

NOV 5 1946

RM No. L6116a

NACA

RESEARCH MEMORANDUM

EVALUATION OF GUST AND DRAFT VELOCITIES FROM FLIGHTS OF

P-61c AIRPLANES WITHIN THUNDERSTORMS

II - JULY 9, 1946 TO JULY 11, 1946

AT ORLANDO, FLORIDA

By

H. B. Tolson

Langley Memorial Aeronautical Laboratory
Langley Field, Va.

Sept. 16, 1946

TECHNICAL
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**NATIONAL ADVISORY COMMITTEE
FOR AERONAUTICS**

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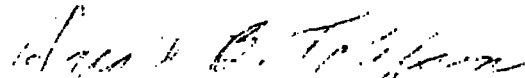
The results obtained from an evaluation for gust and draft velocities of acceleration and airspeed-altitude records taken by NACA recording instruments installed in P-61c airplanes participating in thunderstorm flights 6, 7, and 8, of July 9, 1946, July 10, 1946, and July 11, 1946, respectively, are presented herein. These data are summarized in tables I and II. In accordance with a recent discussion with a member of the U. S. Weather Bureau staff, the tabulated results for the present flights include in addition to data of the type presented in reference 1, the initial heading of the airplane for each traverse, the pressure altitude at the start of each traverse and subsequent variations of pressure altitude throughout the traverse in increments of 500 feet, and the gust gradient distance when it could be evaluated.

The cloud entry and exit times for the present data were taken from motion-picture records of the pilots' instrument panels whenever such records were available while the length of the traverses in seconds and feet was taken from the airspeed-altitude records. In many cases, however, poor agreement is indicated between the duration of the cloud traverses as obtained from the motion-picture records and from the airspeed-altitude records. This result is believed to be due to camera stoppages, inaccurate spring mechanisms of the clocks, and loss of motion-picture record in exposure or development.

With reference to the evaluation of gust data, the nominal threshold was about 2 feet per second. In making gust counts to this threshold, some gusts below that threshold have been included due to limitations of the procedure used. Thus, it will be noted

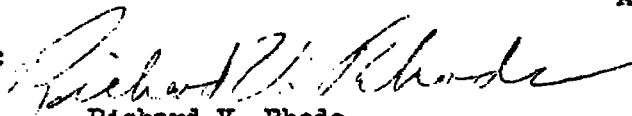
that in some instances gust counts are given in table I although no corresponding gust velocities are listed.

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



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Approved:



Richard V. Rhode
Chief of Aircraft Research Division

ESY

REFERENCE

1. Tolefson, E. B.: Evaluation of Gust and Draft Velocities from Flights of P-61c Airplanes within Thunderstorms. I - June 29, 1946 to July 8, 1946, at Orlando, Florida. NACA MR No. L6I13a, 1946.

TABLE I.- SUMMARY OF GUST MEASUREMENTS FROM FLIGHTS
OF P-61c AIRPLANES WITHIN THUNDERSTORMS

Space interval ft x 10 ³	Pressure altitude (ft)	Maximum effective gust velocity U _e _{max} (fps)	Maximum true gust velocity U _t _{max} (fps)	Gust gradient distance (ft)	No. of gusts
July 9, 1946 - Flight 6					
Airplane 344 Traverse 1	Time (EST) 132901 - 133237 Length of traverse 60.8 sec, 22,000 ft Initial heading (deg) 320				
		(a)	(a)	(a)	(a)
Airplane 344 Traverse 2	Time (EST) - (b) Length of traverse 125.4 sec, 47,111 ft Initial heading (deg) - (b)				
		(a)	(a)	(a)	(a)
Airplane 344 Traverse 3	Time (EST) 135930 - 140119 Length of traverse 312.5 sec, 117,385 ft Initial heading (deg) 70				
		(a)	(a)	(a)	(a)
Airplane 344 Traverse 4	Time (EST) 140514 - 140550 Length of traverse 111.2 sec, 41,232 ft Initial heading (deg) 270				
		(a)	(a)	(a)	(a)
Airplane 344 Traverse 5	Time (EST) - (b) Length of traverse 233.1 sec, 82,185 ft Initial heading (deg) - (b)				
		(a)	(a)	(a)	(a)

^a Failure in operation of accelerometer prevented computation of gust velocities.

^b No motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft x 10 ³	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)		Maximum true gust velocity $U_{t_{max}}$ (fps)		Gust gradient distance (ft)		No. of gusts
July 9, 1946 - Flight 6								
Airplane 331 Traverse 1		Time (EST) - (b) Length of traverse 138.5 sec, 41,798 ft Initial heading (deg) - (b)						
0 - 3	15,000	6.4	-----	11.0	-----	128	-----	1
3 - 6	15,500	4.2	-2.6	11.9	-----	245	-----	3
6 - 9		-----	-5.1	-----	-----	-----	-----	3
9 - 12		8.0	-4.8	20.1	-----	199	-----	5
12 - 15		4.8	-3.5	10.5	-----	28	-----	3
15 - 18		9.0	-8.7	17.5	-2.0	84	55	8
18 - 21		10.6	-8.4	20.5	-----	153	-----	7
21 - 24		4.5	-5.1	-----	-----	-----	-----	7
24 - 27		15.8	-10.9	-----	-----	-----	-----	7
27 - 30		13.8	-7.4	16.8	-----	91	-----	11
30 - 33	16,000	10.0	-11.9	-----	-----	-----	-----	5
33 - 36	16,500	23.1	-13.8	-----	-23.5	-----	58	12
36 - 39		8.4	-9.0	25.3	-----	88	-----	6
39 - 42		5.1	-3.9	-----	-----	-----	-----	3
Airplane 331 Traverse 2		Time (EST) - (b) Length of traverse 144.5 sec, 46,408 ft Initial heading (deg) - (b)						
0 - 3	15,500	8.0	-----	8.5	-----	31	-----	3
3 - 6		7.7	-6.7	11.7	-----	122	-----	8
6 - 9		8.0	-8.0	-----	-12.2	-----	127	7
9 - 12		7.7	-4.2	-----	-----	-----	-----	6
12 - 15		6.7	-----	-----	-----	-----	-----	3
15 - 18		4.5	-6.4	-----	-----	-----	-----	3
18 - 21		4.2	-4.2	-----	-----	-----	-----	6
21 - 24		5.4	-4.5	-----	-12.8	-----	122	3
24 - 27		7.7	-5.4	-----	-----	-----	-----	8
27 - 30		9.3	-7.3	-----	-----	-----	-----	8
30 - 33		15.0	-4.2	16.2	-8.4	33	33	5
33 - 36		9.6	-6.7	21.1	-----	284	-----	6
36 - 39		8.0	-4.5	-----	-----	-----	-----	5
39 - 42		3.8	-7.0	9.8	-----	63	-----	4
42 - 45		4.5	-4.5	-----	-----	-----	-----	6
45 - 48		2.2	-----	-----	-----	-----	-----	2

