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THE NASA DIGITAL VGH PROGRAM - EXPLORATION OF METHODS AND FINAL RESULTS

Volume II - L 1011 Data 1978-1979: 1619 HOURS

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FOREWORD

This report was prepared by Eagle Engineering, Inc., Hampton Division, under contract NASW 4430, sponsored by NASA Langley Research Center and the Federal Aviation Administration Technical Center under the FAA-NASA Interagency Agreement No. DTFA03-890-A-00019 of 13 June 1989. This report fulfills the requirement of the Program Plan for the National Aging Aircraft Research Program, DOT/FAA/CT-88/32, August 1989, Paragraph 2.3.2.1, Flight Loads.

The Eagle Engineering, Inc. effort was performed by Norman L. Crabill and administered under the direction of Joseph W. Stickle (NASA Langley Research Center) and Thomas DeFiore (FAA Technical Center).

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EXPLORATION OF METHODS AND FINAL RESULTS

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SUMMARY

Data obtained from the Digital Flight Data Recorder system of a L 1011 aircraft in 914 flights and 1619 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Data on conditions with flap deployment and autopilot use are given. In addition, acceleration statistics are presented from 23 hours on nonrevenue flights.

INTRODUCTION

This document presents the results of the NASA DVGH Program obtained during 1978-1979 operations of a Lockheed L 1011 aircraft. This volume is an extension of the work and methods documented in Volume I. The data reduction analysis and methods, and data presentation are essentially the same as those reported in Volume I. However, this report does contain additional data on autopilot usage and some limited acceleration-derived exceedance data obtained from non-revenue flights.

AIRCRAFT AND INSTRUMENTATION

Aircraft

The aircraft was a Lockheed L 1011 as in Volume I. Aircraft characteristics used in the analysis are given in Table I; the configuration is shown in figure 1 with the location of the accelerometers as indicated.

Instrumentation

The data were obtained from the Digital Flight Data Recorder system described in Volume I. Measurements were:

Parameter	Range and Units	Samples per Second
$a_n + 1$	-3g to +6g	4
a_y	-1g to +1g	4
CAS	100 to 450 kts	1
HP	-1,000 to 50,000 ft	1
FLP	-5° to 60°	1
Autopilot Status	Off or On	Discrete

Note that Spoiler data are not reported here, although they were in Volume I.

SCOPE OF DATA

Data were collected from a single aircraft operating in regular airline service over the service area shown in figure 2 during 1978 and 1979. Almost all of the data (914 flights and 1619 hours) were obtained during passenger-carrying revenue service; a

small amount (56 flights and 23 hours) was obtained during non-revenue service (ferry flights mainly, although some training and maintenance flights may have been included). As in Volume I, some gaps in the data exist due to faulty or missing records, etc., but this is believed to be small (less than 10 percent of the number of flights).

DATA REDUCTION PROCESS

The Data Reduction Process is basically the same as described in Volume I. The filter used to separate maneuver and gust accelerations was the same since the data are for the same type of aircraft described in Volume 1. Although the results of reference 13 in Volume I indicate that the operation of the autopilot can cause up to a 20 percent reduction in the normal acceleration peak response to continuous turbulence, it was decided, after consultation with the industry, not to account for this in deriving U_{de}, in order to maintain comparability with the earlier VGH results, even through the autopilot status was being monitored in this investigation.

RESULTS

Flight Profile and Acceleration Derived Statistics

Presentation of Flight Profile Statistics results is similar to that described in Volume I. Flight Profile Statistics are given in Percent of Time, and as Maximum Values on a Percent of Flight basis for Entire Flights (flaps up or down) and for Flaps Deflected. For operations reported in this volume, the conditions

existing during flap retraction after lift off, and the conditions existing during flap deflection before landing are given.

Acceleration Derived Statistics are also presented as in Volume I, except that with Flaps Deflected, the maximum a_n and Equivalent Airspeeds during that part of the flight are presented for the various flap detents in take off and landing. Also new are level crossing counts for the Acceleration Derived Quantities for non-revenue ferry, training, and maintenance flights. All other results are for revenue flights. The Acceleration Derived quantities are subject to the same limitations discussed in Volume I, which indicates that the exceedances derived from the DFDR system at 4 samples per second may be significantly less than if actual peak values were counted.

The detailed Flight Profile and Acceleration Derived Statistics are given in figures 3 through 24 as shown in Table II. No discussion of the data is presented.

Autopilot Usage

Autopilot status was monitored as off, or on, without regard to the exact on-mode. The altitudes for autopilot turn-on during climb, turn-off during descent, and percent-of-time and percent-of-flights it was on are given in figure 25. The characteristics of a low amplitude oscillation in normal acceleration that appears sporadically in cruise, as first reported in Volume I, are summarized in figure 26. This phenomenon is believed to be due to off-nominal autopilot operation in the altitude-hold mode. The presence of such a low-frequency resonance was predicted in reference 13. Figure 27 shows normal acceleration power spectra

with autopilot off and on. It can be seen that the effect of the autopilot operation is to shift the gust response of aircraft to a higher frequency, that is from 0.35 Hz to 0.8 Hz in this example as predicted in reference 13. Reference 13 also indicates that another effect of the autopilot is a reduction in the gust response by 10 to 25 percent. However, these autopilot effects were not factored into the U_{de} transfer function in this analyses in order to maintain comparability with the previous VGH results.

CONCLUDING REMARKS

Data obtained from the Digital Flight Data Recorder system of an L 1011 aircraft in 914 flights and 1619 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Some new data on conditions with flap deployment and autopilot usage are given. In addition, acceleration statistics are presented from 23 hours on non-revenue flights. No general discussion of the data is presented.

TABLE I

LOCKHEED L 1011-1 CHARACTERISTICS USED IN THE ANALYSIS

- Geometrical Characteristics
  - Wing Area S = 3456 ft^2
  - Wing Mean Chord = 22.3 ft

- Lift Curve Slope C_{L_α} per degree

Flaps up = f(M, HP)

M	HP = 0	10kft	20kft	40 kft
.20	.0923	.0928	.0929	.0936
.35	.0923	.0928	.0930	.0938
.50	.0913	.0920	.0929	.0946
.60	.0918	.0928	.0940	.0963
.70	.0940	.0954	.0970	.1003
.80	--	.1038	.1058	.1100
.89	--	.1210	.1240	.1305
.91	--	--	.1227	.1286
.95	--	--	.1030	.1081

Flaps Down = f(FLP)

FLP, deg	HP = 0
0	.0925
4	.0973
10	.0980
18	.0975
22	.0971
27	.0962
33	.0948
45	.0912

- Weight was computed linearly with time from take off to landing as described in Appendix C in Volume I.

TABLE II

INDEX OF FLIGHT PROFILE AND ACCELERATION STATISTICS

FLIGHT PROFILE STATISTICS

o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
3	Weight vs. Flight Duration	12-17
4	Altitudes and Gross Weights	18
5	Altitudes and Airspeeds	19-22
6	Altitude Summary	23
7	Maximum Altitudes	24-25

o FLAPS DEFLECTED

8	Flap Detent Use	26
9	Weights, Altitudes and Airspeeds	27-33
10	Flap Deflection Times	34-36
11	Equivalent Airspeeds and Detents	37
12	Flap Use above 10,000 ft	38-39

TABLE II (continued)

ACCELERATION DERIVED STATISTICS

o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
13	Normal Acceleration Exceedances	
(a)	a_n matrix	40
(b)	a_{nM} matrix	41
(c)	a_{nG} matrix	42
(d)-(k)	a_n, a_{nM}, a_{nG} plots	43-52
14	Lateral Acceleration Exceedances	
(a)	a_y matrix	53
(b)-(k)	a_y plots	54-63
15	U_{de} Exceedances	
(a)	U_{de} matrix	64
(b)-(k)	U_{de} plots	65-74
16	Peak Positive and Negative a_n vs. Altitude	
(a)	a_n matrix	75
(b)-(k)	a_n plots	76-85
17	Peak Positive and Negative a_{nM} vs. Altitude	
(a)	a_{nM} matrix	86
(b)-(k)	a_{nM} plots	87-96
18	Peak Positive and Negative a_{nG} vs. Altitude	
(a)	a_{nG} matrix	97
(b)-(k)	a_{nG} plots	98-107

TABLE II (concluded)

19 Peak Positive and Negative U_{de} vs. Altitude

(a)	U_{de} matrix	108
(b)-(k)	U_{de} plots	109-118

o FLAPS DEFLECTED

Figure Number	Subject	Page Numbers
20	a_n Exceedances with Flaps Deflected	
(a)	Take Off Detents matrix	119
(b)	Take Off Detents plot	120
(c)	Landing Detents matrix	121
(d)	Landing Detents plot	122
21	Peak Positive and Negative a_n per flight and EAS bands	
(a)-(d)	Take Off Detents	123-126
(e)-(k)	Landing Detents	127-133

o NON-REVENUE FLIGHTS

Figure Number	Subject	Page Numbers
22	Normal Acceleration Exceedances	
(a)	a_n matrix	134
(b)	a_{nM} matrix	135
(c)	a_{nG} matrix	136
(d)	a_n, a_{nM}, a_{nG} plots	137-146
23	Lateral Acceleration Exceedances	
(a)	a_y matrix	147
(b)-(k)	a_y plots	148-157
24	U_{de} Exceedances	
(a)	U_{de} matrix	158
(b)-(k)	U_{de} plots	159-168

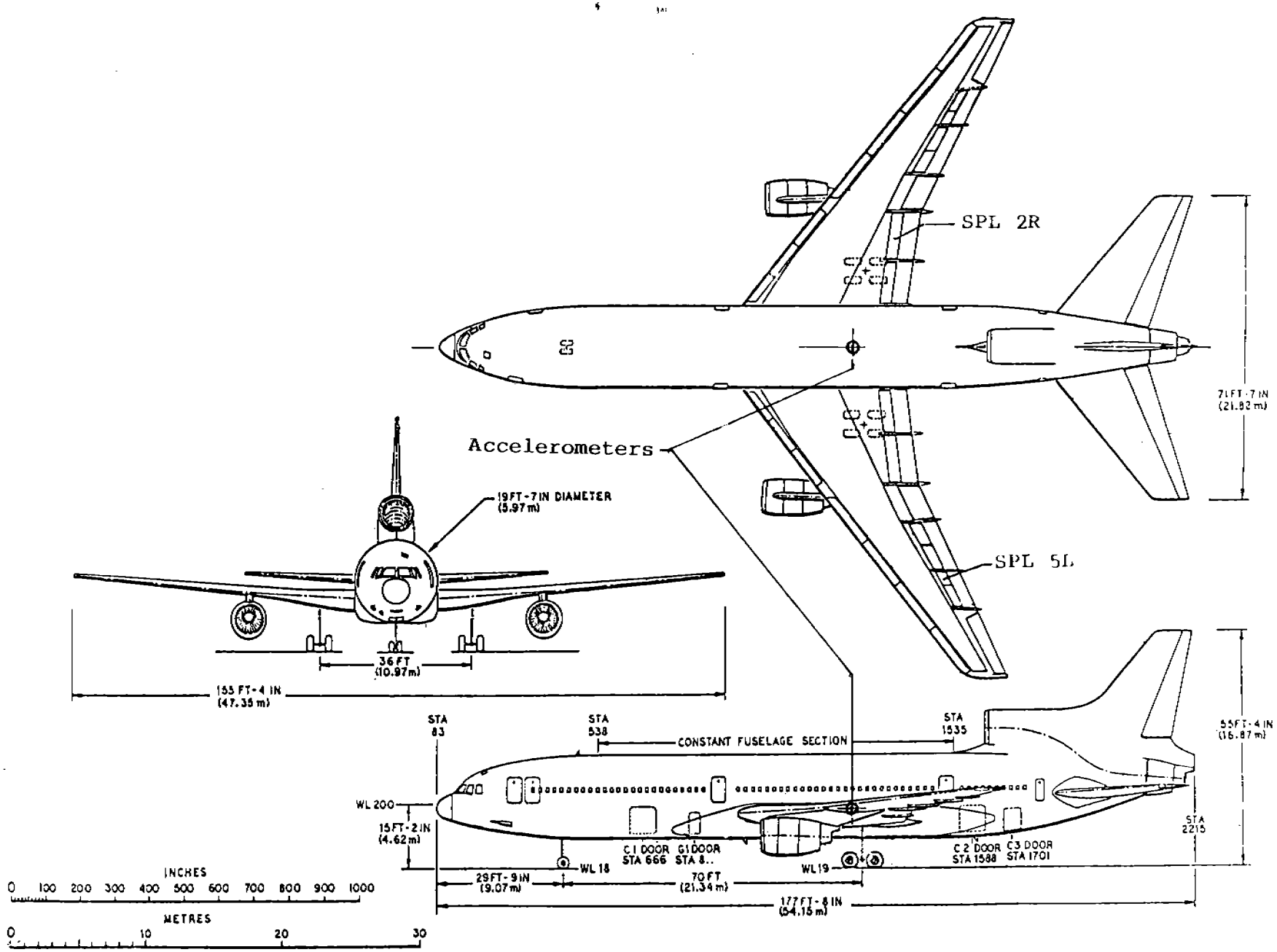
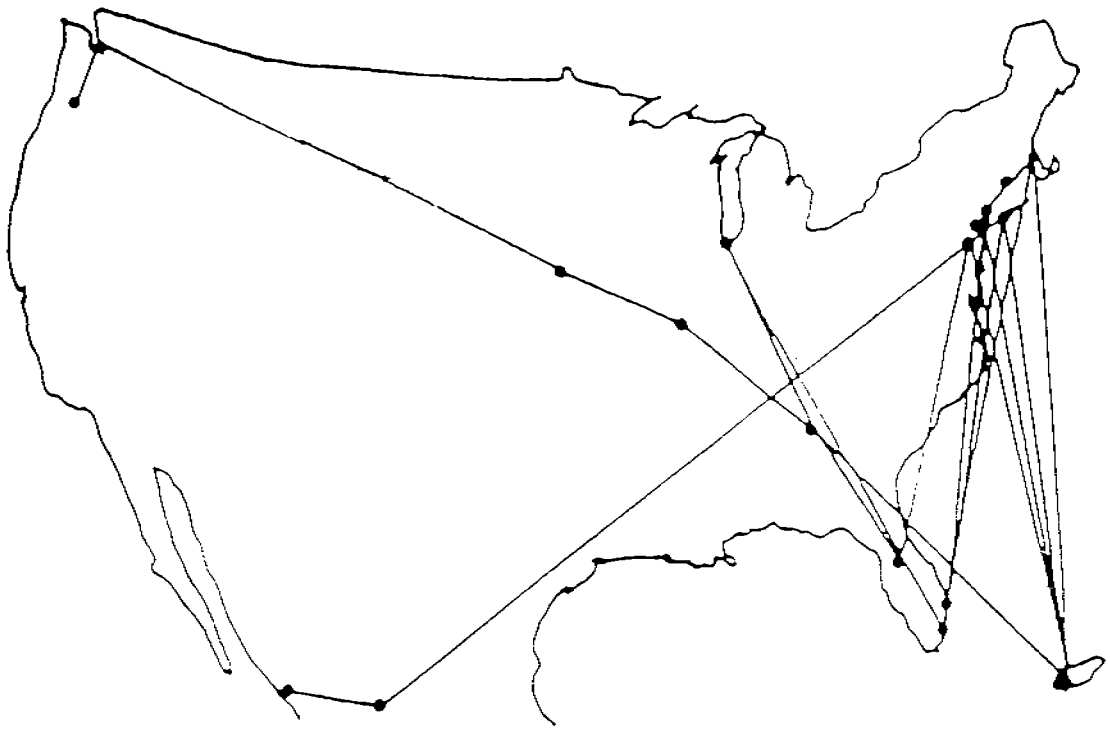


FIGURE 1.- Aircraft three-view with locations of accelerometers and spoilers.



MARCH 1978 - JULY 1979

914 FLIGHTS

1619 HOURS

700,000 N. MILES

FIGURE 2.- Location of service area and scope of data.

