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A CLIMATOLOGICAL STUDY OF VISIBILITY AND RUNWAY VISUAL RANGE OVER IGI AIRPORT NEW DELHI

1. Visibility plays an important role in aviation meteorology. The poor visibility condition not only prevents the aircraft operations such as landing or taking off during the period but also has indirect effects like monetary loss and delay in further scheduling of air flights. In this paper a statistical study of poor visibility (for the period 1973-85) and runway visual range (RVR) (for the period 1973-92) during the months of November, December, January and February when aircraft operations due to visibility factor are affected at its most, have been made.

2. From the current weather registers of meteorological office at Palam for these periods the cases of poor visibility and RVR have been extracted and tabulated in the form of convenient tables which are discussed in the following paragraphs.

3. Table 1 shows the mean monthly frequencies (average number of days in a month) of occurrence of poor visibility in various visibility ranges. It can be seen from Table 1 that the number of days in each visibility range increases from November to January and then decreases abruptly in the month of February. The average

TABLE 1

Frequency (No. of days) of occurrence of visibility of various ranges during winter season at IGI Airport, New Delhi (1973-85)

Visibility (m)	Months			
	November	December	January	February
<400	0.3	3.5	4.8	1.8
<600	1.0	5.0	7.3	2.4
<800	3.8	8.5	11.1	4.1
<1000	7.9	10.6	13.5	5.7
<1200	11.5	13.6	16.5	8.4
<1400	14.9	16.7	18.0	11.9
<1600	17.7	19.3	20.1	14.0
<1800	19.2	20.8	21.2	15.6
<2000	20.5	22.5	22.9	10.3

number of days for visibility range less than 1000 meters are 7.9, 10.6, 13.6 and 5.7 for the months of November to February respectively.

Mean hourwise frequencies (average number of days during each hour) for all the months from November to February have been presented in Table 2 which shows the period of the day when visibility deteriorates or improves. It is clear from Table 2 that the peak of poor visibility occurs in the early morning hours around 0200 UTC with

TABLE 2

Frequency (No. of days) of occurrence of visibility of various ranges at any time of the day during winter season at IGI Airport, New Delhi, 1973-85

Visibility (m)	Hours (UTC)																							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
November																								
<400	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
<600	0.2	0.2	0.5	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.1
<800	0.5	0.5	1.8	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.8	0.8	0.8	0.8	0.9	0.9	0.8	0.3	0.3
<1000	1.1	1.1	2.7	2.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.1	1.9	2.8	2.8	2.6	2.5	1.9	1.9	0.9	0.8	0.8
December																								
<400	1.8	1.8	1.9	1.5	1.5	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.5	0.5	0.8	1.1	1.5	1.8	1.8	
<600	1.9	2.1	2.7	2.1	1.5	0.8	0.5	0.2	0.1	0.0	0.0	0.0	0.1	0.4	0.3	0.5	0.6	0.8	1.3	1.8	2.0	2.1	2.2	
<800	3.0	3.1	4.1	3.4	2.2	1.1	0.6	0.3	0.2	0.0	0.0	0.0	0.1	0.3	1.1	1.8	2.0	2.5	2.3	2.9	2.8	3.1	2.9	3.1
<1000	3.9	4.3	6.4	4.7	2.8	1.6	0.8	0.3	0.3	0.1	0.1	0.1	0.2	0.9	2.0	2.8	3.5	3.9	4.3	4.5	4.5	4.0	3.8	3.8
January																								
<400	2.1	2.2	2.9	2.5	1.3	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.6	0.6	1.1	1.1	1.5	1.5	
<600	2.8	3.3	4.5	3.9	1.9	0.7	0.2	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.3	0.7	0.7	1.3	1.5	1.7	2.1	2.1
<800	4.5	5.5	6.7	5.7	2.9	1.1	0.4	0.1	0.3	0.2	0.1	0.1	0.1	0.2	0.7	1.2	1.1	1.7	1.7	2.1	2.8	2.9	3.5	4.1
<1000	5.5	6.5	8.7	8.3	4.2	2.0	0.8	0.3	0.3	0.2	0.1	0.1	0.1	0.5	1.6	2.8	2.8	3.3	3.0	3.6	4.4	4.8	5.3	5.5
February																								
<400	0.6	0.8	0.8	0.5	0.1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.5	0.5
<600	0.7	1.1	0.9	0.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.8	0.7
<800	1.1	1.6	2.1	1.4	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.3	0.6	0.8	1.0	1.0	
<1000	1.9	2.2	3.5	2.8	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.2	0.3	0.7	0.8	0.9	1.3	1.4	

TABLE 3

Frequency (No. of days) of occurrence of RVR of various ranges at any time of the day during winter season, 1973-92

Visibility (m)	Hours (UTC)																							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
November																								
<400	0.1	0.2	0.2	0.2	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
<600	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
<800	0.2	0.2	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
<1000	0.2	0.3	0.7	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
December																								
<400	1.3	1.7	1.7	1.6	1.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.3	1.3	1.3	
<600	1.4	1.8	1.9	1.7	1.4	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.3	1.3	1.3	
<800	1.7	1.9	2.3	2.3	1.7	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.3	1.5	1.5	
<1000	1.9	2.1	2.7	3.1	2.3	1.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.6	0.9	1.3	1.5	1.6	1.7	
January																								
<400	1.7	2.1	2.5	1.9	1.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.5	0.7	1.0	1.3	1.4	
<600	2.1	2.3	2.7	2.0	1.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.5	0.7	1.1	1.3	1.5	
<800	2.3	2.5	3.4	2.9	2.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.5	0.5	0.7	1.1	1.5	1.5	1.5	
<1000	2.6	2.8	4.3	4.3	2.5	1.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.5	0.5	0.5	0.9	1.3	1.7	1.9	1.9	
February																								
<400	0.4	0.6	0.7	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.3
<600	0.5	0.7	0.7	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.3
<800	0.5	0.7	0.9	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.4
<1000	0.7	0.9	1.1	1.3	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.5

rapid improvement after 0400 UTC. There is no well defined second maxima except for the month of November where second maxima occurs between 1600 to 2000 UTC.

4. Runway visual range (RVR) is a computed value of the range over which an observer on the centre line of the runway can see the runway surface markings or the lights delineating the runway. RVR depends not only upon the transparency of atmosphere which is a meteorological factor but it also depends upon the intensity of runway lights and the background luminance which are non - meteorological factors. In fact the values of RVR in general are higher than those of visibility especially during night and early morning. Also RVR becomes more useful during poor visibility conditions. These days most of the airlines use RVR for their operations. Mean

hourwise frequencies of RVR in various ranges for all the months from November to February have been presented in Table 3. These values shows that the diurnal and monthly variation follows the same pattern as the frequencies of visibility having maxima at 0200- 0300 UTC and monthwise it is January followed by December, February and November.

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