

TURBULENCE REPORTED BY LOW FLYING AIRCRAFT

1. The occurrences of clear air turbulence at jet levels have been studied by some authors elsewhere. Clear air turbulence at lower levels, though less intense, do contribute to uncomfortable flights and hence has to be forecast as best as possible. An attempt has been made here to study some instances of turbulence collected from debriefing reports received at Nagpur Airport during the period 1960 to 1963. These were reported by the pilots of the four night air mail services operating through Nagpur (Palam-Nagpur, Bombay-Nagpur, Calcutta-Nagpur and Madras-Nagpur). All the available details regarding each case of turbulence have been given, though one wishes that the pilots had provided some more details like exact location and time of occurrence.

The turbulence reports can be broadly categorised as (A) those associated with convective clouds or thunderstorm activity and (B) Clear air turbulence. The latter can be sub-divided into those associated with (i) wind discontinuity, (ii) trough line and (iii) other causes like orographic or thermal effects. Statistics of turbulence reports received at Nagpur Airport during 1960-1963 are given in Tables 1 and 2.

TABLE 1

Type associated with	No. of cases
Convective clouds	54
Wind discontinuity	11
Trough line	4
Other causes	2
Total	71

TABLE 2

Type associated with	No. of cases	Percentage
Wind discontinuity	11	65
Trough line	4	24
Other causes (orographic or thermal effects)	2	11
Total	17	100

The forecaster normally indicates in the flight forecast, occurrence of turbulence (Category A) whenever the aircraft is expected to fly through or near the area of convective clouds. Clear air

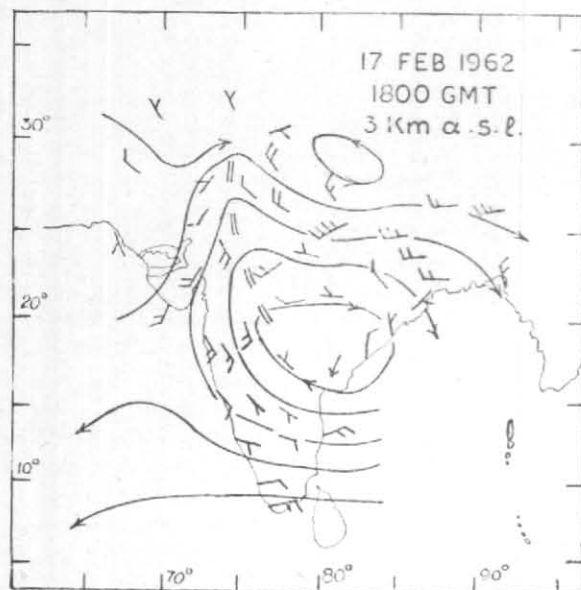


Fig. 1

turbulence due to orographic or thermal effects (Category B *iii*) is rather difficult to anticipate. But clear air turbulence associated with wind discontinuity (B *i*) or trough line (B *ii*) can be forecast from the upper air chart, as discussed below. One diagram for each of these two types is furnished. The 1800 GMT upper air observations plotted in the diagrams pertain to the level nearest to the flight level of the aircraft.

2. *Clear air turbulence associated with wind discontinuity*—The de-briefing report pertains to the flight Bombay-Nagpur on the night of 17 February 1962 (F/L 9000 ft; Dep. Bombay 2225 IST of 17 February 1962; Arr. Nagpur 0100 IST of 18 February 1962). The Captain reported moderate turbulence between Akola and Nagpur. The relevant upper air chart at 10,000 ft is shown in Fig. 1.

It may be seen from Fig. 1 that a marked wind discontinuity (indicated by broken lines) existed in the area where the turbulence was reported. The upper winds to the west of this line were southerly, while to the east were westerlies. It may also be seen that the wind shift was more marked near the place of turbulence. Two more cases of clear air turbulence associated with wind discontinuity were reported on the night of 23 May 1962 when such a type of turbulence was experienced between Hyderabad and Godavari river by

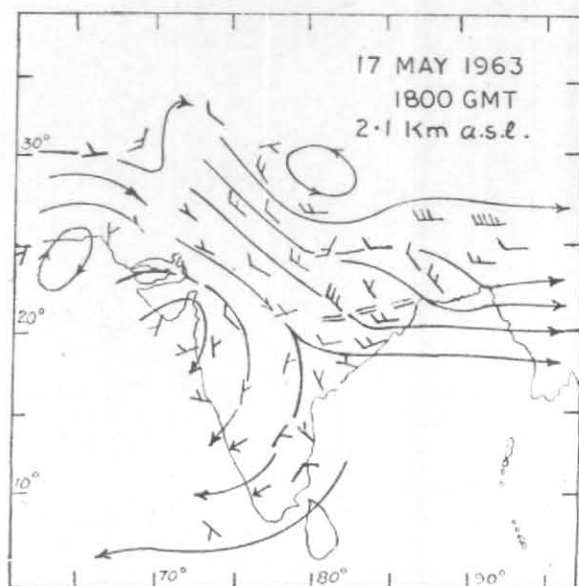


Fig. 2

the pilot of the Madras-Nagpur flight (F/L 7500 ft) and the other on the night of 28 April 1963 near Pachamarhi by the pilot of Palam-Nagpur flight (F/L 7500 ft).

3. *Turbulence associated with trough line*—On the night of 17 May 1963 the aircraft from Calcutta to Nagpur reported clear air turbulence (F/L 8000 ft, Dep. Calcutta 2135 IST of 17 May 1963, Arr. Nagpur 0115 IST of 18 May 1963). The corresponding upper air chart at 7000 ft is given in Fig. 2.

It is seen from Fig. 2 that there was a sharp trough line passing through the turbulence area. Another instance of this kind was on the night of 9 March 1963 when the aircraft from Palam to Nagpur (F/L 7500 ft) reported strong winds and turbulence upto Gwalior. Here also the turbulence occurred in the region of the trough line.

4. The study shows that whenever upper air observations, near the flying level indicate a region of wind discontinuity or trough line, clear air turbulence of that region can be forecast with reasonable certainty.

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