PERCENT OF FLIGHTS

DURATION OF FLIGHT, HOURS	250 TO 270 KLBS	270 TO 290 KLBS	290 TO 310 KLBS	310 TO 330 KLBS	330 TO 350 KLBS	350 TO 370 KLBS	370 TO 390 KLBS	390 TO 410 KLBS	410 TO 430 KLBS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0.1	0.1	0
4.5-5.0	0	0	0	0	0	0.1	0.1	0.3	0.2
4.0-4.5	0	0	0	0	0	0.2	0.8	1.0	0.1
3.5-4.0	0	0	0	0	0	0.7	1.3	1.6	0.7
3.0-3.5	0	0	0	0	0.1	1.5	3.8	3.0	0.4
2.5-3.0	0	0	0	0.1	0.8	1.9	3.4	2.6	0.2
2.0-2.5	0	0	0	1.3	3.9	6.2	4.9	0.5	0
1.5-2.0	0	0	0.1	1.1	3.6	3.9	2.5	0.1	0
1.0-1.5	0	0	0.5	2.4	4.9	6.0	1.5	0	0
.8-1.0	0	0	0.2	1.4	2.7	1.4	0	0	0
.6-.8	0	0	0.5	1.9	1.2	0.7	0	0	0
.5-.6	0	0	1.4	2.2	2.2	0.9	0	0	0
.4-.5	0	0.3	1.6	2.6	1.4	0.5	0	0	0
.3-.4	0	0.3	1.9	2.5	1.5	0	0	0	0
.0-.3	0	0.2	0.5	0.7	0.1	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0	0.9	6.9	16.2	22.5	24.1	18.5	9.3	1.6

(a) Gross weight at take off

Figure 3.- Percent of flights: Weight vs duration.

PERCENT OF FLIGHTS

DURATION OF FLIGHT, HOURS	250 TO 270 KLBS	270 TO 290 KLBS	290 TO 310 KLBS	310 TO 330 KLBS	330 TO 350 KLBS	350 TO 370 KLBS	370 TO 390 KLBS	390 TO 410 KLBS	410 TO 430 KLBS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0.1	0.1	0	0	0	0	0
4.5-5.0	0	0.1	0.1	0.3	0.2	0	0	0	0
4.0-4.5	0	0	0.5	1.1	0.4	0	0	0	0
3.5-4.0	0	0	0.4	2.2	1.5	0.1	0	0	0
3.0-3.5	0	0.1	0.5	4.2	3.6	0.4	0	0	0
2.5-3.0	0	0.1	1.4	2.4	4.5	0.5	0	0	0
2.0-2.5	0	1.0	3.3	6.2	5.7	0.8	0	0	0
1.5-2.0	0	0.7	1.5	4.3	4.3	0.7	0	0	0
1.0-1.5	0	0.4	2.7	4.9	6.1	1.2	0	0	0
.8-1.0	0	0.2	0.4	3.2	2.0	0	0	0	0
.6-.8	0	0.1	1.5	1.4	1.2	0	0	0	0
.5-.6	0	0.3	2.3	2.2	1.3	0.5	0	0	0
.4-.5	0	0.8	2.2	2.1	1.3	0.2	0	0	0
.3-.4	0	0.5	2.5	2.1	1.1	0	0	0	0
.0-.3	0	0.2	0.5	0.7	0.1	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0	4.6	20.2	37.3	33.4	4.5	0	0	0

(b) Gross weight at landing

Figure 3.- Continued.

PERCENT OF FLIGHTS

DURATION OF FLIGHT, HOURS	10 TO 30 KLBS	30 TO 50 KLBS	50 TO 70 KLBS	70 TO 90 KLBS	90 TO 110 KLBS	110 TO 130 KLBS	130 TO 150 KLBS	150 TO 170 KLBS	170 TO 190 KLBS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0.1	0.1	0	0	0
4.5-5.0	0	0	0	0	0.3	0.4	0	0	0
4.0-4.5	0	0	0	0	1.8	0.3	0	0	0
3.5-4.0	0	0	0	1.2	3.0	0.1	0	0	0
3.0-3.5	0	0	0	6.6	2.3	0	0	0	0
2.5-3.0	0	0	1.1	6.8	1.1	0	0	0	0
2.0-2.5	0	0	13.0	3.5	0.4	0	0	0	0
1.5-2.0	0	0.1	8.8	2.2	0.3	0	0	0	0
1.0-1.5	0	4.6	9.8	1.0	0	0	0	0	0
.8-1.0	0	3.2	2.2	0.4	0	0	0	0	0
.6-.8	0	2.3	2.0	0	0	0	0	0	0
.5-.6	0	4.0	2.0	0.7	0	0	0	0	0
.4-.5	0	4.4	2.0	0.2	0	0	0	0	0
.3-.4	0.2	3.9	2.1	0	0	0	0	0	0
.0-.3	0.3	0.7	0.5	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0.5	23.2	43.4	22.5	9.3	1.0	0	0	0

(c) Fuel weight at take off

Figure 3.- Continued.

PERCENT OF FLIGHTS

DURATION OF FLIGHT, HOURS	10 TO 30 KLBS	30 TO 50 KLBS	50 TO 70 KLBS	70 TO 90 KLBS	90 TO 110 KLBS	110 TO 130 KLBS	130 TO 150 KLBS	150 TO 170 KLBS	170 TO 190 KLBS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0.2	0	0	0	0	0	0	0	0
4.5-5.0	0.2	0.5	0	0	0	0	0	0	0
4.0-4.5	1.1	1.0	0	0	0	0	0	0	0
3.5-4.0	2.3	2.0	0	0	0	0	0	0	0
3.0-3.5	4.0	4.8	0	0	0	0	0	0	0
2.5-3.0	4.2	4.4	0.4	0	0	0	0	0	0
2.0-2.5	11.3	5.0	0.7	0	0	0	0	0	0
1.5-2.0	4.6	5.5	1.3	0	0	0	0	0	0
1.0-1.5	5.4	9.1	1.0	0	0	0	0	0	0
.8-1.0	1.4	3.8	0.5	0	0	0	0	0	0
.6-.8	1.1	2.5	0.7	0	0	0	0	0	0
.5-.6	1.6	3.6	0.9	0.5	0	0	0	0	0
.4-.5	1.0	4.4	1.0	0.2	0	0	0	0	0
.3-.4	1.1	3.7	1.4	0	0	0	0	0	0
.0-.3	0.3	0.7	0.5	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	39.8	51.0	8.4	0.8	0	0	0	0	0

(d) Fuel weight at landing

Figure 3.- Continued.

PERCENT OF FLIGHTS

DURATION OF FLIGHT, HOURS	0 TO 20 KLBS	20 TO 40 KLBS	40 TO 60 KLBS	60 TO 80 KLBS	80 TO 100 KLBS	100 TO 120 KLBS	120 TO 140 KLBS	140 TO 160 KLBS	160 TO 180 KLBS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0.2	0	0	0	0
4.5-5.0	0	0	0	0.5	0.2	0	0	0	0
4.0-4.5	0	0	0	2.0	0.1	0	0	0	0
3.5-4.0	0	0	0.8	3.5	0	0	0	0	0
3.0-3.5	0	0	7.9	1.0	0	0	0	0	0
2.5-3.0	0	0.7	8.3	0	0	0	0	0	0
2.0-2.5	0	13.7	3.3	0	0	0	0	0	0
1.5-2.0	0	11.3	0.1	0	0	0	0	0	0
1.0-1.5	5.9	9.5	0	0	0	0	0	0	0
.8-1.0	5.7	0.1	0	0	0	0	0	0	0
.6-.8	4.3	0	0	0	0	0	0	0	0
.5-.6	6.7	0	0	0	0	0	0	0	0
.4-.5	6.6	0	0	0	0	0	0	0	0
.3-.4	6.2	0	0	0	0	0	0	0	0
.0-.3	1.5	0	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	36.9	35.2	20.4	7.0	0.5	0	0	0	0

(e) Fuel burn vs flight duration

Figure 3.- Continued.

PERCENT OF FLIGHTS

DURATION OF FLIGHT, HOURS	0 TO 20 KLBS	20 TO 40 KLBS	40 TO 60 KLBS	60 TO 80 KLBS	80 TO 100 KLBS	100 TO 120 KLBS	120 TO 140 KLBS	140 TO 160 KLBS	160 TO 180 KLBS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0.2	0	0	0	0	0	0	0
4.5-5.0	0.1	0.3	0.3	0	0	0	0	0	0
4.0-4.5	0.2	0.8	1.0	0.1	0	0	0	0	0
3.5-4.0	0	0.9	2.3	1.1	0	0	0	0	0
3.0-3.5	0.1	2.4	4.0	2.3	0	0	0	0	0
2.5-3.0	0.1	2.4	3.9	2.5	0	0	0	0	0
2.0-2.5	1.8	5.0	6.7	3.5	0	0	0	0	0
1.5-2.0	1.1	3.7	4.9	1.6	0	0	0	0	0
1.0-1.5	1.4	4.6	5.4	4.0	0	0	0	0	0
.8-1.0	0.4	2.0	3.2	0.2	0	0	0	0	0
.6-.8	1.3	1.5	1.1	0.3	0	0	0	0	0
.5-.6	2.8	1.8	1.8	0.3	0	0	0	0	0
.4-.5	2.6	2.6	1.2	0.1	0	0	0	0	0
.3-.4	2.8	2.5	0.8	0.1	0	0	0	0	0
.0-.3	1.1	0.2	0.2	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	16.0	31.0	36.8	16.3	0	0	0	0	0

(f) Payload weight vs flight duration.

Figure 3.- Concluded.

PRESSURE ALTITUDE BANDS

GROSS WEIGHT KLBS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
CLIMB										
250-270	0	0	0	0	0	0	0	0	0	0
270-290	0.0163	0.0097	0.0056	0.0026	0.0006	0	0	0	0	0.0347
290-310	0.1037	0.1176	0.1110	0.0812	0.0547	0.0447	0.0499	0.0413	0.0099	0.6140
310-330	0.2683	0.3059	0.3629	0.3093	0.2991	0.3770	0.4765	0.2901	0.0069	2.6961
330-350	0.4056	0.4321	0.5335	0.4886	0.5379	0.6953	0.8288	0.4155	0	4.3373
350-370	0.4645	0.5076	0.6480	0.6441	0.8088	1.1113	1.4090	0.6716	0	6.2650
370-390	0.3895	0.4014	0.4882	0.4780	0.6133	0.8607	1.0575	0.2857	0	4.5743
390-410	0.2076	0.1971	0.2363	0.2370	0.2925	0.3668	0.3950	0.0342	0	1.9664
410-430	0.0381	0.0371	0.0441	0.0320	0.0367	0.0279	0.0157	0	0	0.2316
PERCENT TOTAL TIME =	1.8937	2.0084	2.4296	2.2726	2.6436	3.4838	4.2324	1.7384	0.0169	20.7194
AVE GROSS WEIGHT IN ALTITUDE BAND	355.78	354.74	355.71	357.25	360.05	360.54	359.83	351.19	308.23	
LEVEL										
250-270	0	0	0	0	0	0	0	0	0	0
270-290	0.0493	0.1229	0.0305	0.0081	0.0110	0.0069	0.0050	0.0692	0.0110	0.3141
290-310	0.2012	0.2475	0.2592	0.0722	0.1831	0.1105	0.0804	1.7220	0.1396	3.0158
310-330	0.3938	0.3934	0.6388	0.2421	0.1971	0.3003	0.6058	7.5552	0.0244	10.3509
330-350	0.3632	0.4346	0.4546	0.2157	0.2765	0.4818	2.1031	14.8063	0	19.1359
350-370	0.0659	0.0807	0.1402	0.0763	0.1035	0.4437	3.7598	14.1293	0	18.7994
370-390	0	0.0201	0.0022	0	0.0045	0.1727	3.0682	4.5582	0	7.8258
390-410	0.0016	0.0055	0.0014	0	0.0011	0	0.7742	0.5306	0	1.3145
410-430	0	0.0012	0	0	0	0	0.0797	0	0	0.0810
PERCENT TOTAL TIME =	1.0751	1.3059	1.5269	0.6145	0.7769	1.5160	10.4763	43.3707	0.1751	60.8373
AVE GROSS WEIGHT IN ALTITUDE BAND	323.75	322.92	325.60	329.11	327.62	343.26	362.44	346.29	301.53	
DESCENT										
250-270	0	0	0	0	0	0	0	0	0	0
270-290	0.2089	0.1166	0.0487	0.0294	0.0250	0.0218	0.0269	0.0153	0.0019	0.4945
290-310	0.8501	0.6147	0.4338	0.2600	0.2120	0.2045	0.1718	0.1069	0.0007	2.8546
310-330	1.6165	1.1890	0.9742	0.6359	0.5453	0.5677	0.5078	0.2760	0	6.3125
330-350	1.5097	1.2241	1.0400	0.7301	0.6966	0.7383	0.7115	0.2451	0	6.8953
350-370	0.2186	0.2113	0.2584	0.2216	0.2430	0.2725	0.3072	0.0856	0	1.8212
370-390	0	0.0023	0.0025	0.0019	0.0019	0.0115	0.0257	0.0186	0	0.0644
390-410	0	0	0	0	0	0	0	0.0009	0	0.0009
410-430	0	0	0	0	0	0	0	0	0	0
PERCENT TOTAL TIME =	4.4038	3.3580	2.7577	1.8789	1.7238	1.8194	1.7509	0.7483	0.0026	18.4433
AVE GROSS WEIGHT IN ALTITUDE BAND	323.08	324.80	327.49	329.16	330.75	331.83	333.45	329.03	285.62	

TOTAL FLIGHTS	914
TOTAL TIME	1619.24
TOTAL AIRMILES	708383.64

$$\text{PERCENT TIME} = \frac{\text{HOURS IN ALTITUDE \& CLIMB (LEVEL, DESCENT) \& GROSS WEIGHT BANDS}}{\text{TOTAL TIME, HOURS}} \times 100$$

Figure 4.- Percent time in altitude and gross weight bands.

PRESSURE ALTITUDE BANDS

CAS BAND, KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0	0	0	0	0	0	0	0	0	0
130-140	0	0	0	0	0	0	0	0	0	0
140-150	0.0001	0	0	0	0	0	0	0	0	0.0001
150-160	0.0014	0.0003	0.0001	0	0	0	0	0	0	0.0018
160-170	0.0111	0.0011	0.0004	0	0	0	0	0	0	0.0126
170-180	0.0647	0.0028	0.0003	0	0	0	0	0	0	0.0678
180-190	0.1742	0.0048	0.0003	0	0	0	0	0	0	0.1792
190-200	0.2351	0.0045	0.0003	0	0	0	0	0	0	0.2398
200-210	0.2121	0.0077	0.0043	0.0017	0	0	0	0	0	0.2257
210-220	0.2292	0.0144	0.0032	0.0007	0	0	0	0	0	0.2475
220-230	0.2565	0.0350	0.0040	0.0007	0	0	0.0006	0	0	0.2968
230-240	0.1894	0.0875	0.0102	0.0031	0.0008	0.0006	0.0011	0	0	0.2926
240-250	0.1855	0.4576	0.0980	0.0096	0.0024	0.0014	0.0016	0.0075	0.0015	0.7650
250-260	0.1952	0.7525	0.2293	0.0170	0.0040	0.0038	0.0057	0.0769	0.0122	1.2966
260-270	0.0582	0.1889	0.1632	0.0126	0.0047	0.0033	0.0231	0.3653	0.0031	0.8225
270-280	0.0242	0.0654	0.1602	0.0295	0.0132	0.0118	0.1180	0.7650	0	1.1872
280-290	0.0153	0.0446	0.1962	0.0830	0.0791	0.0936	0.7517	0.4611	0	1.7245
290-300	0.0143	0.0831	0.5243	0.7714	0.9290	1.2477	1.7773	0.0621	0	5.4092
300-310	0.0165	0.1335	0.6549	0.8712	1.0971	1.5036	1.3085	0.0006	0	5.5859
310-320	0.0071	0.0644	0.1914	0.2392	0.2831	0.3620	0.2172	0	0	1.3644
320-330	0.0031	0.0249	0.0811	0.1005	0.1112	0.1429	0.0266	0	0	0.4903
330-340	0.0005	0.0136	0.0441	0.0514	0.0532	0.0699	0.0011	0	0	0.2339
340-350	0	0.0138	0.0328	0.0415	0.0426	0.0382	0	0	0	0.1689
350-360	0	0.0079	0.0225	0.0323	0.0226	0.0045	0	0	0	0.0899
360-370	0	0.0002	0.0070	0.0072	0.0008	0.0002	0	0	0	0.0154
370-380	0	0	0.0014	0.0003	0	0	0	0	0	0.0018
380-390	0	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	222.1913	261.9649	291.8472	303.6753	304.1234	303.6186	296.7216	275.2610	255.9756	
TOTAL HRS IN ALT.& CLIMB	30.6635	32.5208	39.3414	36.7997	42.8065	56.4105	68.5331	28.1487	0.2733	335.4975
PERCENT TIME, IN ALT.& CLIMB	1.8937	2.0084	2.4296	2.2726	2.6436	3.4838	4.2324	1.7384	0.0169	20.7194

TOTAL FLIGHTS 914
TOTAL HOURS 1619.2

(a) Climb

Figure 5.- Percent time in altitude and airspeed bands.