^bNo motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)	Maximum true gust velocity $U_{t_{max}}$ (fps)	Gust gradient distance (ft)	No. of gusts
July 9, 1946 - Flight 6					
Airplane 331 Traverse 3		Time (EST) 133020 - 133405 Length of traverse 236.6 sec, 75,519 ft Initial heading (deg) 330			
0 - 3	15,500	7.9	-----	-----	2
3 - 6		-----	-----	-----	0
6 - 9		12.4	-16.5	-2.8	133
9 - 12		18.4	-11.1	15.8	60
12 - 15	16,000	8.9	-15.9	18.7	65
15 - 18		12.7	-9.8	-4.5	96
18 - 21		10.8	-5.1	-----	-----
21 - 24		7.9	-2.5	12.8	155
24 - 27		4.8	-4.8	14.0	125
27 - 30		7.9	-4.8	14.0	124
30 - 33		3.8	-4.4	-----	-----
33 - 36		4.4	-----	-----	-----
36 - 39	16,500	-----	-5.4	-----	-----
39 - 42		9.5	-4.8	18.2	106
42 - 45		18.1	-9.5	26.5	120
45 - 48		4.8	-15.9	-----	-----
48 - 51		18.4	-18.4	-----	-----
51 - 54		23.8	-7.6	-----	-----
54 - 57		10.1	-10.8	24.4	32
57 - 60		6.7	-8.9	19.3	115
60 - 63		7.3	-----	-----	-----
63 - 66		8.9	-4.1	-----	-----
66 - 69		3.2	-6.0	7.1	34
69 - 72		13.0	-7.0	-----	-----
72 - 75		7.3	-7.0	-7.4	103
75 - 78		-----	-----	-----	-----
Airplane 331 Traverse 4		Time (EST) 134110 - 134515 Length of traverse 2670 sec, 89,197 ft Initial heading (deg) 90			
0 - 3	15,500	-----	-4.7	-----	1
3 - 6		25.2	-----	47.2	58
6 - 9		7.9	-11.3	16.4	91
9 - 12		12.3	-6.9	-7.3	104
12 - 15	16,000	6.9	-4.4	13.3	64

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft x 10 ³	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)	No. of gusts
July 9, 1946 - Flight 6							
Airplane 331 Traverse 4		{ Time (EST) 134110 - 134515 Length of traverse 2670 sec, 89,197 ft Initial heading (deg) 90					
15 - 18	16,000	14.2	-10.7	----	-17.8	----	7
18 - 21		10.4	-16.1	----	-31.8	----	9
21 - 24	16,500	17.0	-8.2	----	----	----	10
24 - 27		11.0	-7.9	----	----	----	7
27 - 30		10.4	-8.8	20.2	----	65	6
30 - 33		7.3	-3.8	11.0	-6.3	67	8
33 - 36	16,000	5.0	----	----	----	----	2
36 - 39		5.4	-2.2	----	----	----	5
39 - 42		3.8	-2.5	----	----	----	4
42 - 45		3.8	----	----	----	----	1
45 - 48		2.2	----	----	----	----	1
48 - 51		5.0	-3.5	9.5	----	71	7
51 - 54		6.9	----	----	----	----	4
54 - 57		3.8	-6.9	----	-12.1	----	4
57 - 60		4.1	-3.8	8.9	----	67	7
60 - 63		7.3	-4.1	----	----	----	7
63 - 66	15,500	9.8	-6.6	12.4	----	72	6
66 - 69		6.6	-2.8	----	----	----	8
69 - 72		10.1	-7.9	----	----	----	11
72 - 75		11.7	-8.5	----	----	----	11
75 - 78		13.6	-8.5	20.9	----	143	11
78 - 81	16,000	23.0	-10.4	----	----	----	9
81 - 84		12.9	-11.3	29.2	----	180	9
84 - 87		12.9	-4.7	15.8	----	101	6
87 - 90		14.2	-18.9	----	-42.9	----	5
Airplane 327 Traverse 1		{ Time (EST) 130905 - 131112 Length of traverse 151.7 sec, 57,675 ft Initial heading (deg) 360					
0 - 3	11,500	6.1	-3.9	----	----	----	3
3 - 6		3.5	-2.6	----	----	----	3
6 - 9		5.8	-5.5	11.0	----	421	2
9 - 12		2.2	-4.2	----	----	----	4
12 - 15		3.5	-2.2	----	----	----	3
15 - 18		5.1	-2.6	9.0	----	302	3

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)		No. of gusts
July 9, 1946 - Flight 6								
Airplane 327 Traverse 1		{ Time (EST) 130905 - 131112 Length of traverse 151.7 sec, 57,675 ft Initial heading (deg) 360						
18 - 21	11,500	3.9	-2.6	-----	-----	-----	-----	4
21 - 24		-----	-3.9	5.4	-----	230	-----	3
24 - 27		6.1	-2.2	-----	-----	-----	-----	2
27 - 30		3.2	-----	-----	-----	-----	-----	3
30 - 33		2.6	-5.8	-----	-----	-----	-----	2
33 - 36		-----	-3.9	-----	-----	-----	-----	2
36 - 39		-----	-----	-----	-----	-----	-----	4
39 - 42		2.6	-----	1.0	-----	156	-----	1
42 - 45		9.0	-7.4	16.8	-----	402	-----	4
45 - 48		2.6	-9.3	-----	-----	-----	-----	4
48 - 51		13.5	-3.5	10.9	-----	40	-----	5
51 - 54		11.9	-8.0	-----	-----	-----	-----	5
54 - 57		2.9	-10.3	-----	-----	-----	-----	3
57 - 60		-----	-----	-----	-----	-----	-----	0
Airplane 333 Traverse 1		{ Time (EST) 131524 - 132002 Length of traverse 308.6 sec, 72,344 ft Initial heading (deg) 85						
0 - 3	6,000	-----	-7.4	-----	-9.2	-----	41	5
3 - 6		-----	-4.8	-----	-7.6	-----	217	2
6 - 9		15.3	-10.6	13.0	-----	23	-----	6
9 - 12		14.4	-4.2	18.9	-14.9	157	23	8
12 - 15		8.6	-8.6	-----	-----	-----	-----	4
15 - 18		11.5	-6.4	21.4	-----	24	-----	6
18 - 21		11.5	-7.0	-----	-11.7	-----	67	5
21 - 24		10.2	-6.1	-----	-----	-----	-----	4
24 - 27		6.7	-----	-----	-----	-----	-----	3
27 - 30		5.4	-----	15.7	-----	49	-----	6
30 - 33		10.2	-----	-----	-----	-----	-----	6
33 - 36		-----	-----	-----	-----	-----	-----	4
36 - 39		-----	-----	-----	-----	-----	-----	0
39 - 42		-----	-----	-----	-----	-----	-----	0
42 - 45	-----	-----	-----	-----	-----	-----	1	
45 - 48	-----	-----	-----	-----	-----	-----	3	

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)	Maximum true gust velocity $U_{t,max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 9, 1946 - Flight 6								
Airplane 333 Traverse 1		{ Time (EST) 131524 - 132002 Length of traverse 308.6 sec, 72,344 ft Initial heading (deg) 85						
48 - 51	6,000	----	----	----	1			
51 - 54		7.0	14.6	189		3		
54 - 57		16.3	----	-6.7		8		
57 - 60		----	----	----		4		
60 - 63		----	----	----		3		
63 - 66		8.6	----	----		7		
66 - 69		7.7	-8.3	----		5		
69 - 72		----	----	----		0		
72 - 75	----	----	----	0				
Airplane 333 Traverse 2		{ Time (EST) 132915 - (c) Length of traverse 448.2 sec, 106,326 ft Initial heading (deg) 330						
0 - 3	6,000	10.5	8.9	-5.0	114	116	4	
3 - 6		----	----	----	----	----	3	
6 - 9		6.4	-5.1	9.9	-6.6	130	52	9
9 - 12		6.7	----	----	----	----	----	4
12 - 15		----	----	----	----	----	----	6
15 - 18		----	-5.4	----	-9.4	----	49	1
18 - 21		5.4	-4.1	----	-9.3	----	49	6
21 - 24		6.4	-4.1	----	----	----	----	5
24 - 27		10.2	----	----	----	----	----	2
27 - 30		----	----	----	----	----	----	0
30 - 33		6.7	----	----	----	----	----	4
33 - 36		----	----	----	----	----	----	1
36 - 39		8.0	----	----	----	----	----	1
39 - 42		----	----	----	----	----	----	1
42 - 45		----	----	----	----	----	----	0
45 - 48		----	----	----	----	----	----	0
48 - 51		----	----	----	----	----	----	0
51 - 54	----	----	----	----	----	----	0	
54 - 57	7.6	-5.1	----	----	----	----	2	
57 - 60	7.6	----	----	----	----	----	5	

