NOTES AND CORRESPONDENCE

Comments on "The Variation of Gust Factors with Mean Wind Speed and with Height"

GERALD C. GILL

Dept. of Meteorology and Oceanography, University of Michigan, Ann Arbor

3 September 1968

Davis and Newstein (1968) have reported on a very useful and valuable study relating gust ratios with mean wind speed for speeds up to 40 kt, and with height. They state, "the gust factor is defined as the ratio of the peak wind speed (of a given duration) to the mean wind speed (for a given averaging period)"—a very reasonable definition. In Figs. 1–7 they used peak speeds recorded for 10-min averaging periods for the seven tower levels studied. Regression equations of the form $y = a + bx$ were evaluated from the straight line of best fit where x is the mean wind speed, y the peak gust, b the slope of the line, and a the intercept on the y axis. Since "the gust factor G is defined as the ratio of the peak gust to the mean wind speed, then $y = Gx$, and $G = (a/x) + b$." For the period illustrated,

$$y = 1.59x + 0.43 \quad \text{at} \quad 40 \text{ ft,}$$

$$y = 1.42x + 0.90 \quad \text{at} \quad 200 \text{ ft,}$$

$$y = 1.23x - 0.26 \quad \text{at} \quad 890 \text{ ft.}$$

The decrease in the value of b with height was expected and the variation of a from a small positive to a small negative value is not surprising. The values of G for selected wind speeds for these three levels have been computed from the above relationship and are given in Table 1. It is to be noted that the significance of the intercept a becomes almost negligible for speeds > 20 kt, as it should with G approaching the slope b of the line.

The writer contends, by definition, that the gust factor G cannot be less than unity under any circumstances since the peak speed in any period cannot be

TABLE 1. Values of gust factor G for selected wind speeds.

Mean wind speed (kt)	Tower levels		
	40 ft	200 ft	890 ft
10	1.63	1.51	1.20
20	1.61	1.46	1.22
40	1.60	1.44	1.22
80	1.60	1.43	1.23

less than the average speed for that period. Davis and Newstein's curves showing the variation of gust ratios vs height and wind speed are thus open to question, as illustrated by Fig. 13 which purports to show that the gust ratio drops to a value of 0.62 for a mean wind speed of 100 kt at the 570-ft level on the tower. How could the peak wind speed be only 62 kt during a 10-min period when the average speed was 100 kt?

The writer would like the authors to review their thinking and their calculations, and, assuming some corrections are needed, to publish corrected curves. It would be valuable if these curves indicated the confidence level of the computations, maybe showing the 2σ values as well as the mean values for Figs. 8–13. There is a real need by design engineers for such studies as the authors have made and the writer sincerely hopes they will give new curves.

REFERENCE

- Davis, Francis K., and Herman Newstein, 1968: The variation of gust factors with mean wind speed and with height. *J. Appl. Meteor.*, **7**, 372–378.