PRESSURE ALTITUDE BANDS

CAS BAND KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0.0001	0	0	0	0	0	0	0	0	0.0001
130-140	0.0011	0.0002	0	0	0	0	0	0	0	0.0013
140-150	0.0105	0.0017	0	0	0	0	0	0	0	0.0122
150-160	0.0741	0.0032	0.0010	0	0	0	0	0	0	0.0784
160-170	0.1836	0.0230	0.0007	0	0	0	0	0	0	0.2073
170-180	0.1564	0.0439	0.0078	0	0	0	0	0	0	0.2080
180-190	0.1307	0.0395	0.0053	0	0	0	0	0	0	0.1755
190-200	0.0516	0.0169	0.0036	0	0	0	0	0	0	0.0721
200-210	0.0539	0.0939	0.0242	0.0002	0	0	0	0	0	0.1722
210-220	0.0700	0.1691	0.1152	0.0010	0	0	0	0	0	0.3554
220-230	0.0541	0.0752	0.0817	0.0011	0.0067	0	0	0.0040	0	0.2229
230-240	0.0510	0.0645	0.0689	0.0025	0.0583	0.0135	0.0026	0.0165	0	0.2779
240-250	0.0641	0.2159	0.1361	0.0125	0.0126	0.0103	0.0039	0.0502	0.0062	0.5119
250-260	0.0792	0.2874	0.1978	0.0138	0.0253	0.0096	0.0014	0.2037	0.1684	0.9867
260-270	0.0234	0.1047	0.1048	0.0049	0.0092	0.0056	0.0034	3.1522	0.0004	3.4087
270-280	0.0113	0.0293	0.0768	0.0037	0.0138	0.0045	0.0168	15.0436	0	15.1998
280-290	0.0092	0.0210	0.0753	0.0062	0.0061	0.0063	0.0482	12.2956	0	12.4680
290-300	0.0085	0.0253	0.0770	0.0127	0.0093	0.0144	0.8929	12.6007	0	13.6407
300-310	0.0071	0.0201	0.0879	0.0122	0.0170	0.0310	6.6572	0.0041	0	6.8366
310-320	0.0057	0.0145	0.0960	0.0147	0.0303	0.0820	2.2265	0	0	2.4698
320-330	0.0113	0.0102	0.0918	0.0355	0.0547	0.4939	0.6232	0	0	1.3207
330-340	0.0114	0.0137	0.0789	0.0821	0.1047	0.5902	0.0002	0	0	0.8812
340-350	0.0064	0.0139	0.0816	0.1437	0.1626	0.1791	0	0	0	0.5872
350-360	0	0.0163	0.0666	0.1881	0.1817	0.0698	0	0	0	0.5226
360-370	0	0.0024	0.0446	0.0778	0.0827	0.0057	0	0	0	0.2131
370-380	0	0	0.0033	0.0017	0.0020	0	0	0	0	0.0070
380-390	0	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	204.1130	242.0146	279.7108	338.9914	327.6451	329.2281	307.2635	282.7732	254.6688	
TOTAL HRS IN ALT.& LEVEL	17.4081	21.1458	24.7247	9.9497	12.5792	24.5475	169.6369	702.2781	2.8350	985.1050
PERCENT TIME IN ALT. & LEVEL	1.0751	1.3059	1.5269	0.6145	0.7769	1.5160	10.4763	43.3707	0.1751	60.8373

TOTAL FLIGHTS 914
TOTAL HOURS 1619.2

(b) Level

Figure 5.- Continued.

PRESSURE ALTITUDE BANDS

CAS BAND KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0.0105	0.0009	0	0	0	0	0	0	0	0.0115
130-140	0.2221	0.0076	0	0	0	0	0	0	0	0.2297
140-150	0.8841	0.0128	0	0	0	0	0	0	0	0.8970
150-160	0.8058	0.0339	0.0021	0	0	0	0	0	0	0.8418
160-170	0.5278	0.0976	0.0043	0	0	0	0	0	0	0.6298
170-180	0.3724	0.1697	0.0135	0	0	0	0	0	0	0.5557
180-190	0.2995	0.1762	0.0211	0	0	0	0	0	0	0.4968
190-200	0.1979	0.1382	0.0172	0.0004	0	0	0	0	0	0.3537
200-210	0.1789	0.2093	0.0391	0.0008	0	0	0	0	0	0.4280
210-220	0.1887	0.3161	0.0822	0.0068	0.0029	0	0	0	0	0.5967
220-230	0.1289	0.2039	0.0479	0.0152	0.0071	0.0008	0.0013	0	0	0.4049
230-240	0.1149	0.2058	0.0680	0.0229	0.0181	0.0049	0.0031	0	0	0.4378
240-250	0.1522	0.5020	0.2034	0.0404	0.0350	0.0190	0.0043	0.0011	0	0.9574
250-260	0.1170	0.6136	0.2629	0.0803	0.0339	0.0209	0.0066	0.0111	0.0021	1.1484
260-270	0.0334	0.1313	0.1011	0.0193	0.0165	0.0161	0.0177	0.0658	0.0005	0.4019
270-280	0.0243	0.0563	0.0821	0.0214	0.0168	0.0161	0.0284	0.1287	0	0.3741
280-290	0.0252	0.0469	0.0809	0.0344	0.0247	0.0201	0.0557	0.2634	0	0.5512
290-300	0.0224	0.0385	0.1000	0.0870	0.0637	0.0457	0.1956	0.2382	0	0.7911
300-310	0.0184	0.0394	0.1317	0.0799	0.0767	0.0661	0.4186	0.0400	0	0.8708
310-320	0.0199	0.0437	0.1366	0.0687	0.0646	0.0941	0.4617	0.0001	0	0.8894
320-330	0.0184	0.0523	0.1641	0.0916	0.0655	0.1980	0.3941	0	0	0.9840
330-340	0.0202	0.0676	0.2276	0.1505	0.1125	0.4107	0.1557	0	0	1.1447
340-350	0.0160	0.0926	0.3207	0.2920	0.2314	0.4843	0.0081	0	0	1.4452
350-360	0.0045	0.0706	0.3782	0.4606	0.4040	0.3109	0	0	0	1.6289
360-370	0.0002	0.0295	0.2544	0.3793	0.5002	0.0994	0	0	0	1.2630
370-380	0	0.0014	0.0183	0.0275	0.0501	0.0122	0	0	0	0.1095
380-390	0	0	0	0	0.0002	0	0	0	0	0.0003
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	179.8910	240.3053	304.3755	333.4549	339.8685	334.8912	311.8291	285.2743	257.0915	
TOTAL HRS IN ALT.& DESCENT	71.3083	54.3736	44.6533	30.4234	27.9122	29.4610	28.3508	12.1172	0.0425	298.6423
PERCENT TIME IN ALT.& DESCENT	4.4038	3.3580	2.7577	1.8789	1.7238	1.8194	1.7509	0.7483	0.0026	18.4433

TOTAL FLIGHTS 914
TOTAL HOURS 1619.2

(c) Descent

Figure 5.- Continued.

PRESSURE ALTITUDE BANDS

CAS BAND KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0.0107	0.0009	0	0	0	0	0	0	0	0.0116
130-140	0.2232	0.0079	0	0	0	0	0	0	0	0.2310
140-150	0.8948	0.0145	0.0001	0	0	0	0	0	0	0.9093
150-160	0.8812	0.0375	0.0033	0	0	0	0	0	0	0.9220
160-170	0.7226	0.1217	0.0054	0	0	0	0	0	0	0.8497
170-180	0.5935	0.2165	0.0216	0	0	0	0	0	0	0.8315
180-190	0.6044	0.2205	0.0267	0	0	0	0	0	0	0.8516
190-200	0.4846	0.1596	0.0212	0.0004	0	0	0	0	0	0.6657
200-210	0.4448	0.3109	0.0675	0.0027	0	0	0	0	0	0.8260
210-220	0.4879	0.4997	0.2007	0.0084	0.0029	0	0	0	0	1.1996
220-230	0.4396	0.3141	0.1336	0.0170	0.0137	0.0008	0.0019	0.0040	0	0.9247
230-240	0.3553	0.3578	0.1471	0.0285	0.0772	0.0191	0.0068	0.0165	0	1.0083
240-250	0.4018	1.1755	0.4375	0.0625	0.0501	0.0307	0.0098	0.0587	0.0077	2.2343
250-260	0.3914	1.6535	0.6901	0.1111	0.0632	0.0343	0.0137	0.2916	0.1827	3.4317
260-270	0.1151	0.4249	0.3692	0.0367	0.0303	0.0251	0.0442	3.5834	0.0041	4.6330
270-280	0.0599	0.1510	0.3191	0.0546	0.0437	0.0324	0.1632	15.9372	0	16.7611
280-290	0.0497	0.1126	0.3524	0.1235	0.1098	0.1200	0.8556	13.0201	0	14.7438
290-300	0.0453	0.1469	0.7013	0.8710	1.0020	1.3007	2.8657	12.9010	0	19.8410
300-310	0.0420	0.1930	0.8745	0.9633	1.1907	1.6008	8.3842	0.0447	0	13.2932
310-320	0.0327	0.1227	0.4240	0.3226	0.3780	0.5382	2.9054	0.0001	0	4.7235
320-330	0.0328	0.0874	0.3370	0.2276	0.2315	0.8349	1.0439	0	0	2.7950
330-340	0.0322	0.0949	0.3507	0.2839	0.2704	1.0708	0.1570	0	0	2.2598
340-350	0.0224	0.1203	0.4351	0.4771	0.4366	0.7016	0.0081	0	0	2.2013
350-360	0.0046	0.0948	0.4674	0.6810	0.6083	0.3853	0	0	0	2.2414
360-370	0.0002	0.0321	0.3060	0.4643	0.5836	0.1053	0	0	0	1.4915
370-380	0	0.0014	0.0230	0.0296	0.0520	0.0122	0	0	0	0.1183
380-390	0	0	0	0	0.0002	0	0	0	0	0.0003
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	194.2882	247.1595	294.2328	319.9683	319.6600	317.6557	305.0384	282.5293	254.8149	
TOTAL HRS IN ALTITUDE BAND	119.3799	108.0403	108.7194	77.1728	83.2978	110.4190	266.5208	742.5439	3.1508	1619.2448
PERCENT TIME, IN ALTITUDE BAND	7.3726	6.6723	6.7142	4.7660	5.1442	6.8192	16.4596	45.8574	0.1946	100.0000

TOTAL FLIGHTS 914
TOTAL HOURS 1619.2

(d) All flight modes

Figure 5.- Concluded.

PRESSURE ALTITUDE BANDS

TIME INTERVAL HOURS IN ALT. BAND	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT
6.50-7.00	0	0	0	0	0	0	0	0	0
6.00-6.50	0	0	0	0	0	0	0	0	0
5.50-6.00	0	0	0	0	0	0	0	0	0
5.00-5.50	0	0	0	0	0	0	0	0	0
4.50-5.00	0	0	0	0	0	0	0	0	0
4.00-4.50	0	0	0	0	0	0	0	0.219	0
3.50-4.00	0	0	0	0	0	0	0	0.547	0
3.00-3.50	0	0	0	0	0	0	0.109	1.641	0
2.50-3.00	0	0	0	0	0	0	0.766	4.048	0
2.00-2.50	0	0	0	0	0	0.109	2.626	8.425	0
1.50-2.00	0	0	0	0	0	0.109	0.985	7.768	0
1.00-1.50	0	0.109	0	0	0	0.547	2.845	15.755	0.219
.90-1.00	0	0	0	0	0	0	1.313	0.985	0
.80-.90	0	0.109	0	0	0.109	0.219	1.532	1.969	0
.70-.80	0	0.109	0	0	0.109	0	0.985	1.641	0
.60-.70	0	0	0.109	0	0	0	0.875	2.626	0
.50-.60	0.109	0.109	0	0	0	0.219	0.985	2.298	0.109
.45-.50	0	0	0	0	0	0.547	0.656	2.626	0
.40-.45	0.109	0	0.328	0	0.109	0.656	1.204	1.094	0
.35-.40	0.219	0.109	0	0	0	0.109	1.422	1.313	0
.30-.35	0.547	0.438	0.328	0	0	0.438	2.516	0.656	0
.25-.30	1.532	0.875	0.766	0.766	0.438	0.985	2.298	0.328	0
.20-.25	4.267	4.376	3.173	1.422	2.079	4.267	6.236	0.985	0
.15-.20	16.849	10.832	19.365	3.173	4.923	12.582	21.444	1.422	0
.10-.15	53.282	36.433	37.856	14.770	30.197	47.593	23.523	0.766	0
.05-.10	21.991	46.171	34.354	71.444	45.295	7.659	0.875	0.219	0
.00-.05	1.094	0.219	0.328	0.766	0	0	0	0.109	0
TOTAL HOURS IN ALT BAND	119.3799	108.0403	108.7194	77.1728	83.2978	110.4190	266.5208	742.5439	3.1508
TOTAL PERCENT TIME IN ALT BAND	7.3726	6.6723	6.7142	4.7660	5.1442	6.8192	16.4596	45.8574	0.1946

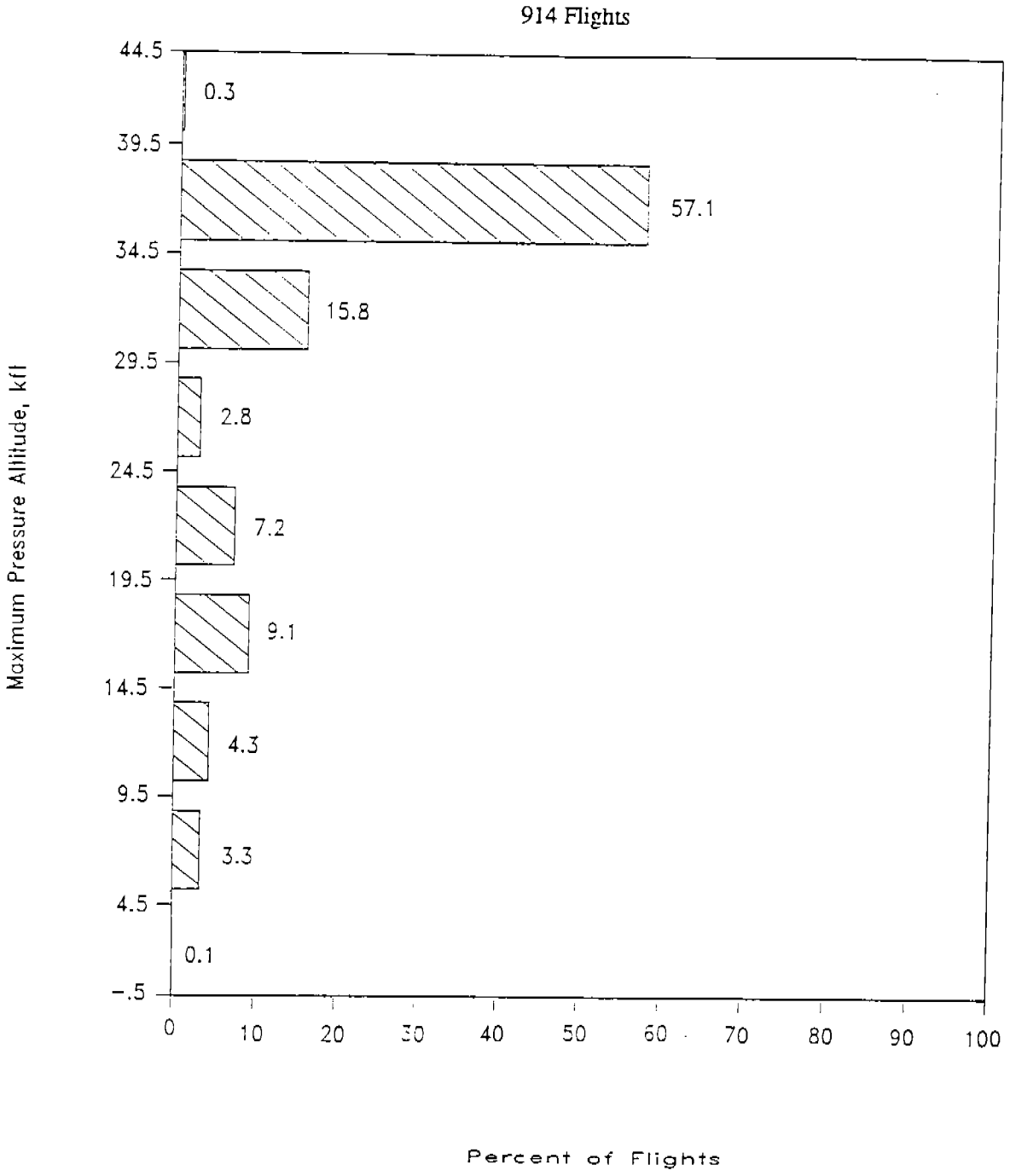
TOTAL FLIGHTS 914
TOTAL HOURS 1619.2

Figure 6.- Percent of flights that spend indicated time in pressure altitude bands.