^cFilm supply for motion-picture camera exhausted before end of traverse.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft x 10 ³	Pressure altitude (ft)	Maximum effective gust velocity U _e _{max} (fps)	Maximum true gust velocity U _t _{max} (fps)	Gust gradient distance (ft)	No. of gusts		
July 9, 1946 - Flight 6							
Airplane 333 Traverse 2		Time (EST) 132915 - (c) Length of traverse 448.2 sec, 106,326 ft Initial heading (deg) 330					
60 - 63	6,000	----	----	----	3		
63 - 66		12.7	----	----	4		
66 - 69		7.6	----	16.2	116	3	
69 - 72		20.4	-11.8	14.9	49	11	
72 - 75		6.4	-6.0	----	----	9	
75 - 78		11.5	-8.9	20.1	47	6	
78 - 81		----	----	----	----	0	
81 - 84		10.5	-7.0	17.7	-8.8	140	5
84 - 87		11.5	-5.4	----	----	155	8
87 - 90		----	-5.4	----	-13.5	97	3
90 - 93		13.4	----	27.2	288	7	
93 - 96		9.5	-7.0	----	-12.3	45	9
96 - 99		8.6	-7.6	----	----	----	5
99 - 102		10.2	-4.1	----	----	----	9
102 - 105	6.4	-8.0	10.0	107	9		
105 - 108	6.0	-4.5	----	-9.5	23	5	
Airplane 333 Traverse 3		Time (EST) - (b) Length of traverse 186.2 sec, 40,326 ft Initial heading (deg) - (b)					
0 - 3	5,500	----	-5.0	----	4		
3 - 6		9.4	----	10.6	44	4	
6 - 9		16.7	-6.9	12.9	22	7	
9 - 12		8.5	-6.9	17.8	22	6	
12 - 15		7.2	-7.9	----	-12.5	90	4
15 - 18		10.7	-10.7	----	-19.8	133	9
18 - 21		12.0	-7.2	17.7	66	9	
21 - 24		7.9	-4.4	----	-5.8	66	6
24 - 27		24.2	-11.0	15.3	161	9	

^bNo motion-picture records obtained.

^cFilm supply for motion-picture camera exhausted before end of traverse.

TABLE I. - SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)	Maximum true gust velocity $U_{t_{max}}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 9, 1946 - Flight 6								
Airplane 333 Traverse 3		{ Time (EST) - (b) Length of traverse 186.2 sec, 40,326 ft Initial heading (deg) - (b)						
27 - 30	5,500	13.2	-----	-----	64	5		
30 - 33		-----	-6.0	-----		-----	4	
33 - 36		7.2	-4.7	-----		-----	6	
36 - 39		5.7	-----	-----		-----	3	
39 - 42		-----	-----	-----		-----	0	
Airplane 333 Traverse 4		{ Time (EST) 135419 - 135525 Length of traverse 83.2 sec, 16,572 ft Initial heading (deg) - (d)						
0 - 3	5,500	-----	-----	-----	160	1		
3 - 6		-----	-----	-----		-----	0	
6 - 9		-----	-----	-----		-----	0	
9 - 12		7.5	-----	-----		-----	7	
12 - 15		7.5	-6.9	-----		-13.8	7	
15 - 18		-----	-----	-----		-----	3	
18 - 21	-----	-----	10.3	-----	44	1		
July 10, 1946 - Flight 7								
Airplane 347 Traverse 1		{ Time (EST) - (b) Length of traverse 268.5 sec, 93,759 ft Initial heading (deg) - (b)						
0 - 3	26,000	-----	-4.7	-----	35	102	5	
3 - 6		8.8	-7.6	8.3			-21.6	6
6 - 9		3.2	-3.8	8.3			-----	4
9 - 12		-----	-----	-----			-----	0
12 - 15	26,500	-----	-2.2	-----	-----	-----	1	
15 - 18		-----	-----	-----			-----	0
18 - 21		-----	-----	-----			-----	0
21 - 24		2.5	-----	-----			-----	1

^bNo motion-picture records obtained.

^dHeading on motion-picture records not readable.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)	No. of gusts	
July 10, 1946 - Flight 7								
Airplane 347 Traverse 1		{ Time (EST) - (b) Length of traverse 268.5 sec, 93,759 ft Initial heading (deg) - (b)						
24 - 27	26,000	2.2	-2.2	-----	-10.5	-----	36	4
27 - 30		3.2	-2.2	11.6	-----	323	-----	3
30 - 33		3.8	-----	5.0	-----	244	-----	1
33 - 36		-----	-----	-----	-----	-----	-----	0
36 - 39		4.4	-----	10.4	-----	368	-----	2
39 - 42	26,500	28.4	-13.2	-----	-13.2	-----	33	8
42 - 45		6.0	-12.0	24.3	-18.2	135	198	6
45 - 48		15.4	-14.5	-----	-----	-----	-----	5
48 - 51		11.3	-6.3	12.6	-8.2	387	181	3
51 - 54	27,000	4.7	-5.0	-----	-----	-----	-----	8
54 - 57		7.9	-13.2	-----	-----	-----	-----	3
57 - 60		2.5	-5.4	-----	-5.6	-----	72	6
60 - 63		2.8	-5.4	-----	-15.3	-----	211	8
63 - 66		4.4	-2.8	-----	-11.5	-----	415	5
66 - 69		4.4	-4.1	-----	-----	-----	-----	3
69 - 72		8.2	-5.4	11.3	-----	104	-----	2
72 - 75		2.5	-5.0	4.9	-----	71	-----	5
75 - 78		4.7	-2.5	9.6	-----	216	-----	3
78 - 81		5.7	-3.2	6.5	-----	36	-----	5
81 - 84		9.1	-5.0	-----	-----	-----	-----	3
84 - 87		2.5	-3.2	8.5	-4.6	72	106	2
87 - 90		5.7	-4.7	8.3	-9.8	36	71	6
90 - 93		4.4	-5.0	-----	-----	-----	-----	7
93 - 96		-----	-3.2	-----	-5.7	-----	139	1
Airplane 331 Traverse 1		{ Time (EST) - (b) Length of traverse 208.5, 65,972 ft Initial heading (deg) - (b)						
0 - 3	15,500	-----	-----	-----	-----	-----	-----	0
3 - 6		-----	-----	-----	-----	-----	-----	0
6 - 9		-----	-----	-----	-----	-----	-----	0
9 - 12		6.7	-4.5	9.9	-----	131	-----	2

