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RESEARCH MEMORANDUM CASE FILE COPY

PRELIMINARY RESULTS FROM GUST VELOCITY

MEASUREMENTS AT HIGH ALTITUDES

By H. B. Tolefson

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

WASHINGTON

April 1, 1952



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RESEARCH MEMORANDUM

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SUMMARY

The first sample of high-altitude gust data obtained from routine operations of military airplanes has been evaluated. Time-history records of airspeed, altitude, and acceleration available at this time represent about 90,000 miles of flight at altitudes up to 46,000 feet. The gust velocities are presented in tabular form.

GENERAL COMMENT

A program for collecting data on the intensity and frequency of occurrence of atmospheric gusts up to altitudes of about 45,000 feet has been initiated by the NACA to obtain gust information for use in airplane and missile design. These data are being obtained from timehistory recordings of airspeed, altitude, and acceleration made during routine operations of several types of military airplanes.

In view of the interest in high-altitude gust data, the information obtained from the operations is summarized in table I to indicate . the gust conditions encountered at the various altitudes. The scope of these data is indicated in table I by the total miles flown by the instrumented airplanes within altitude intervals of 5,000 feet and the miles of rough air encountered within each altitude interval. Rough air is represented herein by the portions of the record in which the accelerometer trace was disturbed and contained acceleration increments equal to or greater than 0.05g. The gust data consist of the maximum effective gust velocity and the number of gusts with velocities above a threshold of 3 feet per second encountered at each altitude. The gust velocities were evaluated on the basis of actual wing loading. As a measure of the average gust experience, the table also shows the average number of gusts (above the 3-foot-per-second threshold) encountered per mile of flight at each altitude. Insufficient data are available at this time to obtain a comparison of the gust-frequency distributions at the various altitudes.

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No general conclusions are warranted from table I in view of the limited size of this initial sample of high-altitude gust data. There is an indication, however, that the maximum gust velocity and the number of gusts encountered per mile of flight decrease with increasing altitude.

Langley Aeronautical Laboratory National Advisory Committee for Aeronautics Langley Field, Va.

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Average number of gusts per mile of flight	0,193	.038	.082	.013	.008	200.	910.	100.	•006	0	NACA
Number of gusts 23 fps	246	434	1800	72.	JOS	93	148	2	146	0	-
Maximum effective gust velocity (fps)	Ţ	12	13	11	6	6	, 6	2	Ŋ	ľ	
Miles in rough air (DETECTED Q >.059)	1669	1481	3698	107	6मम	1413	3114	87	118	0	
Flight distance (miles)	4,913	11,281	21 , 924	5,412	13,704	13 , 447	3,071	6,492	, 8,327	455	
Altitude (ft)	0 to 5,000	5,000 to 10,000	10,000 to 15,000	15,000 to 20,000	20,000 to 25,000	25,000 to 30,000	30,000 to 35,000	35,000 to 40,000	40,000 to 45,000	45,000 to 50,000	

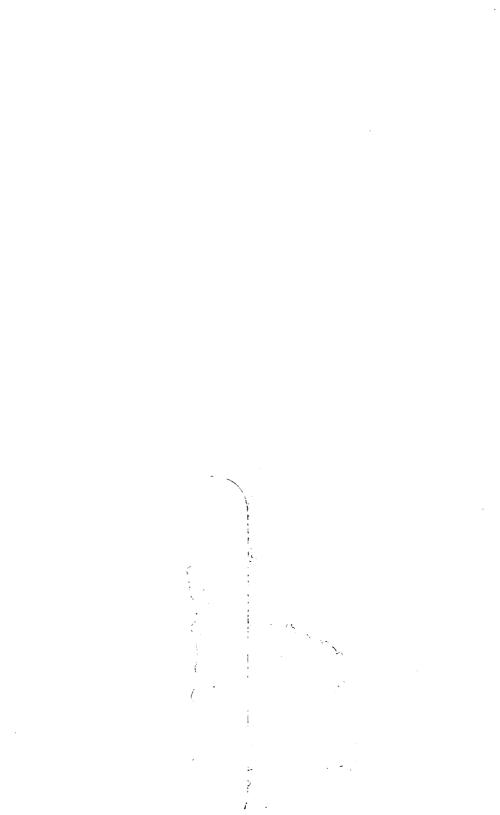
TABLE I.- SUMMARY OF GUST DATA

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