DURATION OF FLIGHT, HOURS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0	0.2	0
4.5-5.0	0	0	0	0	0	0	0	0.8	0
4.0-4.5	0	0	0	0	0	0	0.1	2.0	0
3.5-4.0	0	0	0	0	0	0	0.4	3.8	0
3.0-3.5	0	0	0	0	0	0	1.0	7.9	0
2.5-3.0	0	0	0	0	0	0.1	2.4	6.5	0
2.0-2.5	0	0	0	0.1	0	0.1	1.3	15.2	0.2
1.5-2.0	0	0	0	0	0	0.3	2.1	8.9	0.1
1.0-1.5	0	0.1	0	0	0	0.9	4.0	10.4	0
.8-1.0	0	0	0	0.1	0	0.7	3.6	1.4	0
.6-.8	0	0	0.1	1.5	1.3	0.5	0.7	0.1	0
.5-.6	0	0	0.1	1.2	5.0	0.2	0.1	0	0
.4-.5	0	0.7	1.3	3.7	0.9	0	0	0	0
.3-.4	0	1.5	2.3	2.4	0	0	0	0	0
.0-.3	0.1	1.0	0.4	0	0	0	0	0	0
TOTAL PERCENT ALL FLIGHTS	0.1	3.3	4.3	9.1	7.2	2.8	15.8	57.1	0.3

(a) Maximum altitude vs flight duration - matrix

Figure 7.- Percent of flights to maximum pressure altitude.



(b) Percent of flights to maximum pressure altitude per flight : plot

Figure 7.- Concluded.

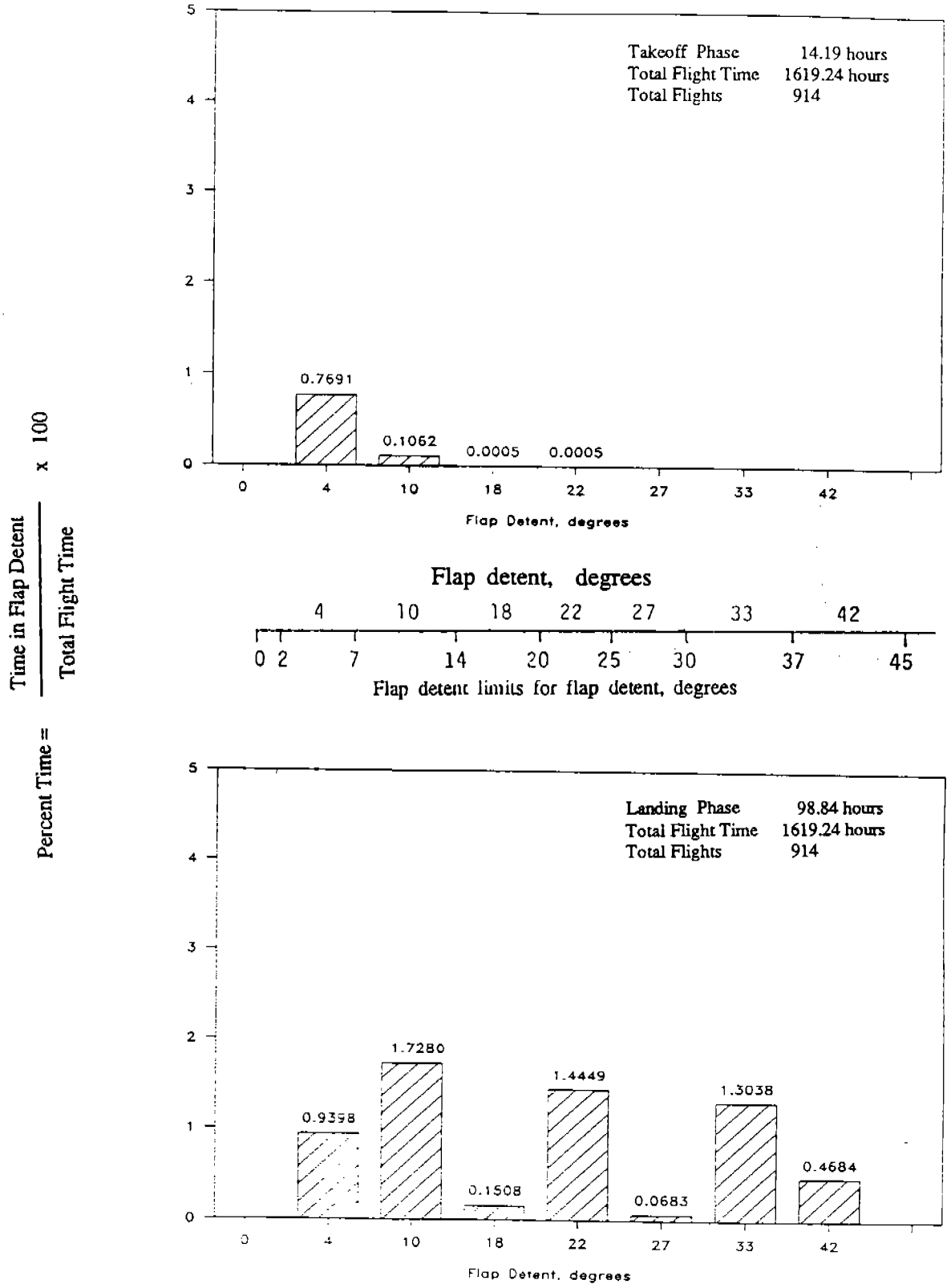
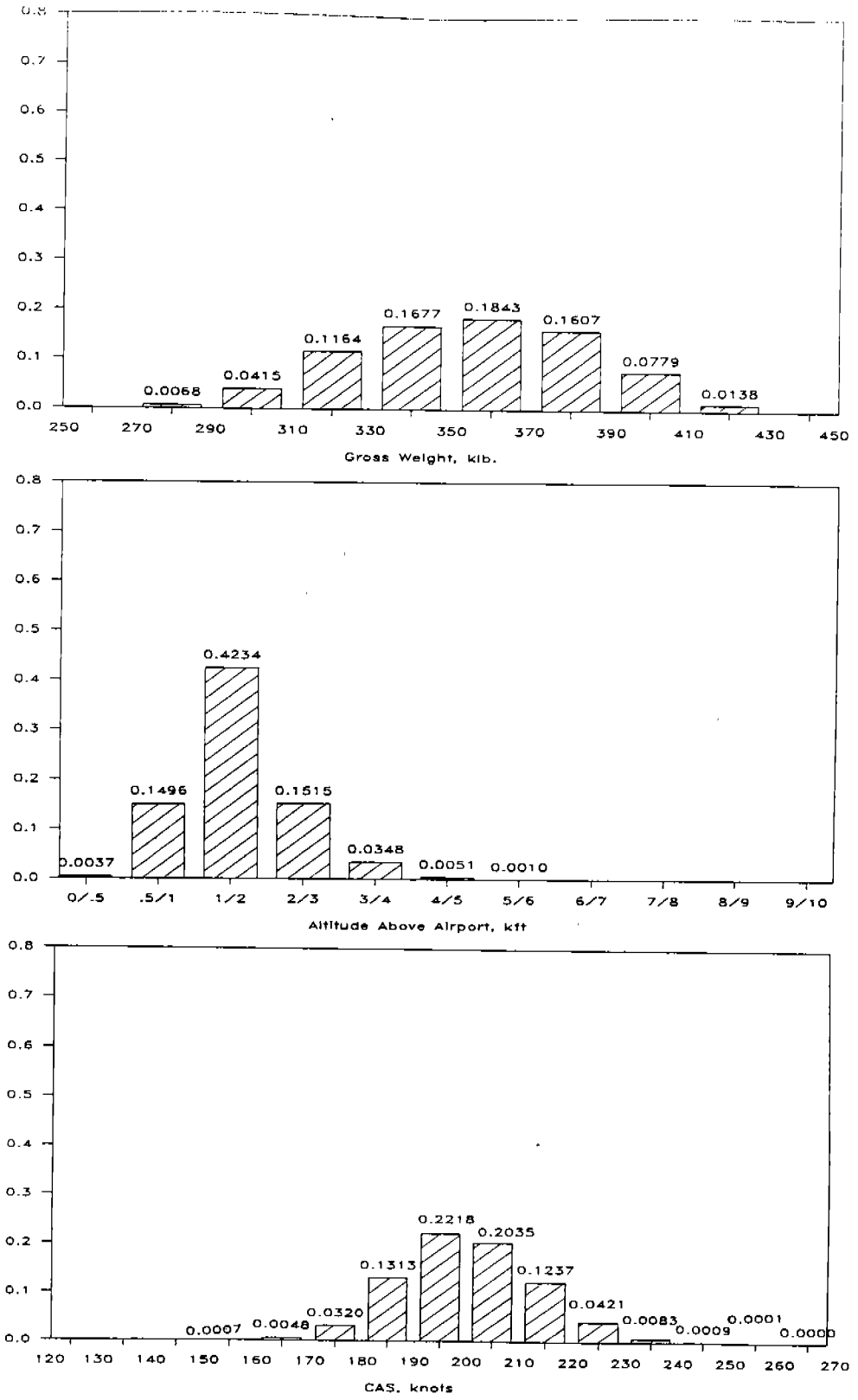


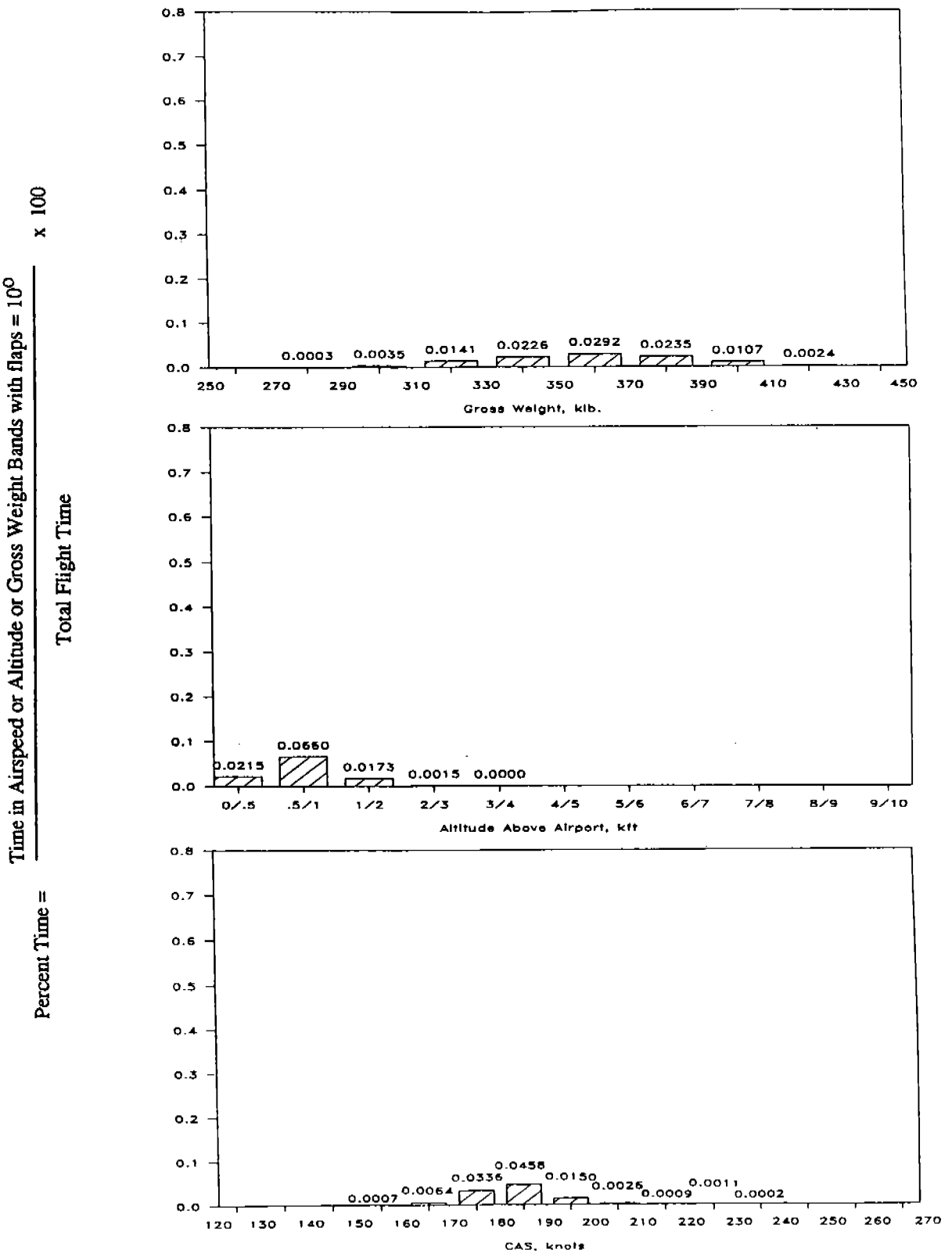
Figure 8.- Percent of total flight time at each flap detent.

$$\text{Percent Time} = \frac{\text{Time in Airspeed or Altitude or Gross Weight Bands with flaps} = 4^{o}}{\text{Total Flight Time}} \times 100$$