^b No motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)		Maximum true gust velocity $U_{t_{max}}$ (fps)		Gust gradient distance (ft)		No. of gusts
July 10, 1946 - Flight 7								
Airplane 331 Traverse 1		{ Time (EST) - (b) Length of traverse 208.5, 65,972 ft Initial heading (deg) - (b)						
12 - 15	15,500	10.8	-6.1	10.0	-6.6	31	129	6
15 - 18		9.6	-4.5	-----	-----	-----	-----	8
18 - 21		6.7	-3.8	10.8	-----	30	-----	6
21 - 24		-----	-4.1	-----	-----	-----	-----	1
24 - 27		-----	-----	-----	-----	-----	-----	0
27 - 30		7.0	-2.2	6.6	-----	188	-----	3
30 - 33		-----	-2.6	-----	-7.8	-----	159	3
33 - 36		4.5	-----	-----	-4.6	-----	125	4
36 - 39		-----	-4.5	-----	-----	-----	-----	1
39 - 42		-----	-----	-----	-----	-----	-----	0
42 - 45		4.5	-2.6	7.1	-----	33	-----	2
45 - 48		3.2	-----	7.9	-----	130	-----	1
48 - 51		7.7	-----	18.4	-----	227	-----	3
51 - 54		10.5	-7.3	-----	-----	-----	-----	9
54 - 57		6.1	-6.1	-----	-9.7	-----	269	4
57 - 60		5.4	-3.8	-----	-11.7	-----	129	4
60 - 63		5.4	-4.5	-----	-4.2	-----	63	3
63 - 66		3.8	-3.8	10.1	-2.9	31	94	4
Airplane 331 Traverse 2		{ Time (EST) 152233 - 152458 Length of traverse 218.0 sec, 66,922 ft Initial heading (deg) 110						
0 - 3	15,500	10.7	-----	-----	-----	-----	-----	4
3 - 6		6.6	-----	14.9	-----	30	-----	1
6 - 9		4.7	-----	-----	-----	-----	-----	1
9 - 12		-----	-----	-----	-----	-----	-----	0
12 - 15		4.7	-----	7.4	-----	91	-----	1
15 - 18		4.7	-----	-----	-----	-----	-----	1
18 - 21		-----	-----	-----	-----	-----	-----	0
21 - 24		-----	-----	-----	-----	-----	-----	0
24 - 27	-----	-----	-----	-----	-----	-----	0	

^bNo motion-picture records obtained.

TABLE I. - SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e \max}$ (fps)	Maximum true gust velocity $U_{t \max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 10, 1946 - Flight 7								
Airplane 331 Traverse 2		Time (EST) 152233 - 152458 Length of traverse 218.0 sec, 66,922 ft Initial heading (deg) 110						
27 - 30	15,500	----	-2.8	----	----	1		
30 - 33		4.4	-2.8	----	----	2		
33 - 36		----	----	----	-5.0	216	1	
36 - 39		----	----	----	----	----	0	
39 - 42		----	----	----	----	----	0	
42 - 45		7.9	----	12.7	-9.8	125	62	2
45 - 48		4.7	-2.8	----	----	----	----	3
48 - 51		3.5	-5.7	9.3	-4.8	30	148	3
51 - 54		4.1	----	----	----	----	----	1
54 - 57		4.1	-4.1	17.3	----	30	----	2
57 - 60		6.0	-4.4	13.9	-14.0	123	62	7
60 - 63		8.8	-4.7	6.9	----	95	----	6
63 - 66		6.9	-5.1	----	----	----	----	5
66 - 69	----	----	----	----	----	----	0	
Airplane 331 Traverse 3		Time (EST) 153853 - 154015 Length of traverse 95.5 sec, 31,438 ft Initial heading (deg) - (a)						
0 - 3	15,500	14.7	-13.8	----	----	----	6	
3 - 6		16.6	-8.8	----	----	----	----	9
6 - 9		9.7	-13.8	22.5	----	94	----	11
9 - 12		21.3	-7.5	15.8	----	34	----	7
12 - 15		12.2	-6.9	20.5	----	35	----	6
15 - 18		13.5	-19.4	----	----	----	----	3
18 - 21		7.2	-3.1	8.9	----	67	----	3
21 - 24		----	-3.4	----	----	----	----	1
24 - 27		8.8	----	----	----	----	----	2
27 - 30		----	-3.1	----	----	----	----	1
30 - 33		----	----	----	----	----	----	0

^aHeading on motion-picture records not readable.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 10, 1946 - Flight 7								
Airplane 331 Traverse 4		{ Time (EST) 154510 - 154725 Length of traverse 153.8 sec, 49,178 ft Initial heading (deg) - (d)						
0 - 3	15,500	----	----	----	----	0		
3 - 6		14.0	----	----	----	2		
6 - 9		15.0	-8.4	----	----	7		
9 - 12		15.0	-7.8	----	----	8		
12 - 15		7.8	-4.4	12.5	----	33	4	
15 - 18		10.6	-16.5	----	----	----	7	
18 - 21		5.9	-9.0	----	-6.6	----	95	6
21 - 24		15.9	-6.5	----	----	----	----	3
24 - 27		10.3	-3.7	10.1	-7.9	95	95	4
27 - 30		9.4	-12.5	23.6	----	95	----	6
30 - 33		6.5	-5.3	----	-14.3	----	303	6
33 - 36		8.1	-5.6	----	----	----	----	5
36 - 39		7.5	-7.8	----	-13.8	----	65	7
39 - 42		7.2	-4.1	----	-3.8	----	132	4
42 - 45		3.1	-3.7	----	----	----	----	3
45 - 48		3.1	-2.2	5.4	----	161	----	2
48 - 51	----	----	----	----	----	----	0	
Airplane 327 Traverse 1		{ Time (EST) 151023 - 151210 Length of traverse 110.1 sec, 35,133 ft Initial heading (deg) 230						
0 - 3	11,000	3.8	----	----	----	----	4	
3 - 6		3.8	-3.2	5.2	-4.6	126	31	8
6 - 9		2.5	-3.8	6.9	-3.7	92	92	6
9 - 12	10,500	4.8	-5.1	6.7	-10.0	64	95	6
12 - 15		2.9	-2.9	----	-6.0	----	33	5
15 - 18		2.2	----	4.5	----	33	----	3
18 - 21	----	-3.2	----	----	----	----	1	
21 - 24	3.8	----	6.2	----	216	----	4	
24 - 27	4.1	-4.8	6.7	-6.8	31	61	7	
27 - 30	2.2	-4.5	----	-8.0	----	63	3	
30 - 33	10,000	----	----	----	----	----	2	
33 - 36		2.9	----	----	----	----	----	2

^dHeading on motion-picture records not readable.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft x 10 ³	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)	Maximum true gust velocity $U_{t,max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 10, 1946 - Flight 7								
Airplane 327 Traverse 2		Time (EST) 151413 - 151634 Length of traverse 99.2 sec, 28,710 ft Initial heading (deg) 120						
0 - 3	10,000	----	----	----	0			
3 - 6		----	----	----	2			
6 - 9		----	----	-5.2	115	1		
9 - 12		----	-4.1	-6.8	228	3		
12 - 15		----	----	4.5	57	3		
15 - 18		3.2	-3.2	5.4	-5.1	86	6	
18 - 21		----	----	----	----	3		
21 - 24		----	----	----	----	1		
24 - 27	----	----	----	----	0			
27 - 30	----	----	----	----	0			
Airplane 327 Traverse 3		Time (EST) 152802 - 152904 Length of traverse 80.6 sec, 26,864 ft Initial heading (deg) 90						
0 - 3	10,500	----	-2.2	----	-5.9	233	1	
3 - 6		----	----	----	-4.6	197	3	
6 - 9		----	----	----	----	----	1	
9 - 12		----	----	----	----	----	1	
12 - 15		----	-2.2	----	----	----	3	
15 - 18		----	-3.5	----	-4.5	162	1	
18 - 21		----	-2.2	3.9	----	66	3	
21 - 24		----	----	----	----	----	0	
24 - 27	2.2	-2.8	----	----	----	3		
Airplane 327 Traverse 4		Time (EST) 153825 - 154048 Length of traverse 149.9 sec, 48,490 ft Initial heading (deg) 270						
0 - 3	11,000	5.0	-5.0	8.5	-8.2	88	177	5
3 - 6		6.9	-5.0	----	----	----	----	8
6 - 9	10,500	5.3	-3.4	----	-5.7	100	----	5
9 - 12		----	----	----	----	----	----	0
12 - 15		----	----	----	----	----	----	0
15 - 18	----	----	-2.2	----	----	----	----	1

