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CORRESPONDENCE

A Case of Severe Turbulence

by R.McDonell

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I was involved in an unusual meteorological condition on a flight in a Vickers Viscount from Adelaide to Sydney on the afternoon of 3 January 1960.

On the morning flight from Sydney to Adelaide the conditions were broken cumulus base about 12,000 ft, with slight turbulence below the cloud on descent into Adelaide and smooth conditions above the cloud. From Hay to Adelaide surface temperatures were very high. Some large cumulus was observed in the distance south of the track.

For the return flight with an all-up weight of 59,000 lb and ISA + 15°C we planned to reach a cruising height of 19,000 ft about 150 miles out of Adelaide where the forecast indicated Cu and Cb which could be dodged at 19,000 to 20,000 ft.

We departed Adelaide at 6.30 pm local time and 90 miles out were climbing at 16,500 ft through broken Cu base 15,000 ft when seat belts were fastened as isolated heavy Cu were observed ahead. No turbulence had been experienced above 5,000 ft prior to this.

Without warning and clear of cloud we struck severe turbulence which took us up an estimated 2,000 ft with an increase in air speed from 155 to 185 knots. During this ascent we passed into Cu cloud when we were subjected to a downdraft of extreme violence causing loss of control.

The minutes which followed were incredible. The aircraft tumbled nose down into an outside loop of considerable violence. Considerable negative "g" resulted as might be expected in the circumstances. The interior fittings of the aircraft, galley appointments, etc. were smashed to pieces and, for some 8 seconds, I observed an oxygen bottle from under my seat floating in front of my eyes.

During this dive we were in and out of cloud and the air speed remained at 200 knots while thousands of feet were lost. The aircraft would not respond to maximum travel of the control column in any

direction and I opened the power to maximum without any change of response. We eventually got the aircraft under control about 8,000 ft, after being subjected to this incredible battering for about 4 minutes.

We continued on to Sydney at 7,000 ft with a reduced air speed encountering some thunderstorms after passing Mildura. These were like mill ponds compared with what we had been through.

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(Comment. At 6 pm 3 January 1960 a MSL low pressure area with an axis orientated northwest/southeast was situated between Oodnadatta and Mildura. The 500 mb chart at 9 am on the same day showed a ridge with moderate anticyclonic curvature between Adelaide and Sydney with a jet stream just south of Victoria — a situation favourable for cyclogenesis northwest of the jet axis.

Sferics were reported in the afternoon around the M.S.L. low pressure area and variable rains, mainly from half to three-quarters of an inch, were reported in northwest Victoria and southwest New South Wales in the 24 hours to 9 am 4 January. A fall of 202 points was recorded at Swan Hill.

At 8.30 am at Adelaide on 3 January the following upper air temperatures and winds were observed -

	Temp.	Wind
400 mb	-21.1°C	300° 51 kt
448 mb	-15.4	—
500 mb	-10.8	320° 46 kt
600 mb	-0.7	310° 13 kt

There is a comparatively stable layer between 500 and 448 mb with a much smaller change in potential temperature with height above and below this layer. The average wind shear between 600 and 500 mb is about 8 knots per 1000 ft with only small wind shears above and below.

The Adelaide upper air conditions between 600 mb and 500 mb are probably fairly similar to conditions prevailing at the time of the incident. There the Richardson number for the layer 600 to 500 mb is 0.69.

Various investigations have indicated that turbulence in clear air is associated with low Richardson numbers. Here it is probable that over a shallower layer, the vertical wind shear would be greater and the Richardson number smaller than the values for the 600-500 mb layer.

However, although it is possible that the turbulence was a "clear air" type, it seems more likely that it was associated with the thunderstorm activity in the area.

Ed. A.M.M.)