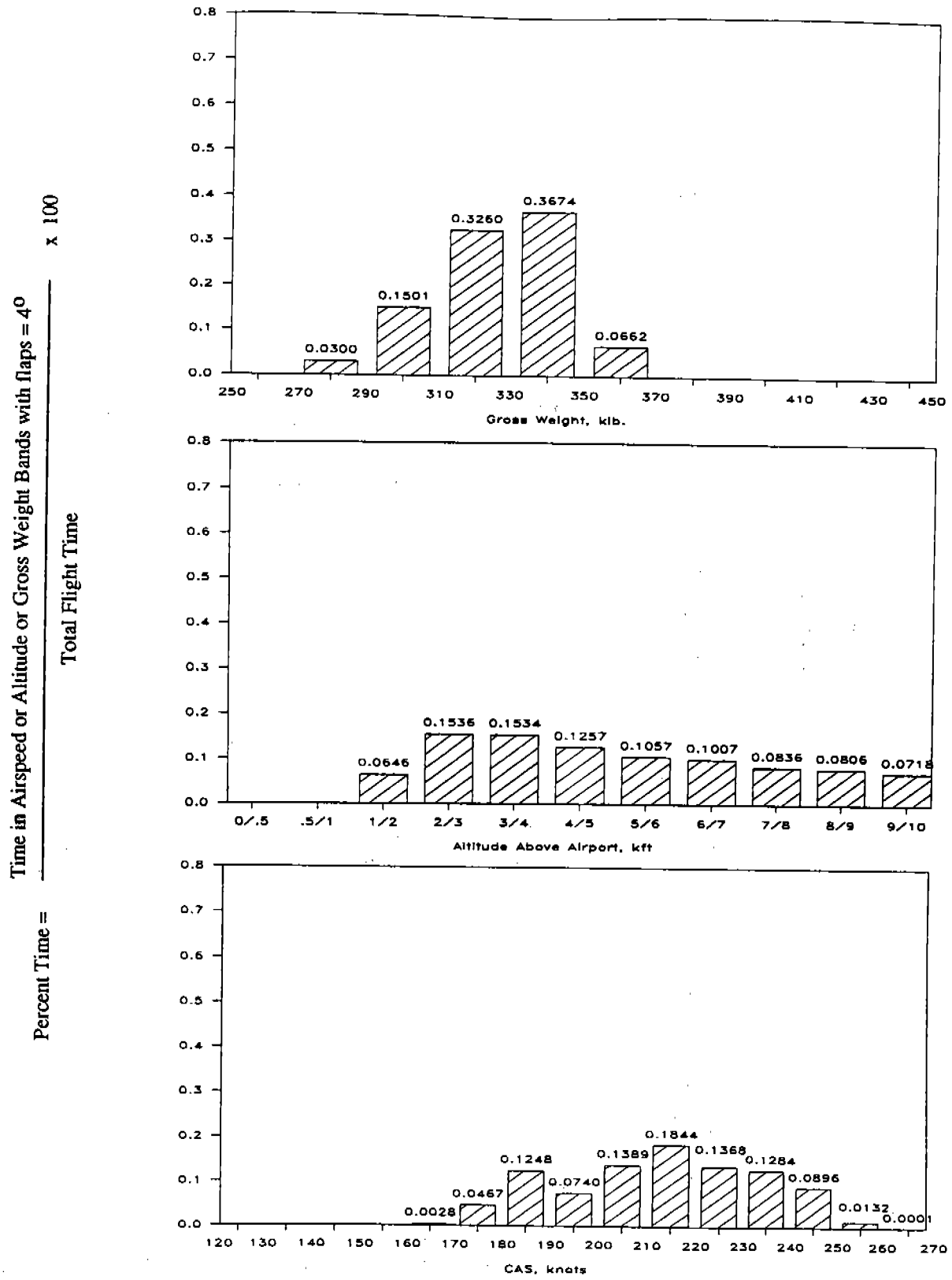
(a) Take off, flaps = 4°; 12.4544 hours

Figure 9.- Gross weight, altitude above airport, and airspeed percent time distributions.



(b) Take off, flaps = 10°; 1.7203 hours

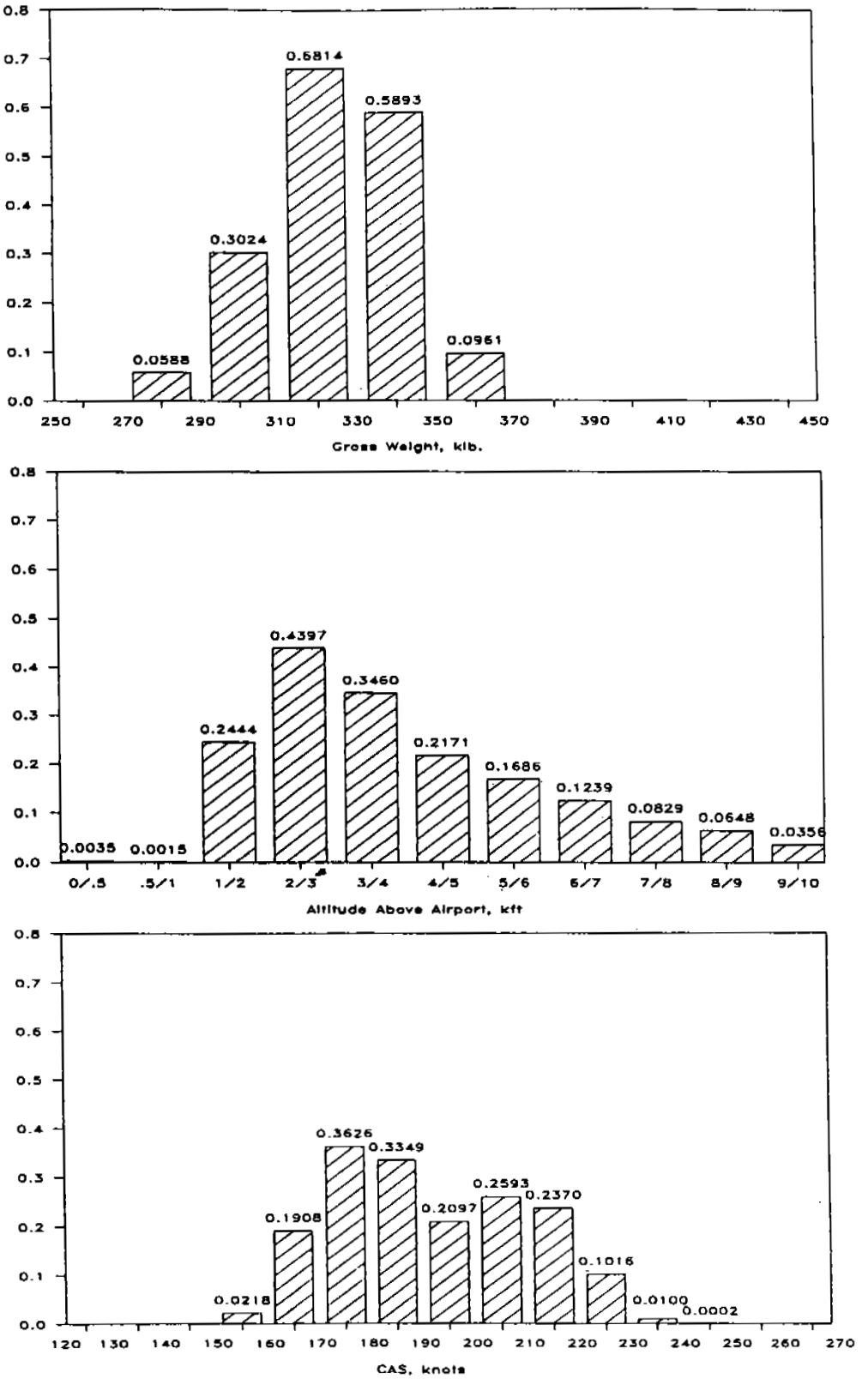
Figure 9. - Continued.



(c) Landing, flaps = 4°; 15.2172 hours

Figure 9. - Continued.

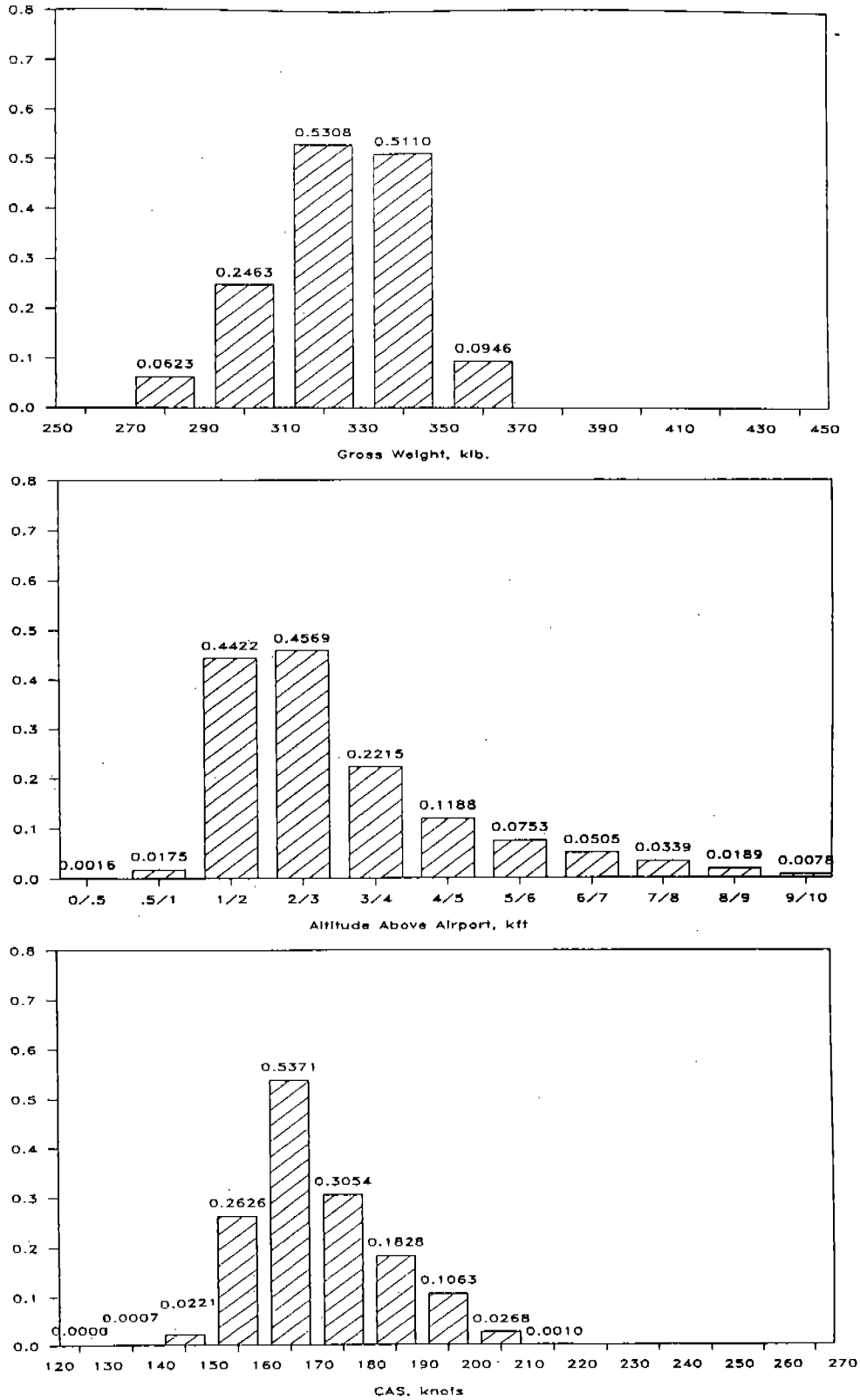
$$\text{Percent Time} = \frac{\text{Time in Airspeed or Altitude or Gross Weight Bands with flaps} = 10^{o}}{\text{Total Flight Time}} \times 100$$



(d) Landing, flaps = 10°; 27.9800 hours

Figure 9. - Continued.

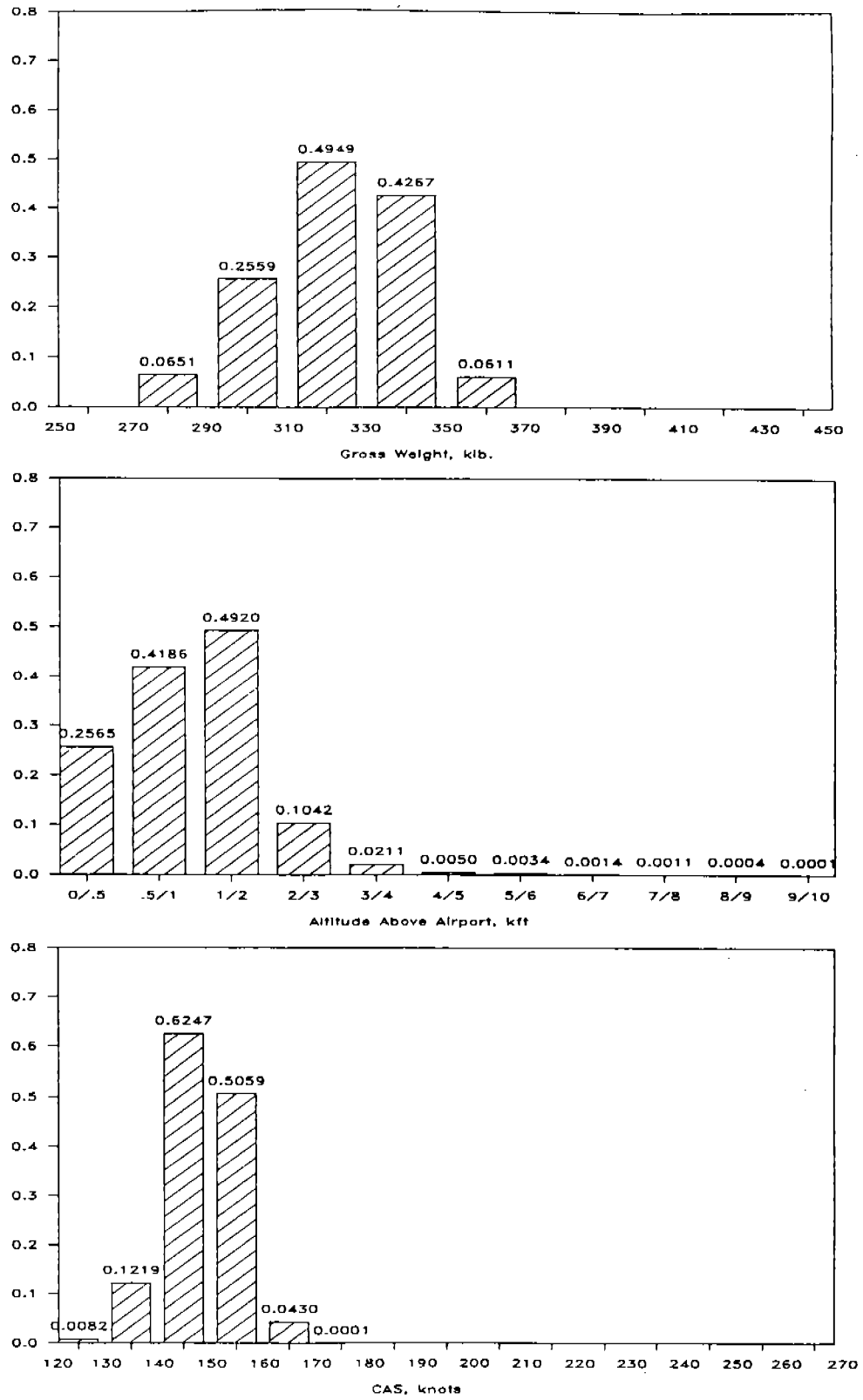
$$\text{Percent Time} = \frac{\text{Time in Airspeed or Altitude or Gross Weight Bands with flaps} = 22^{\circ}}{\text{Total Flight Time}} \times 100$$