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)		Maximum true gust velocity $U_{t_{max}}$ (fps)		Gust gradient distance (ft)		No. of gusts
July 10, 1946 - Flight 7								
Airplane 327 Traverse 4		{ Time (EST) 153825 - 154048 Length of traverse 149.9 sec, 48,490 ft Initial heading (deg) 270						
18 - 21	10,500	2.8	-3.4	-----	-----	-----	-----	5
21 - 24		5.3	-5.0	12.2	-8.9	157	63	8
24 - 27		7.5	-7.5	-----	-----	-----	-----	4
27 - 30		10.6	-3.4	15.0	-----	101	-----	7
30 - 33		7.2	-10.3	-----	-----	-----	-----	6
33 - 36		10.6	-4.1	15.5	-----	106	-----	7
36 - 39		5.6	-5.6	7.4	-----	101	-----	2
39 - 42	11,000	5.9	-9.1	9.6	-----	129	-----	6
42 - 45		4.1	-4.1	-----	-----	-----	-----	5
45 - 48		3.4	-10.3	-----	-13.4	-----	205	5
48 - 51		-----	-----	-----	-----	-----	-----	0
Airplane 327 Traverse 5		{ Time (EST) 154525 - 154645 Length of traverse 92.3 sec, 29,065 ft Initial heading (deg) 180						
0 - 3	10,500	-----	-----	-----	-----	-----	-----	0
3 - 6		-----	-----	-----	-----	-----	-----	0
6 - 9	10,000	-----	-----	-----	-----	-----	-----	0
9 - 12		3.1	-----	5.1	-----	241	-----	1
12 - 15		-----	-----	-----	-3.8	-----	63	3
15 - 18		6.9	-11.2	-----	-----	-----	-----	7
18 - 21		3.7	-4.7	-----	-11.2	-----	133	7
21 - 24		5.0	-4.1	-----	-7.7	-----	203	5
24 - 27		2.2	-----	-----	-----	-----	-----	1
27 - 30		-----	-----	-----	-----	-----	-----	0
Airplane 344 Traverse 1		{ Time (EST) - (b) Length of traverse 116.3 sec, 28,688 ft Initial heading (deg) - (b)						
0 - 3	6,000	12.5	-4.8	24.3	-----	114	-----	5
3 - 6		6.1	-3.5	17.4	-----	47	-----	12
6 - 9		6.4	-6.7	10.2	-----	90	-----	7
9 - 12		4.8	-6.1	-----	-----	-----	-----	5

^bNo motion-picture records obtained.

TABLE I. - SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)		Maximum true gust velocity $U_{t,max}$ (fps)		Gust gradient distance (ft)		No. of gusts
July 10, 1946 - Flight 7								
Airplane 344 Traverse 1		{ Time (EST) - (b) Length of traverse 116.3 sec, 28,688 ft Initial heading (deg) - (b)						
12 - 15	6,000	8.0	-4.5	----	-3.1	----	81	6
15 - 18		7.7	-6.4	----	----	----	----	12
18 - 21		3.2	-6.1	----	-7.8	----	52	6
21 - 24		3.5	-9.6	6.0	-14.8	25	125	10
24 - 27		2.9	-3.5	----	----	----	----	6
27 - 30	6,500	----	-2.9	----	----	----	----	2
Airplane 344 Traverse 2		{ Time (EST) 152207 - 152438 Length of traverse 110.1 sec, 27,407 ft Initial heading (deg) 90						
0 - 3	6,000	2.8	----	----	----	----	----	3
3 - 6		----	----	----	----	----	----	3
6 - 9		----	-3.5	----	----	----	----	5
9 - 12		----	-3.5	----	----	----	----	4
12 - 15		2.8	-5.4	----	----	----	----	9
15 - 18	5,500	4.1	-5.7	----	-11.2	----	77	9
18 - 21		3.5	-5.0	----	----	----	----	6
21 - 24		5.4	-6.0	----	----	----	----	8
24 - 27		2.8	-2.8	----	----	----	----	8
27 - 30		----	----	----	----	----	----	1
Airplane 344 Traverse 3		{ Time (EST) 153503 - 153642 Length of traverse 115.3 sec, 28,512 ft Initial heading (deg) 280						
0 - 3	6,000	----	-4.1	----	----	----	----	3
3 - 6	5,500	2.8	-2.8	----	----	----	----	7
6 - 9		----	-3.1	----	----	----	----	6
9 - 12	6,000	7.2	-5.3	13.0	----	24	----	8
12 - 15		4.4	-9.7	9.2	-5.9	24	24	8
15 - 18		9.4	-6.3	8.6	----	53	----	6
18 - 21	6,000	8.1	----	----	----	----	----	2
21 - 24		3.4	-4.4	----	----	----	----	4
24 - 27		3.1	-7.5	----	-4.6	----	24	7
27 - 30		3.4	----	----	----	----	----	2

^b No motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)		Maximum true gust velocity $U_{t_{max}}$ (fps)		Gust gradient distance (ft)		No. of gusts	
July 10, 1946 - Flight 7									
Airplane 344 Traverse 4		{ Time (EST) - (b) Length of traverse 125.2 sec, 31,862 ft Initial heading (deg) - (b)							
0 - 3	6,000	6.9	-1.9	----	-----	-----	-----	3	
3 - 6		2.5	-6.9	----	-----	-----	-----	2	
6 - 9		----	-3.4	----	-----	-----	-----	1	
9 - 12		3.4	-4.4	----	-----	-----	-----	9	
12 - 15		8.7	-5.6	10.6	-----	154	-----	8	
15 - 18		4.7	-3.4	----	-----	-----	-----	4	
18 - 21		4.7	-3.7	----	-----	-----	-----	6	
21 - 24		----	-3.1	----	-----	-----	-----	1	
24 - 27		8.7	-8.4	13.6	-----	101	-----	3	
27 - 30		----	-5.0	----	-----	-----	-----	3	
30 - 33	----	-----	-----	-----	-----	-----	2		
July 11, 1946 - Flight 8									
Airplane 333 Traverse 1		{ Time (EST) 130830 - 131038 Length of traverse 195.5 sec, 72,369 ft Initial heading (deg) 50							
0 - 3	26,000	----	-4.1	----	-10.8	-----	34	2	
3 - 6		4.1	-----	5.7	-----	138	-----	3	
6 - 9		9.4	-8.1	----	-18.5	-----	311	3	
9 - 12		6.3	-7.8	----	-14.3	-----	105	5	
12 - 15		12.8	-6.6	----	-13.3	-----	146	7	
15 - 18		4.1	-9.7	----	-18.2	-----	105	2	
18 - 21		10.6	-4.7	29.1	-----	289	-----	7	
21 - 24		25,500	9.1	-5.9	21.3	-17.1	38	321	5
24 - 27			13.1	-10.0	----	-13.3	-----	38	9
27 - 30		26,000	----	-8.1	----	-----	-----	-----	1
30 - 33	12.2		-3.4	----	-----	-----	-----	9	
33 - 36	26,500	13.8	-10.0	----	-26.3	-----	495	5	
36 - 39		6.6	-17.5	----	-----	-----	-----	6	
39 - 42		----	-3.4	----	-----	-----	-----	1	
42 - 45		----	-----	-----	-----	-----	-----	0	

