pilot attributed the behaviour of the aircraft to an up-draft.

3.11 As the flight approached Caiguna the pilot noticed a radar echo which indicated a cloud build-up lying across the aircraft's track some 70 miles ahead. The cumulo-nimbus cloud producing the echo was sighted visually and appeared larger than those seen earlier. The top of the cloud reached about 36,000 feet and, in common with those seen earlier, showed no sign of anvil development. The pilot diverted to the north of track with the intention of clearing the build-up by a distance of five miles, remaining clear of all cloud.

3.12 At a distance of about 20 miles the pilot became aware that the aircraft would enter thin stratus in the vicinity of the cumulo-nimbus build-up. This stratus extended to a height of approximately 36,000 feet. After carefully considering the appearance of the stratus the pilot assessed it as non-turbulent and continued on the same heading. He did not activate the seat belt sign.

3.13 At 1358 hours the aircraft again began to accelerate in clear air. The acceleration continued for approximately two minutes and the Mach number increased from M.82 to M.88. Throughout this period the automatic pilot was engaged in altitude hold mode and the altitude of the aircraft remained substantially constant. It is likely that the automatic pilot trimmed forward as the aircraft accelerated but no stabiliser trim movement was noticed by the pilot. He did not reduce power.

3.14 At 1400 hours, as the aircraft entered the stratus, slight turbulence was encountered and the pilot activated the seat belt sign. Almost immediately the turbulence became severe. The pilot disconnected the automatic pilot and, in the belief that the turbulence was associated with the cumulo-nimbus, turned the aircraft through 45 degrees to port. Several times during the turn the angle of bank increased to almost 90 degrees but this was the only control difficulty, during the turbulence, reported by the pilot.

3.15 The aircraft passed in and out of cloud several times but at no time was there a usable visual horizon. The pilot controlled the aircraft by reference to the flight instruments, attempting to maintain a reasonably constant pitch attitude and ignoring the inappropriate indications of the flight director system which he did not have the opportunity of re-setting. The severe turbulence continued for a period of approximately two minutes. During this time the aircraft lost 4,500 feet in altitude at a substantially constant rate of descent which suggests that the pitch attitude datum used by the pilot was nose low. The aircraft's speed varied widely with two peaks in excess of M.90 and a minimum of M.74. The pilot did not alter the power setting but, coincident with the speed peaks, the first officer twice deployed the speed brakes to reduce speed and silence the Mach/airspeed warning. This action was taken at the first officer's suggestion with the pilot's approval.

3.16 The maximum vertical acceleration excursions recorded by the Flight Data Recorder were +1.59 g and -2.86 g about the 1.0 g datum, giving maximum load factors of +2.59 and -1.86. The maximum negative load factor recorded was indicative of a vertical gust velocity at about 100 feet per second. Although the aircraft was subject to these very high loads, a subsequent inspection revealed no basic airframe damage or distortion.

3.17 Few of the passengers noticed the seat belt sign at the onset of the turbulence and only one passenger is known to have been able to fasten his belt as a result of noticing the sign. Passengers whose belts were not fastened were thrown about violently in the cabin, in some cases striking the cabin ceiling and overhead fittings as well as seats and broken glassware from meal-trays. These included the two passengers who sustained serious injury. Three passengers whose seat belts had been kept fastened as a precaution were thrown against their belts with sufficient force to cause bruising and one was also struck by a passenger whose belt was not fastened.

3.18 The five flight hostesses were not seated at the onset of the turbulence. All five were alerted by the turbulence itself rather than by the seat belt sign and were able to sit in nearby seats and fasten their belts but not before two had sustained minor injury. The supernumerary flight hostess was seated with her belt fastened and was not injured.

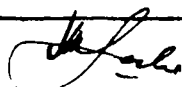
3.19 One of the passengers who sustained minor injury was seated in the left rear group of three seats with his seat belt fastened. He was the only occupant of this seat group which is normally removed for flights to Port Moresby to permit the installation of additional galley equipment. This seat unit became detached from its mounting rails and struck in turn the cabin ceiling and the floor. No defect was found in the seat mounting fittings or the mounting rails and it is apparent that the unit had not been correctly re-installed after a flight to Port Moresby on 11 October, 1974.

3.20 When the turbulence moderated the pilot re-engaged the automatic pilot in the pitch hold mode and at 1406 hours requested and received a clearance to flight level 370. The further flight to Adelaide, initially at flight level 370 above a layer of thin stratus and later at flight level 310, was completed without incident.

3.21 During the remainder of the flight the cabin crew rendered competent first aid to the injured, eleven of whom required no further treatment. On arrival at Adelaide airport at 1528 WST (1658 CST) eleven injured passengers and crew members were taken to hospital for further treatment. All but one passenger were released on the same day.

3.22 An analysis of the weather situation indicated that the aircraft had probably encountered wave-induced turbulence associated with the jet stream (CAT) although the possibility that the turbulence was associated with the cumulo-nimbus cannot be completely ruled out. The provision to the pilot of better information on the significance of the wind shear conditions may have alerted him to the need for additional precautionary measures to be taken.

Approved for
publication



(I. M. Leslie)
Delegate of the Secretary

Date

14.1.1976