(e) Landing, flaps = 22°; 23.3960 hours

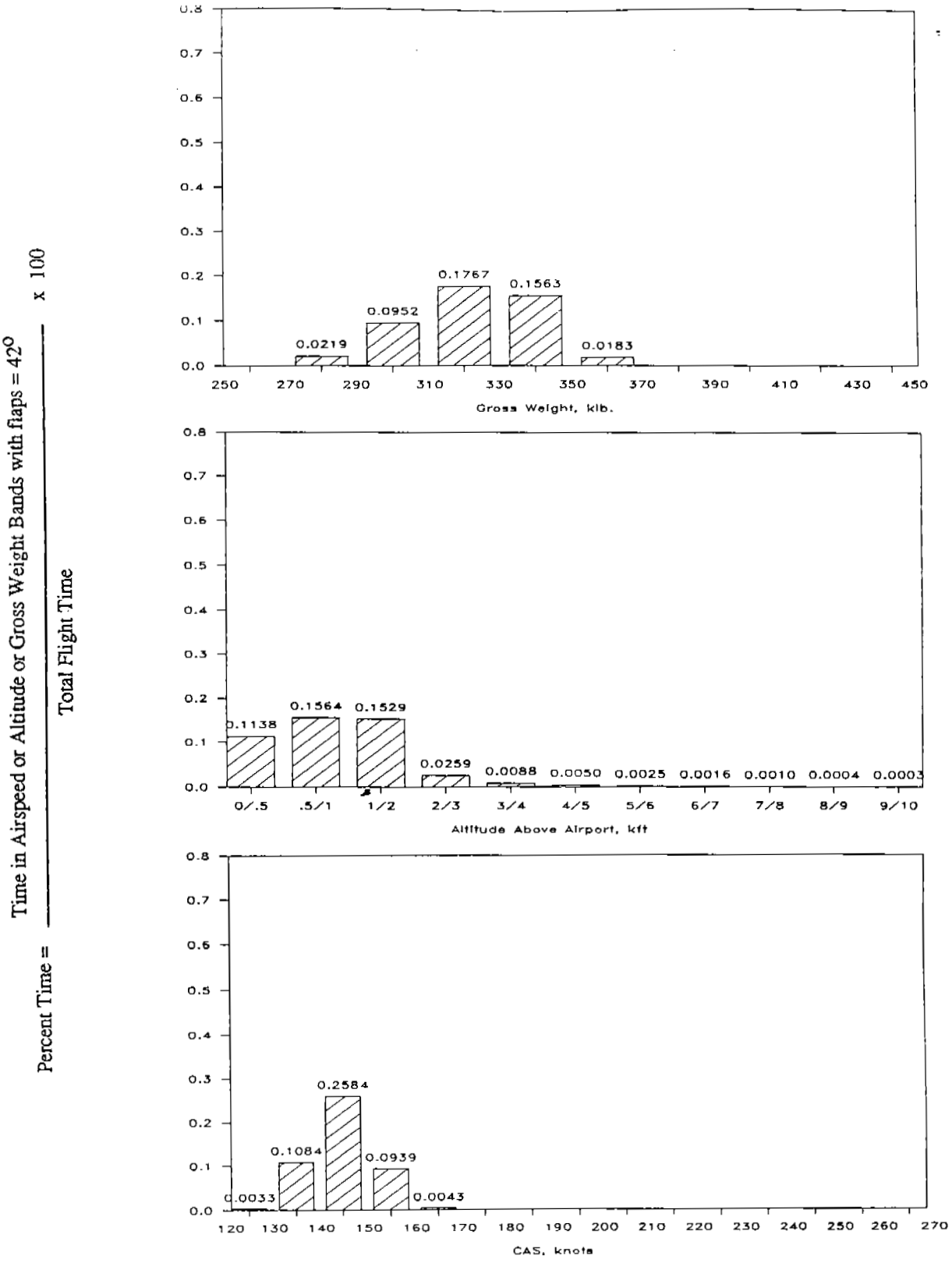
Figure 9. - Continued.

$$\text{Percent Time} = \frac{\text{Time in Airspeed or Altitude or Gross Weight Bands with flaps} = 33^{\circ}}{\text{Total Flight Time}} \times 100$$



(f) Landing, flaps = 33°; 21.1119 hours

Figure 9. - Continued.



(g) Landing, flaps = 42°; 7.5845 hours

Figure 9. - Concluded.

FLAP DEFLECTION, DEGREES

TIME AFTER LIFTOFF MINUTES	30.0	25.0	20.0	14.0	7.0	2.0
0.0 - .1	0	0	0.1	0.2	46.4	0
.1 - .2	0	0	0.1	0	23.1	0
.2 - .3	0	0	0.1	0.1	7.3	1.3
.3 - .4	0	0	0	0.2	2.4	1.3
.4 - .5	0	0	0	0	1.4	6.8
.5 - .6	0	0	0	0	0.9	7.9
.6 - .8	0	0	0	0	1.0	26.5
.8 - 1.0	0	0	0	0	0.2	22.5
1.0 - 1.2	0	0	0	0	0	14.2
1.2 - 1.4	0	0	0	0	0	7.9
1.4 - 1.6	0	0	0	0	0.1	6.0
1.6 - 1.8	0	0	0	0	0	2.4
1.8 - 2.0	0	0	0	0	0	2.0
2.0 - 2.2	0	0	0	0	0	0.2
2.2 - 2.4	0	0	0	0	0	0.3
2.4 - 2.6	0	0	0	0	0	0.3
2.6 - 2.8	0	0	0	0	0	0.1
2.8 - 3.0	0	0	0	0	0	0
3.0 - 3.5	0	0	0	0	0	0
3.5 - 4.0	0	0	0	0	0	0
4.0 - 4.5	0	0	0	0	0	0
4.5 - 5.0	0	0	0	0	0	0
5.0 - 6.0	0	0	0	0	0	0
6.0 - 7.0	0	0	0	0	0	0
7.0 - 8.0	0	0	0	0	0	0
8.0 - 9.0	0	0	0	0	0	0
9.0 - 10.0	0	0	0	0	0	0
10.0 - 15.0	0	0	0	0	0	0
15.0 - 20.0	0	0	0	0	0	0
20.0 - 25.0	0	0	0	0	0	0
0.0 - 25.0	0	0	0.3	0.5	82.8	99.9

Notes:
1. 914 flights
2. The first 15 seconds after liftoff for each flight are not included.
3. Flap deflections less than 2 degrees were considered to be zero.

(a) Takeoff: Percent of flights vs times when takeoff flap deflecion is reduced to less than indicated values

Figure 10.- Flap deflection times.

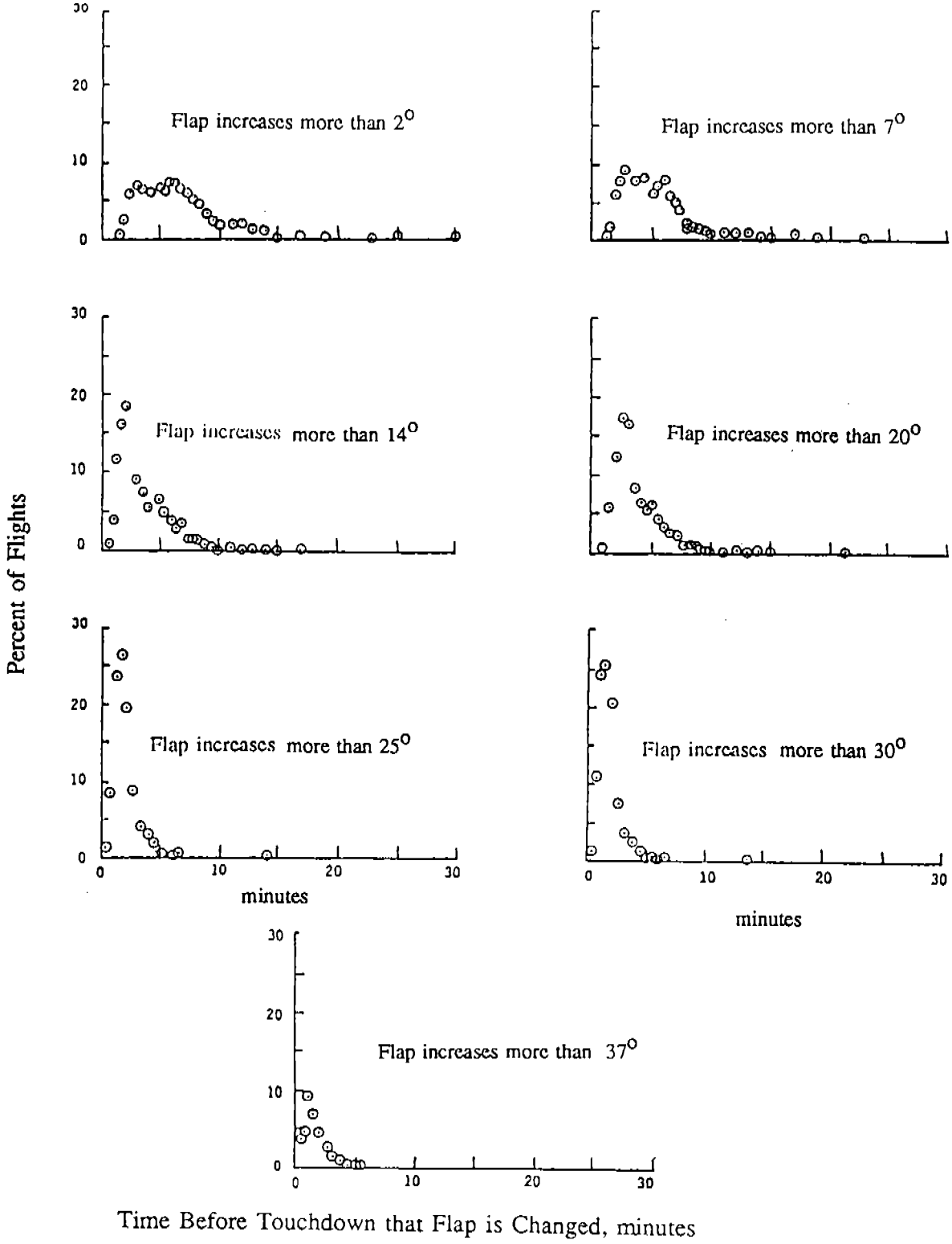
FLAP DEFLECTIONS, DEGREES

TIME BEFORE TOUCHDOWN MINUTES	2.0	7.0	14.0	20.0	25.0	30.0	37.0
0.0 - .5	0	0	0	0	1.1	1.5	3.9
.5 - 1.0	0	0	0.8	0.8	8.4	10.4	4.7
1.0 - 1.5	0	0.4	4.0	5.9	23.4	24.7	9.0
1.5 - 2.0	0.7	2.0	11.5	12.3	26.9	25.5	6.5
2.0 - 2.5	2.4	6.3	16.2	17.6	19.7	20.5	4.8
2.5 - 3.0	5.7	8.1	17.3	16.7	8.9	7.5	2.3
3.0 - 3.5	6.8	9.6	9.1	8.4	3.9	3.6	1.1
3.5 - 4.0	6.3	8.0	7.1	6.8	3.0	2.5	1.0
4.0 - 4.5	5.9	8.5	5.7	5.7	2.1	1.8	0.3
4.5 - 5.0	6.9	6.7	6.9	6.3	0.4	0.4	0.2
5.0 - 5.5	6.6	7.5	4.5	4.4	0.5	0.5	0.1
5.5 - 6.0	7.7	8.2	3.6	3.2	0.3	0.2	0
6.0 - 6.5	6.8	5.8	2.8	2.7	0.7	0.7	0
6.5 - 7.0	6.8	5.1	3.0	2.6	0	0	0
7.0 - 7.5	6.0	4.6	1.3	1.0	0	0	0
7.5 - 8.0	5.0	3.3	1.3	1.4	0	0	0
8.0 - 8.5	4.8	3.5	1.3	1.2	0	0	0
8.5 - 9.0	3.5	2.2	1.0	0.9	0	0	0
9.0 - 9.5	3.4	1.5	0.5	0.3	0	0	0
9.5 - 10.0	2.1	1.8	0.2	0.3	0	0	0
10.0 - 11.0	2.2	1.6	0.5	0.3	0	0	0
11.0 - 12.0	2.3	1.3	0.3	0.4	0	0	0
12.0 - 13.0	1.9	1.5	0.2	0.1	0	0	0
13.0 - 14.0	1.6	0.3	0.2	0.2	0.1	0.1	0
14.0 - 15.0	0.5	0.4	0.1	0.1	0	0	0
15.0 - 17.0	0.8	0.7	0.1	0	0	0	0
17.0 - 19.0	0.4	0.3	0	0	0	0	0
19.0 - 21.0	0	0	0	0.1	0	0	0
21.0 - 23.0	0.1	0.1	0	0	0	0	0
23.0 - 25.0	0	0	0	0	0	0	0
25.0 - 30.0	0.4	0	0	0	0	0	0
30.0 - 35.0	0.1	0	0	0	0	0	0
35.0 - 40.0	0	0	0	0	0	0	0
40.0 - 60.0	0.1	0	0	0	0	0	0
0.0 - 60.0	97.8	99.6	99.7	99.9	99.5	100.0	33.9

NOTES:
1. 914 flights
2. The last 15 seconds before touchdown on each flight are not included.
3. Flap deflections less than 2 degrees were considered to be zero.

(b) Landing: Percent of flights vs. time when landing flap deflection is increased to greater than indicated value

Figure 10.- Continued.



(c) Landing: Plots of data from Figure 10(b)

Figure 10. - Concluded.

		EAS																				
FLAP DEFLECTION RANGE	FLAP DETENT	120 TO 130 KTS	130 TO 140 KTS	140 TO 150 KTS	150 TO 160 KTS	160 TO 170 KTS	170 TO 180 KTS	180 TO 190 KTS	190 TO 200 KTS	200 TO 210 KTS	210 TO 220 KTS	220 TO 230 KTS	230 TO 240 KTS	240 TO 250 KTS	250 TO 260 KTS	260 TO 270 KTS	270 TO 280 KTS	280 TO 290 KTS	290 TO 300 KTS	300 TO 310 KTS	310 TO 320 KTS
37-45	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-37	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-30	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-25	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-20	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-14	10	0	0	0	0	4	29	37	9	2	0	0	0	0	0	0	0	0	0	0	0
2- 7	4	0	0	0	0	0	0	0	3	28	48	16	2	0	0	0	0	0	0	0	2

(a) Takeoff

		EAS																				
FLAP DEFLECTION RANGE	FLAP DETENT	120 TO 130 KTS	130 TO 140 KTS	140 TO 150 KTS	150 TO 160 KTS	160 TO 170 KTS	170 TO 180 KTS	180 TO 190 KTS	190 TO 200 KTS	200 TO 210 KTS	210 TO 220 KTS	220 TO 230 KTS	230 TO 240 KTS	240 TO 250 KTS	250 TO 260 KTS	260 TO 270 KTS	270 TO 280 KTS	280 TO 290 KTS	290 TO 300 KTS	300 TO 310 KTS	310 TO 320 KTS
2- 7	4	0	0	0	0	0	0	0	1	8	16	16	22	25	8	0	0	0	0	0	2
7-14	10	0	0	0	0	1	3	7	6	17	24	31	6	0	0	0	0	0	0	0	2
14-20	18	0	0	0	4	14	21	17	16	21	4	0	0	0	0	0	0	0	0	0	1
20-25	22	0	0	0	6	18	21	18	19	15	1	0	0	0	0	0	0	0	0	0	1
25-30	27	0	0	5	42	45	4	1	0	0	0	0	0	0	1	1	0	0	0	0	0
30-37	33	0	0	7	54	37	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
37-40	42	0	1	10	17	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(b) Landing

Figure 11.- Percent of flights vs. equivalent airspeed at flap detent change.