^bNo motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)	Maximum true gust velocity $U_{t_{max}}$ (fps)	Gust gradient distance (ft)	No. of gusts
July 11, 1946 - Flight 8					
Airplane 333 Traverse 1		{ Time (EST) 130830 - 131038 Length of traverse 195.5 sec, 72,369 ft Initial heading (deg) 50			
45 - 48	26,500	----	----	----	0
48 - 51		----	----	----	0
51 - 54		5.3	-4.4	----	3
54 - 57		----	----	----	0
57 - 60	26,000	4.4	-3.1	----	4
60 - 63		7.8	-4.4	13.8	4
63 - 66	26,500	6.9	-2.5	----	3
66 - 69		5.9	-6.6	-17.0	7
69 - 72		4.1	-9.1	----	3
72 - 75		----	----	----	0
Airplane 333 Traverse 2		{ Time (EST) 131925 - 132000 Length of traverse 61.1 sec, 22,570 ft Initial heading (deg) 270			
0 - 3	26,000	6.8	-8.4	19.8	7
3 - 6		5.0	-5.6	----	4
6 - 9		5.9	-2.5	----	3
9 - 12		2.8	----	----	1
12 - 15		24.8	-31.6	15.6	5
15 - 18		15.2	-12.1	31.1	7
18 - 21		----	-16.1	----	1
21 - 24		4.7	----	----	1
Airplane 333 Traverse 3		{ Time (EST) 132725 - 132820 Length of traverse 75.0 sec, 27,503 ft Initial heading (deg) 100			
0 - 3	26,000	3.7	-4.3	----	5
3 - 6		2.8	-4.6	----	4
6 - 9		6.8	-5.6	13.0	6
9 - 12		4.9	-3.7	13.0	6
12 - 15		4.0	-8.0	-18.1	4

TABLE I. + SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)		Maximum true gust velocity $U_{t,max}$ (fps)		Gust gradient distance (ft)		No. of gusts
July 11, 1946 - Flight 8								
Airplane 333 Traverse 3		{ Time (EST) 132725 - 132820 Length of traverse 75.0 sec, 27,503 ft Initial heading (deg) 100						
15 - 18	26,000	10.2	-----	22.1	-----	186	-----	3
18 - 21		9.3	-3.4	-----	-----	-----	-----	6
21 - 24		8.3	-8.3	16.2	-15.8	73	37	7
24 - 27		6.8	-8.3	-----	-----	-----	-----	9
27 - 30		-----	-----	-----	-----	-----	-----	0
Airplane 333 Traverse 4		{ Time (EST) 133514 - 133708 Length of traverse 134.5 sec, 47,098 ft Initial heading (deg) 90						
0 - 3	26,000	-----	-----	-----	-----	-----	-----	0
3 - 6		6.4	-8.3	-----	-16.6	-----	167	4
6 - 9		11.9	-9.8	-----	-19.6	-----	158	4
9 - 12		6.1	-----	-----	-----	-----	-----	1
12 - 15		8.9	-5.5	16.2	-----	37	-----	5
15 - 18		10.4	-3.4	-----	-----	-----	-----	5
18 - 21		4.9	-8.0	-----	-----	-----	-----	2
21 - 24		5.2	-2.8	-----	-----	-----	-----	3
24 - 27		-----	-2.8	-----	-----	-----	-----	1
27 - 30		2.8	-5.8	-----	-5.8	-----	345	3
30 - 33		-----	-3.7	-----	-----	-----	-----	1
33 - 36		5.8	-----	-----	-----	-----	-----	1
36 - 39		7.4	-----	14.0	-----	38	-----	2
39 - 42		-----	-2.8	-----	-----	-----	-----	2
42 - 45		-----	-4.9	-----	-----	-----	-----	2
45 - 48	-----	-----	-----	-----	-----	-----	0	
Airplane 347 Traverse 1		{ Time (EST) - (b) Length of traverse 246.6 sec - (a) Initial heading (deg) - (b)						
		(e)	(e)	(e)	(e)	(e)	(e)	(e)

^bNo motion-picture records obtained.

^aFailure in operation of airspeed-altitude recorder prevented computations for length of traverses in feet and gust velocities.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)	Maximum true gust velocity $U_{t,max}$ (fps)	Gust gradient distance (ft)	No. of gusts
July 11, 1946 - Flight 8					
Airplane 347 Traverse 2	{ Time (EST) 133008 - 133035 Length of traverse 43.4 sec - (e) Initial heading (deg) 280				
		(e)	(e)	(e)	(e)
Airplane 347 Traverse 3	{ Time (EST) 133546 - 133840 Length of traverse 193.0 sec - (e) Initial heading (deg) 90				
		(e)	(e)	(e)	(e)
Airplane 347 Traverse 4	{ Time (EST) 134434 - 134603 Length of traverse 96.4 sec - (e) Initial heading (deg) - (d)				
		(e)	(e)	(e)	(e)
Airplane 347 Traverse 5	{ Time (EST) 135013 - 135131 Length of traverse 81.4 sec - (e) Initial heading (deg) 110				
		(e)	(e)	(e)	(e)
Airplane 347 Traverse 6	{ Time (EST) 135240 - 135328 Length of traverse 54.0 sec - (e) Initial heading (deg) - (d)				
		(e)	(e)	(e)	(e)
Airplane 331 Traverse 1	{ Time (EST) 124510 - 124630 Length of traverse 84.9 sec, 26,823 ft Initial heading (deg) - (d)				
0 - 3	15,500	----	-5.7	----	4
3 - 6		5.7	-3.8	9.7	5
6 - 9		4.8	----	-4.4	8

^dHeading on motion-picture records not readable.

^eFailure in operation of airspeed-altitude recorder prevented computations for length of traverses in feet and gust velocities.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft x 10 ³	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)		Maximum true gust velocity $U_{t_{max}}$ (fps)		Gust gradient distance (ft)	No. of gusts	
July 11, 1946 - Flight 8								
Airplane 331 Traverse 1		Time (EST) 124510 - 124630 Length of traverse 84.9 sec, 26,823 ft Initial heading (deg) - (d)						
9 - 12	15,500	7.9	-3.5	----	----	----	5	
12 - 15		----	----	----	----	----	2	
15 - 18		----	----	----	----	----	2	
18 - 21		3.5	----	----	----	----	4	
21 - 24		----	----	----	----	----	2	
24 - 27	----	----	----	----	----	----	2	
Airplane 331 Traverse 2		Time (EST) 125412 - 125515 Length of traverse 77.8 sec, 25,511 ft Initial heading (deg) - (d)						
0 - 3	15,500	4.1	-2.9	----	-7.5	----	341	3
3 - 6		4.1	-6.3	----	-2.9	----	308	3
6 - 9		10.8	-5.7	----	-13.8	----	386	11
9 - 12		7.0	-3.5	----	----	----	----	10
12 - 15		6.7	-7.3	10.6	----	101	----	6
15 - 18		4.1	-5.7	----	----	----	----	6
18 - 21		6.3	----	14.0	----	340	----	3
21 - 24		3.8	-3.2	----	-6.3	----	534	3
24 - 27	----	----	----	----	----	----	0	
Airplane 331 Traverse 3		Time (EST) 132435 - 132856 Length of traverse 177.6 sec, 58,206 ft Initial heading (deg) 260						
0 - 3	15,500	----	-2.2	----	-7.5	----	330	1
3 - 6		5.4	----	----	----	----	----	1
6 - 9		13.9	-12.3	----	-14.7	----	182	10
9 - 12		8.5	-5.7	----	----	----	----	10
12 - 15		7.6	----	----	----	----	----	9
15 - 18	6.0	-5.0	----	----	----	----	7	