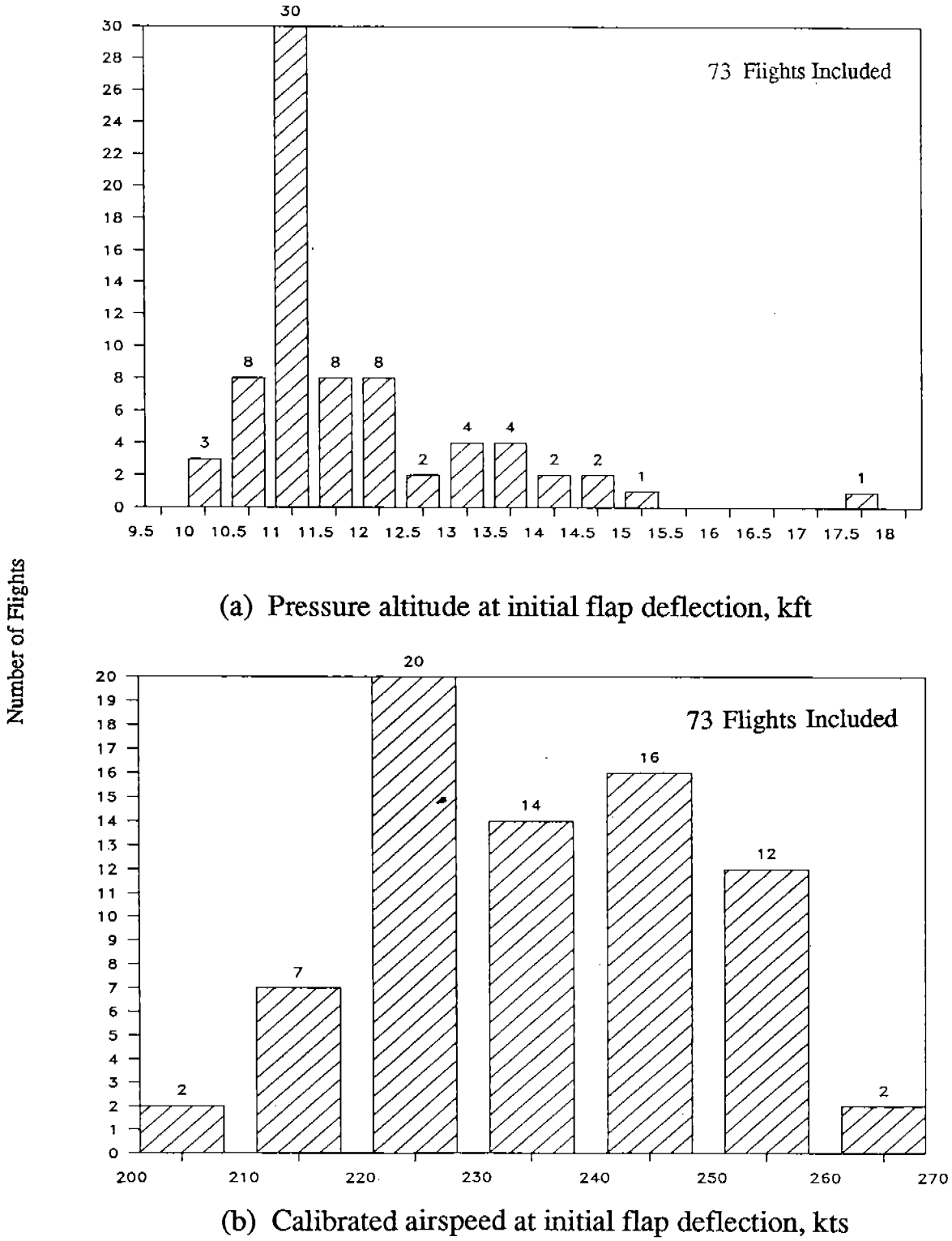
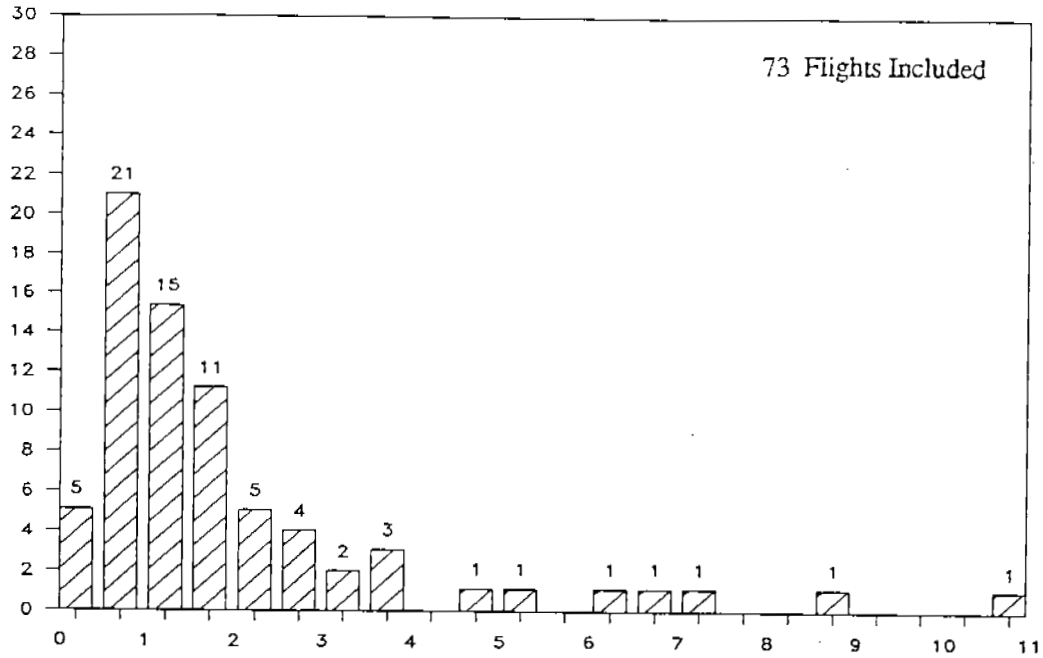
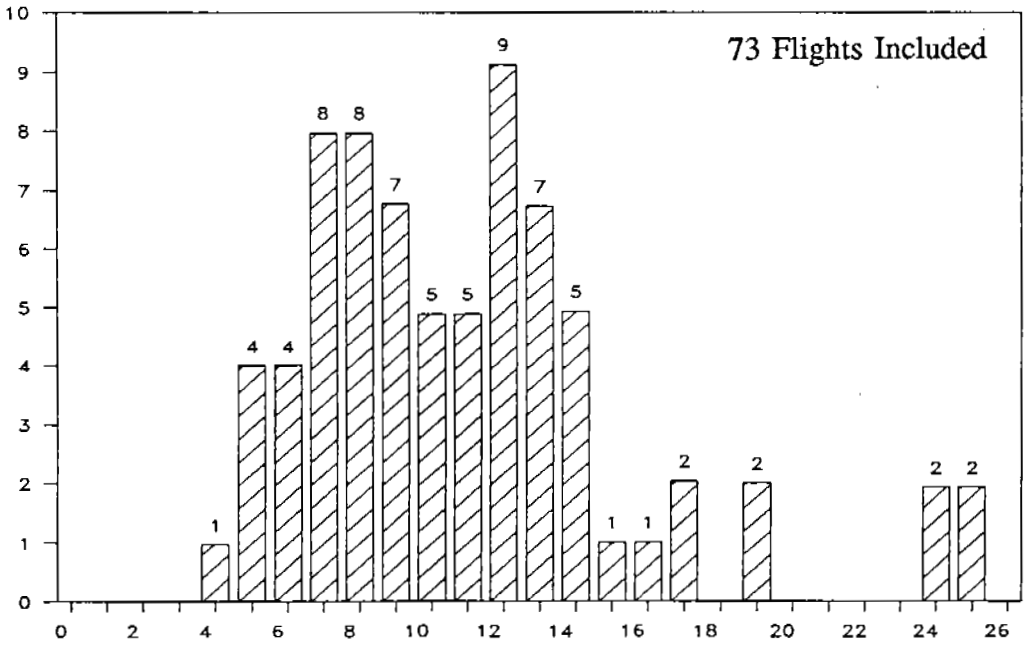


Figure 12.- Flap use above 10,000 feet pressure altitude.



(c) Minutes above 10,000 ft. that flaps deflected > 2 deg



(d) Minutes before touchdown of initial flap deflection

Figure 12.- Concluded.

PRESSURE ALTITUDE BANDS

a_n LEVEL g'S	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0.01	0.01	0	0	0	0	0	0	0
.70	0	0.03	0.01	0	0	0	0	0	0	0
.60	0	0.06	0.03	0.01	0	0	0	0	0	0.01
.50	0	0.12	0.10	0.04	0	0	0.02	0	0	0.02
.40	0.13	0.36	0.28	0.17	0.01	0.01	0.04	0.01	0	0.07
.30	1.57	1.37	0.97	0.65	0.24	0.09	0.10	0.03	0	0.35
.20	14.58	9.31	5.89	3.41	1.21	0.80	0.58	0.39	0	2.64
.15	43.58	25.84	15.83	9.58	3.83	2.54	1.82	1.26	0	7.71
.10	140.52	101.17	64.10	35.52	17.95	13.09	8.71	6.70	4.76	29.44
.05	362.38	208.06	194.39	148.89	115.24	92.28	67.81	53.17	70.77	108.65
0.00	865.02	811.63	947.45	1041.56	1123.34	1301.39	1533.91	1677.95	1741.76	1403.05
-.05	283.09	148.22	135.16	122.23	90.73	71.59	57.67	48.77	93.94	87.25
-.10	74.69	39.01	34.15	23.99	13.69	9.82	7.81	6.05	10.47	17.00
-.15	17.14	9.77	8.40	6.26	3.11	1.73	1.61	1.20	0.95	3.87
-.20	4.42	3.36	3.31	2.31	1.06	0.55	0.49	0.35	0.32	1.22
-.30	0.34	0.64	0.55	0.36	0.13	0.02	0.08	0.04	0	0.16
-.40	0.04	0.17	0.14	0.14	0.02	0	0.02	0.01	0	0.04
-.50	0	0.06	0.04	0.06	0	0	0.01	0	0	0.01
-.60	0	0.03	0	0.01	0	0	0.01	0	0	0
-.70	0	0.01	0	0	0	0	0.01	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60

TOTAL FLIGHTS	914
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN	708383.60

(a) a_n level crossing counts per hour within pressure altitude bands

Figure 13.- Normal acceleration exceedances.

PRESSURE ALTITUDE BANDS

a_{nM} LEVEL g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0.01	0	0	0	0	0	0	0
.30	0.04	0.06	0.03	0.03	0.01	0	0	0	0	0.01
.20	1.03	0.69	0.23	0.21	0.06	0.05	0.02	0	0	0.16
.15	4.32	3.22	1.22	0.69	0.38	0.18	0.07	0.02	0	0.70
.10	17.18	15.48	7.49	3.25	1.73	0.92	0.26	0.12	0	3.21
.05	47.74	42.94	32.77	20.53	13.24	8.47	3.71	2.15	1.27	12.42
0.00	153.48	129.03	122.85	119.14	120.15	139.09	165.95	184.68	181.22	161.87
-.05	30.05	26.10	22.35	17.65	11.72	7.01	3.23	2.02	3.17	8.84
-.10	4.15	3.94	3.09	1.98	1.02	0.39	0.21	0.10	0.32	1.03
-.15	0.39	0.43	0.29	0.26	0.12	0.05	0.05	0.01	0	0.11
-.20	0.03	0.06	0.03	0.03	0.01	0.01	0.01	0	0	0.01
-.30	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60

TOTAL FLIGHTS	914
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN	708383.60

(b) a_{nM} level crossing counts per hour within pressure altitude bands

Figure 13.- Continued.

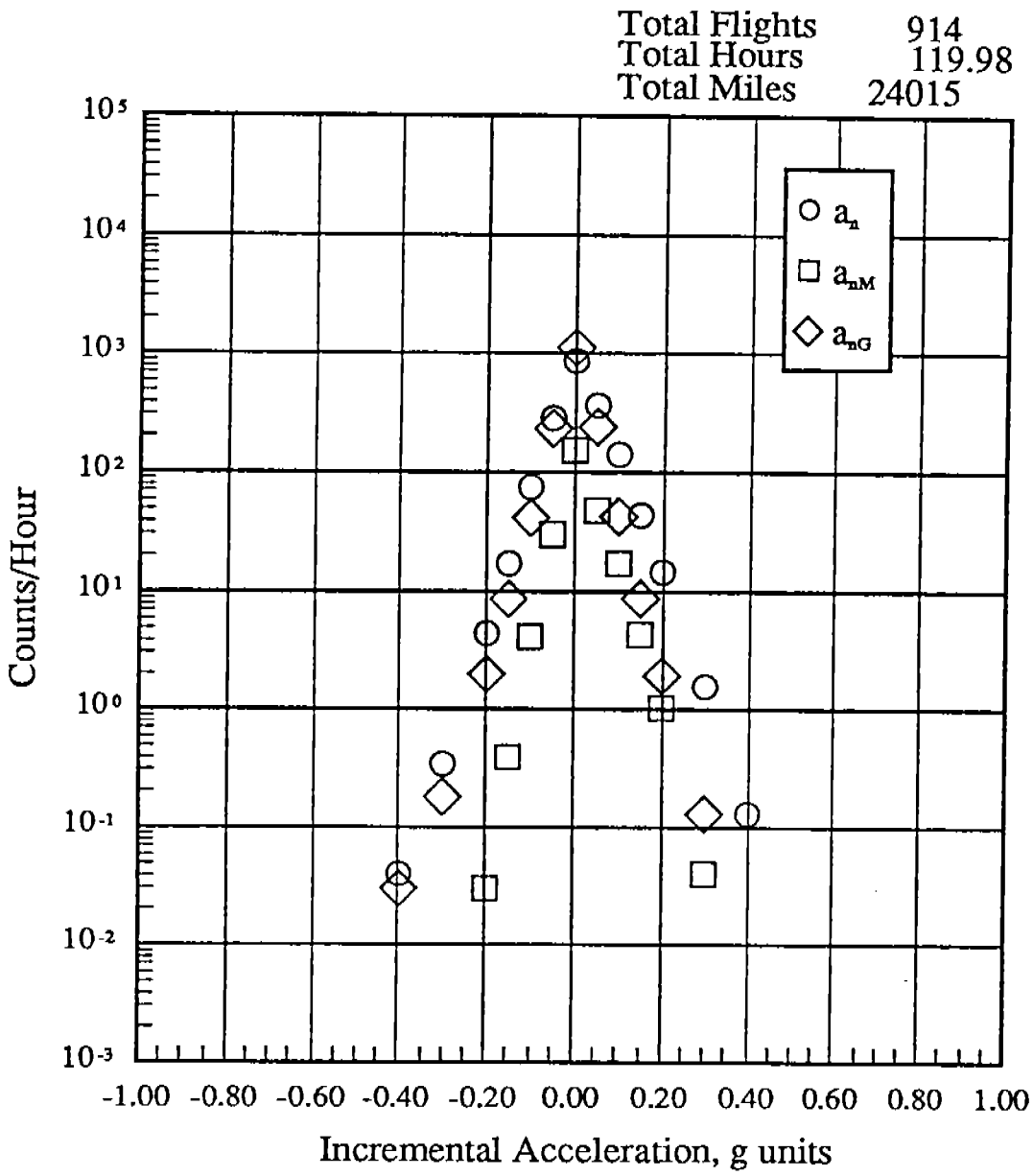
PRESSURE ALTITUDE BANDS

a_{nG} LEVEL g'S	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0.01	0	0	0	0	0	0	0
.60	0	0.02	0.02	0	0	0	0	0	0	0
.50	0	0.06	0.03	0.03	0	0	0	0	0	0.01
.40	0	0.14	0.13	0.04	0.01	0	0.01	0	0	0.02
.30	0.13	0.35	0.40	0.26	0.02	0.01	0.06	0.01	0	0.09
.20	1.94	1.80	1.70	1.10	0.24	0.14	0.20	0.11	0	0.54
.15	8.73	5.00	4.67	2.84	0.95	0.59	0.72	0.51	0	1.87
.10	42.48	17.92	15.35	9.56	4.31	3.29	3.37	2.73	0.95	8.07
.05	239.27	92.41	72.85	50.69	31.24	27.47	27.95	23.90	32.37	50.21
0	1121.52	1205.66	1383.02	1505.45	1602.97	1623.82	1647.05	1651.64	1702.41	1552.74
-.05	232.50	94.22	73.75	51.73	32.35	27.29	27.53	23.69	31.74	49.83
-.10	41.39	17.75	15.44	9.25	4.57	3.31	3.26	2.62	1.27	7.91
-.15	8.64	4.98	4.68	2.73	0.92	0.67	0.68	0.45	0	1.82
-.20	1.99	2.02	1.89	1.10	0.18	0.19	0.20	0.10	0	0.56
-.30	0.18	0.45	0.36	0.19	0.02	0	0.03	0.01	0	0.09
-.40	0.03	0.14	0.08	0.06	0	0	0.01	0	0	0.02
-.50	0	0.06	0.03	0.01	0	0	0.01	0	0	0.01
-.60	0	0.01	0	0.01	0	0	0.01	0	0	0
-.70	0	0.01	0	0	0	0	0.01	0	0	0
-.80	0	0.01	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60