^dHeading on motion-picture records not readable.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft x 103	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)	Maximum true gust velocity $U_{t,max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 11, 1946 - Flight 8								
Airplane 331 Traverse 3		Time (EST) 132435 - 132856 Length of traverse 177.6 sec, 58,206 ft Initial heading (deg) 260						
18 - 21	15,500	5.0	-----	-----	-----	9		
21 - 24		3.1	-5.0	-----	-4.7	66	9	
24 - 27		8.2	-6.6	14.0	-4.2	32	32	11
27 - 30		4.7	-6.9	-----	-----	-----	-----	5
30 - 33		5.4	-----	-----	-----	-----	-----	5
33 - 36		6.3	-----	-----	-----	-----	-----	6
36 - 39		-----	-----	-----	-----	-----	-----	3
39 - 42		3.8	-3.1	12.6	-----	324	-----	6
42 - 45		3.8	-----	-----	-5.4	-----	131	5
45 - 48		9.1	-3.1	-----	-----	-----	-----	6
48 - 51		18.3	-7.2	-----	-----	-----	-----	11
51 - 54		14.8	-8.8	-----	-----	-----	-----	13
54 - 57	10.4	-7.2	-----	-2.4	-----	316	5	
57 - 60	-----	-----	-----	-----	-----	-----	0	
Airplane 331 Traverse 4		Time (EST) - (b) Length of traverse 137.2 sec, 45,519 ft Initial heading (deg) - (b)						
0 - 3	15,500	10.1	-----	-----	-----	-----	1	
3 - 6		12.9	-----	9.2	-----	200	-----	3
6 - 9		4.4	-4.7	-----	-----	-----	-----	3
9 - 12		4.4	-4.1	-----	-----	-----	-----	7
12 - 15		4.7	-----	-----	-----	-----	-----	6
15 - 18		3.1	-----	6.8	-----	98	-----	6
18 - 21	16,000	22.6	-14.5	-----	-2.3	-----	101	8
21 - 24		20.7	-20.4	12.7	-----	34	-----	5
24 - 27		19.2	-13.5	-----	-----	-----	-----	10
27 - 30		21.1	-17.9	-----	-----	-----	-----	12
30 - 33		7.5	-8.5	-----	-----	-----	-----	7
33 - 36		20.4	-8.5	-----	-6.0	-----	63	3
36 - 39		10.7	-14.8	18.2	-----	94	-----	13
39 - 42		13.8	-9.1	6.1	-----	35	-----	8

^bNo motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts		
July 11, 1946 - Flight 8							
Airplane 331 Traverse 4		Time (EST) - (b) Length of traverse 137.2 sec, 45,519 ft Initial heading (deg) - (b)					
42 - 45	16,000	6.3	-2.8	----	8		
45 - 48		----	----	----	1		
Airplane 331 Traverse 5		Time (EST) - (b) Length of traverse 180.2 sec, 58,622 ft Initial heading (deg) - (b)					
0 - 3	15,500	7.8	-5.3	14.7	196	6	
3 - 6		6.6	-4.1	11.2	98	9	
6 - 9		4.4	-5.3	----	-6.4	68	7
9 - 12		5.6	----	----	----	----	10
12 - 15		6.9	-3.1	----	----	----	9
15 - 18		8.5	-6.9	20.2	224	----	3
18 - 21		16.6	-17.2	----	----	----	9
21 - 24		4.7	-9.4	----	----	----	7
24 - 27		15.4	-7.5	----	----	----	5
27 - 30		12.8	-15.4	----	----	----	8
30 - 33		10.7	-2.5	----	----	----	5
33 - 36		6.3	----	----	----	----	2
36 - 39		13.8	----	7.1	175	----	1
39 - 42		5.6	----	8.0	320	----	1
42 - 45		3.4	----	----	----	----	2
45 - 48		6.6	----	8.8	250	----	1
48 - 51		4.4	----	----	-1.6	101	6
51 - 54		10.0	-9.4	----	----	----	4
54 - 57		12.8	-4.4	----	----	----	4
57 - 60		5.6	-5.3	----	----	----	3

^b No motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)	Maximum true gust velocity $U_{t,max}$ (fps)	Gust gradient distance (ft)	No. of gusts
July 11, 1946 - Flight 8					
Airplane 331 Traverse 6		{ Time (EST) - (b) Length of traverse 103.6 sec, 34,816 ft Initial heading (deg) - (b)			
0 - 3	15,500	---	---	---	2
3 - 6		7.5	-2.5	---	9
6 - 9	16,000	6.3	-3.8	---	8
9 - 12		16.9	-8.5	---	6
12 - 15		17.8	-7.5	---	11
15 - 18		7.8	-8.5	---	9
18 - 21		6.3	-6.6	-6.9	33
21 - 24		9.7	-5.9	13.5	97
24 - 27		3.8	-7.2	---	4
27 - 30		4.1	---	5.9	136
30 - 33		5.9	---	---	4
33 - 36		---	---	---	1
Airplane 331 Traverse 7		{ Time (EST) - (b) Length of traverse 166.5 sec, 57,282 ft Initial heading (deg) - (b)			
0 - 3	16,000	10.9	-5.0	---	4
3 - 6		6.9	-4.7	-6.2	302
6 - 9		8.7	-7.2	-15.7	94
9 - 12		11.2	-10.6	---	10
12 - 15		9.4	-11.5	---	11
15 - 18		6.5	---	-3.8	177
18 - 21		5.0	-2.8	-6.0	213
21 - 24		5.3	-7.2	---	3
24 - 27		9.0	-20.9	-16.4	189
27 - 30		6.9	-6.9	---	7
30 - 33		4.1	-2.8	---	8
33 - 36		5.6	-3.4	-8.9	105
36 - 39	15,500	4.1	-2.8	---	3
39 - 42		---	---	2.1	202
42 - 45		6.5	-2.5	9.4	102

^bNo motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft x 103	Pressure altitude (ft)	Maximum effective gust velocity $U_{e,max}$ (fps)	Maximum true gust velocity $U_{t,max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 11, 1946 - Flight 8								
Airplane 331 Traverse 7		Time (EST) - (b) Length of traverse 166.5 sec, 57,282 ft Initial heading (deg) - (b)						
45 - 48	16,000	----	----	----	2			
48 - 51		----	----	----	1			
51 - 54		----	----	----	3			
54 - 57		3.4	----	----	4			
57 - 60		----	----	----	0			
Airplane 344 Traverse 1		Time (EST) - (b) Length of traverse 62.0 sec, 17,155 ft Initial heading (deg) - (b)						
0 - 3	11,000	----	----	----	0			
3 - 6		17.3	-8.3	28.5	-21.3	117	85	7
6 - 9	11,500	7.7	-8.6	----	-25.2	----	83	7
9 - 12		14.4	-16.6	29.4	-28.5	78	82	9
12 - 15		14.7	-15.7	----	-28.5	----	181	8
15 - 18		----	-8.3	----	----	----	----	2
Airplane 344 Traverse 2		Time (EST) - (b) Length of traverse 202.0 sec, 55,811 ft Initial heading (deg) - (b)						
0 - 3	11,000	3.5	-12.7	----	-12.3	----	51	7
3 - 6		9.5	-2.2	----	----	----	----	4
6 - 9	11,500	4.1	-4.1	----	-13.4	----	172	8
9 - 12		8.2	-6.0	13.9	-9.7	87	85	9
12 - 15		4.4	-4.1	----	----	----	----	6
15 - 18		----	-4.4	----	----	----	----	3
18 - 21		----	----	----	----	----	----	3
21 - 24	11,500	----	-4.4	----	-8.2	----	53	3
24 - 27		2.8	----	----	----	----	----	1
27 - 30		----	----	----	----	----	----	0
30 - 33		----	-4.4	----	-7.3	----	105	1
33 - 36		----	----	----	----	----	----	0

^bNo motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Space interval ft × 103	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)	Maximum true gust velocity $U_{t_{max}}$ (fps)	Gust gradient distance (ft)	No. of gusts			
July 11, 1946 - Flight 8								
Airplane 344 Traverse 2	{ Time (EST) - (b) Length of traverse 202.0 sec, 55,811 ft Initial heading (deg) - (b)							
36 - 39	11,000	7.0	-7.0	----	-9.8	----	60	6
39 - 42		7.3	-12.7	----	----	----	----	12
42 - 45	11,500	10.1	-8.2	----	-16.0	----	32	8
45 - 48		2.8	-5.7	----	----	----	----	4
48 - 51		4.1	-10.4	----	----	----	----	5
51 - 54		6.6	-4.1	12.2	----	57	----	7
54 - 57		----	-3.5	----	----	----	----	1
Airplane 344 Traverse 3	{ Time (EST) 131205 - 131518 Length of traverse 220.0 sec, 64,078 Initial heading (deg) 60							
0 - 3	10,500	----	-6.0	----	----	----	----	1
3 - 6		----	----	----	----	----	----	0
6 - 9		8.2	-6.6	17.2	----	29	----	4
9 - 12		6.6	-5.7	----	----	----	----	3
12 - 15		4.4	-6.9	----	----	----	----	5
15 - 18		18.2	-13.8	----	-24.9	----	149	6
18 - 21		16.2	-6.6	12.6	----	31	----	8
21 - 24	11,000	8.2	-11.9	10.7	-11.7	124	32	10
24 - 27		9.1	-9.1	----	----	----	----	10
27 - 30		4.1	-15.1	----	----	----	----	11
30 - 33		3.1	----	10.8	----	87	----	1
33 - 36		----	----	----	----	----	----	0
36 - 39		----	-4.7	----	-7.9	----	88	1
39 - 42		4.4	----	7.9	----	60	----	1
42 - 45		6.3	-6.9	----	----	----	----	3
45 - 48		6.0	-4.7	----	----	----	----	3
48 - 51		13.8	-14.4	----	----	----	----	11
51 - 54		12.9	-13.2	19.4	-27.9	178	30	8
54 - 57		9.4	-4.7	7.9	----	89	----	8
57 - 60		6.3	-12.9	17.8	----	212	----	6
60 - 63		5.7	----	21.7	----	147	----	1
63 - 66		----	----	----	----	----	----	0

^bNo motion-picture records obtained.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Concluded

Space interval ft $\times 10^3$	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)	Maximum true gust velocity $U_{t_{max}}$ (fps)	Gust gradient distance (ft)	No. of gusts		
July 11, 1946 - Flight 8							
Airplane 344 Traverse 4		{ Time (EST) 131938 - 132239 Length of traverse 203.5 sec, 61,427 ft Initial heading (deg) 210					
0 - 3	10,500	5.6	-3.7	-----	-----	6	
3 - 6		3.1	-9.7	-----	-----	8	
6 - 9		6.6	-6.6	11.0	-14.4	93	8
9 - 12		5.9	-5.9	-----	-----	-----	10
12 - 15		-----	-6.6	-----	-12.2	-----	120
15 - 18		-----	-----	-----	-----	-----	0
18 - 21		4.4	-7.5	-----	-----	-----	3
21 - 24		5.3	-3.7	-----	-6.6	-----	62
24 - 27		4.4	-3.7	-----	-----	-----	4
27 - 30		2.5	-4.4	-----	-----	-----	2
30 - 33		4.4	-4.4	-----	-12.3	-----	61
33 - 36		-----	-5.3	-----	-8.7	-----	119
36 - 39		-----	-----	-----	-----	-----	0
39 - 42		-----	-----	-----	-----	-----	0
42 - 45		-----	-----	-----	-----	-----	0
45 - 48		3.7	-3.7	-----	-----	-----	2
48 - 51		17.8	-6.2	9.9	-----	92	5
51 - 54		9.4	-4.7	-----	-8.3	-----	66
54 - 57		4.4	-----	7.4	-----	92	7
57 - 60		5.6	-----	-----	-----	-----	4
60 - 63	-----	-7.2	-----	-----	-----	1	

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TABLE II.- SUMMARY OF DRAFT MEASUREMENTS FROM FLIGHTS OF
P-61c AIRPLANES WITHIN THUNDERSTORMS

Date	Flight no.	Air-plane no.	Assigned altitude (ft)	Tra-verse no.	Draft location from cloud entry (ft)		Draft extent (ft)	Average draft velocity (fps)		
					Start	End				
7-9-46	6	344	21,000	1	3,113	9,085	5,972	75.2 ?		
				2	1,444	4,874	3,430	24.2		
					4,874	7,875	3,001	-43.3		
					15,288	21,078	5,850	13.8		
					34,692	40,428	5,736	23.2		
		3	11,422	21,314	9,892	-7.5 ?				
			21,314	29,070	7,756	29.0				
			^a 4							
		5	2,547	9,009	6,462	22.8				
			48,070	56,450	8,380	11.2 ?				
				331	16,000	^a 1				
						2	31,805	39,189	7,384	15.0
						3	15,875	23,192	7,317	12.4
						4	17,380	25,286	7,906	21.7
				327	11,000	1	26,488	31,917	5,429	11.5 ?
		333	6,000	1	984	4,230	3,246	13.6		
					57,035	60,757	3,722	10.6		
				2	5,357	8,389	3,032	18.5		
					17,488	23,224	5,736	-16.9		
					68,647	72,462	3,815	-19.1		
				3	6,454	8,762	2,308	25.6		
					15,322	28,977	13,655	-21.3		
				4	12,443	15,543	3,100	-21.4		
7-10-46	7	347	26,000	1	8,152	13,412	5,260	-10.7		
					47,370	55,394	8,024	23.3		
					56,395	61,622	5,227	18.0		

^aNo draft velocities indicated by records.

TABLE II.- SUMMARY OF DRAFT MEASUREMENTS - Continued

Date	Flight no.	Air-plane no.	Assigned altitude (ft)	Tra-verse no.	Draft location from cloud entry (ft)		Draft extent (ft)	Average draft velocity (fps)	
					Start	End			
7-10-46	7	331	16,000	1	29,912	36,976	7,064	8.9	
				2	37,465	41,693	4,228	-16.5	
				a ₃					
				4	13,516	16,578	3,062	27.8	
					33,992	37,915	3,923	-11.9	
		327	11,000	a ₁					
				a ₂					
				a ₃					
				4	26,106	28,338	2,232	-32.2	
					33,552	38,010	4,458	20.8	
				a ₅					
344	6,000	1	17,316	28,534	11,218	5.7			
		2	11,031	23,553	12,522	-5.2			
		a ₃							
		a ₄							
7-11-46	8	333	26,000	1	31,241	38,266	7,025	36.4	
				a ₂					
				3	20,752	23,247	2,495	44.8	
		a ₄							
		347	21,000	b ₁					
				b ₂					

^aNo draft velocities indicated by records.

^bFailure in operation of airspeed-altitude recorder prevented draft-velocity computations.

TABLE II.- SUMMARY OF DRAFT MEASUREMENTS - Concluded

Date	Flight no.	Airplane no.	Assigned altitude (ft)	Tra-verse no.	Draft location from cloud entry (ft)		Draft extent (ft)	Average draft velocity (fps)
					Start	End		
7-11-46	8	347	21,000	b ₃				
				b ₄				
				b ₅				
				b ₆				
		331	16,000	1	7,359	10,214	2,855	-14.2
					14,615	19,518	4,903	-19.6
					27,041	30,590	3,549	-27.2
					6,874	11,801	4,927	18.6
					12,880	17,035	4,155	-17.3
					8,826	14,713	5,887	-13.4
					39,116	43,445	4,329	-29.0
		344	11,000	7	29,600	43,108	13,508	-13.5
					5,056	13,476	8,420	25.9
					38,146	50,229	12,083	11.6
					19,021	21,743	2,722	33.7
		3	50,714	61,500	10,786	21.9		
					22,837	29,320	6,483	-14.2

^aNo draft velocities indicated by records.

^bFailure in operation of airspeed-altitude recorder prevented draft-velocity computations.

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