TOTAL FLIGHTS	914
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN	708383.60

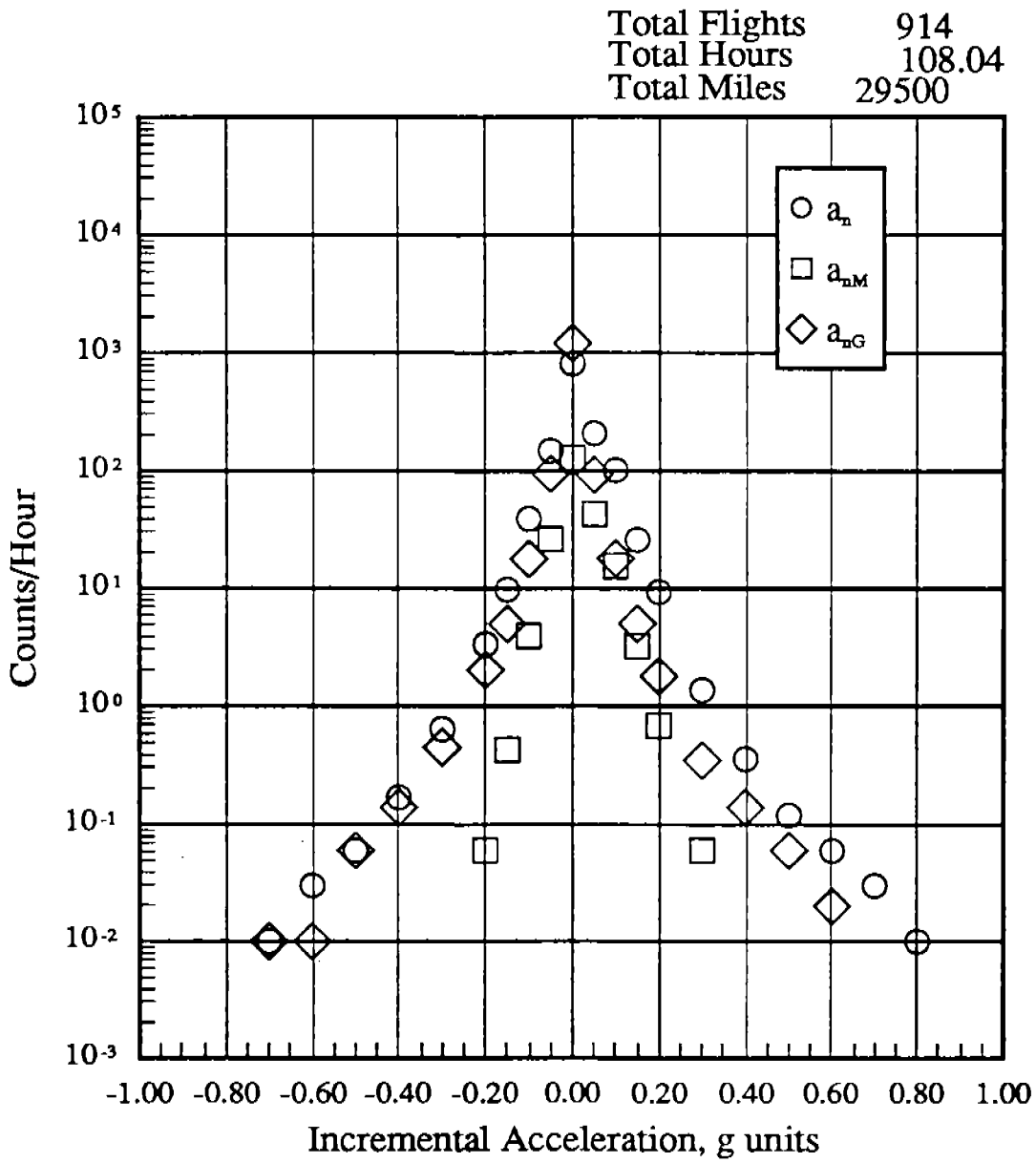
(c) a_{nG} level crossing counts per hour within pressure altitude bands

Figure 13.- Continued.



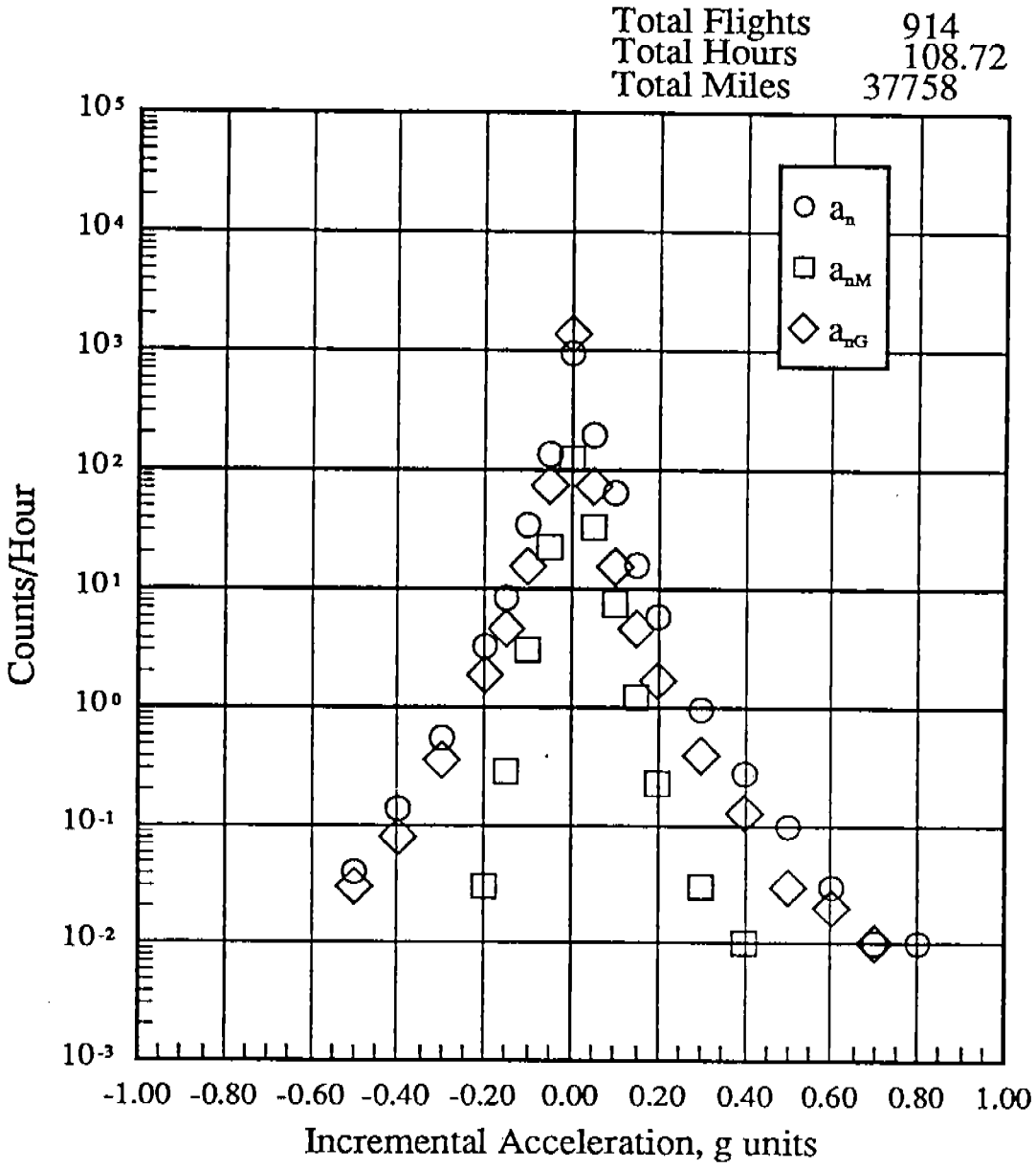
(d) a_n, a_{nM}, a_{nG}, -500 to 4500 feet altitude

Figure 13.- Continued.



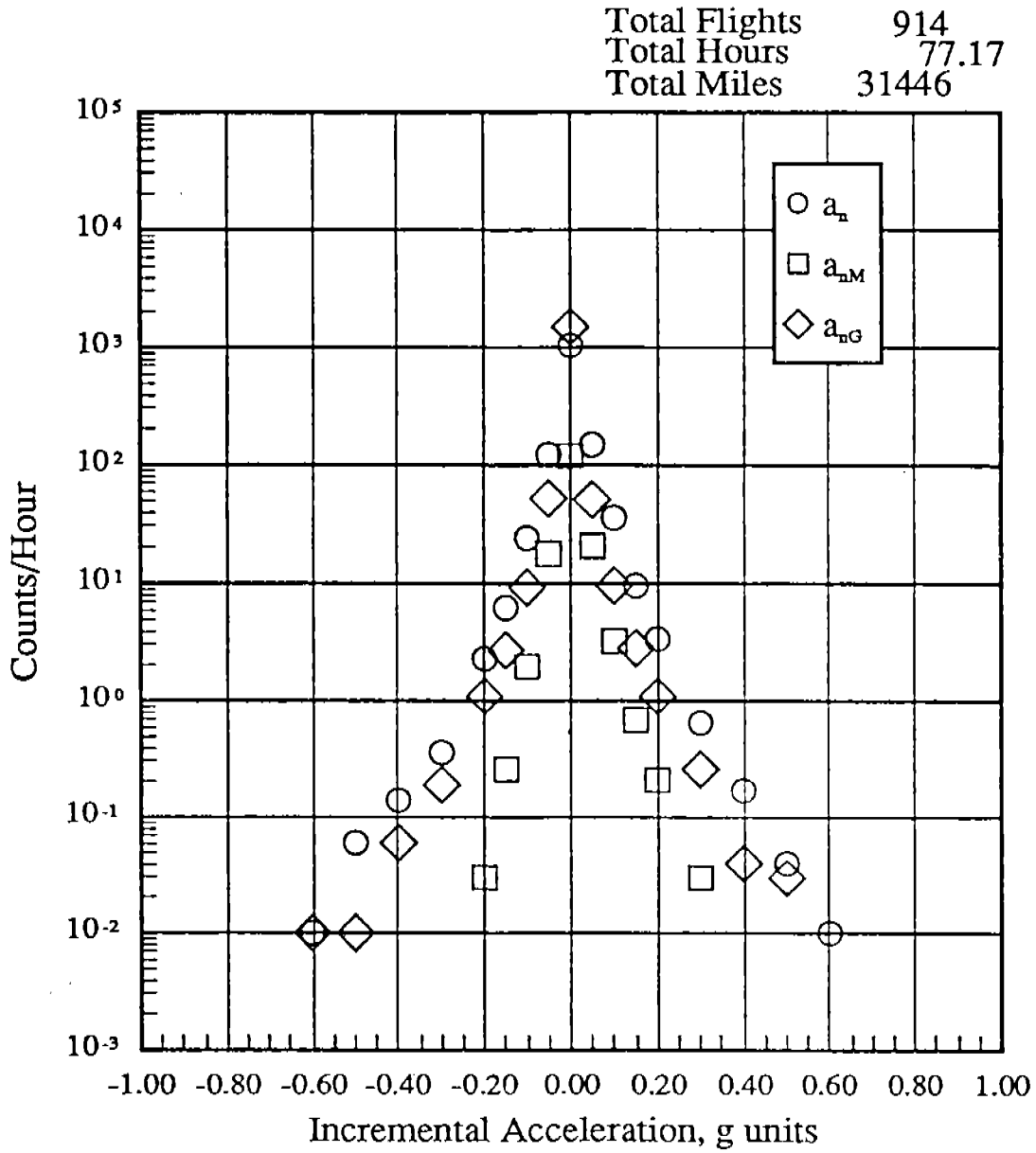
(e) a_n, a_{nM}, a_{nG}, 4500 to 9500 feet altitude

Figure 13.- Continued.



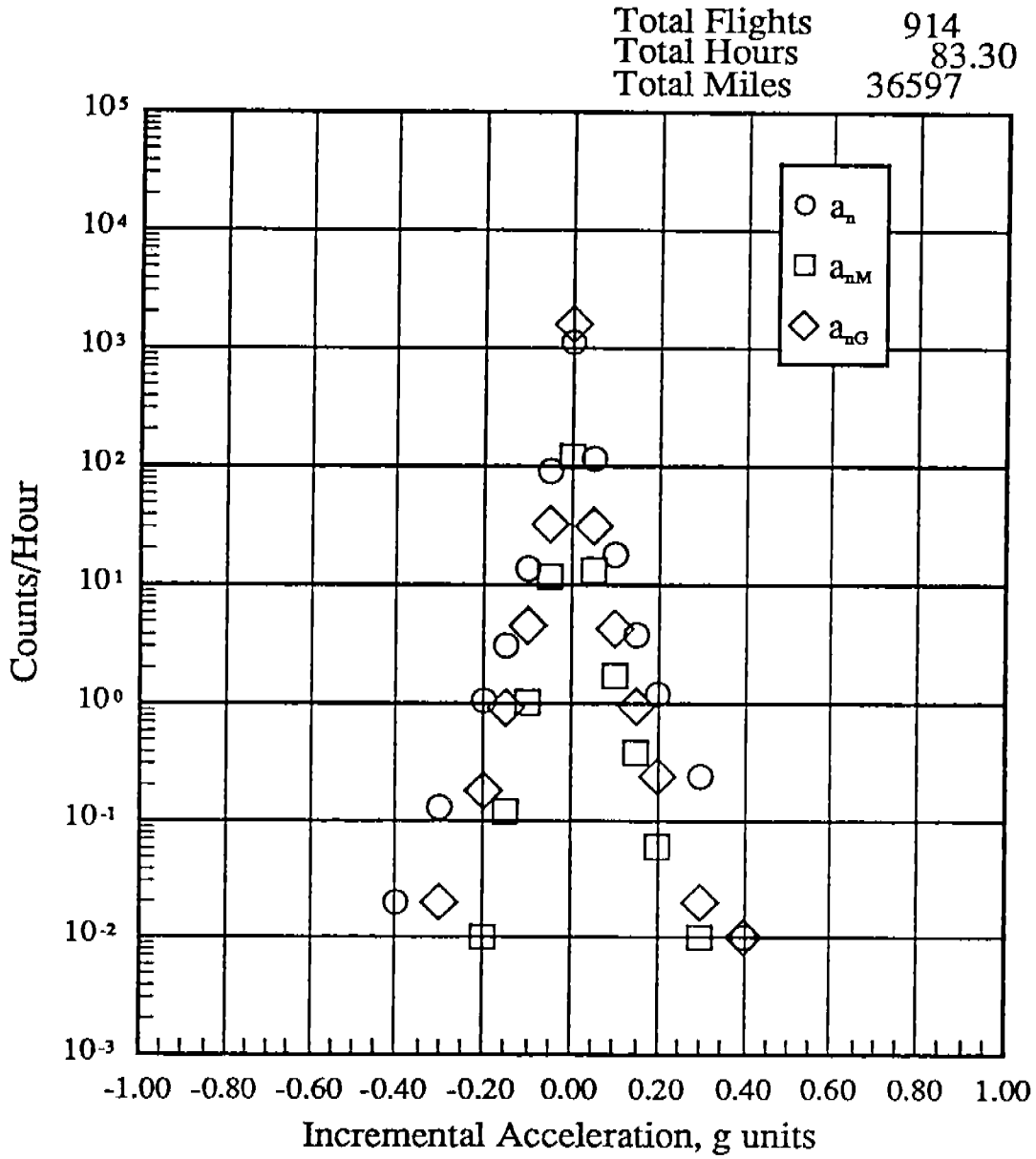
(f) a_n, a_{nM}, a_{nG}, 9500 to 14500 feet altitude

Figure 13.- Continued.



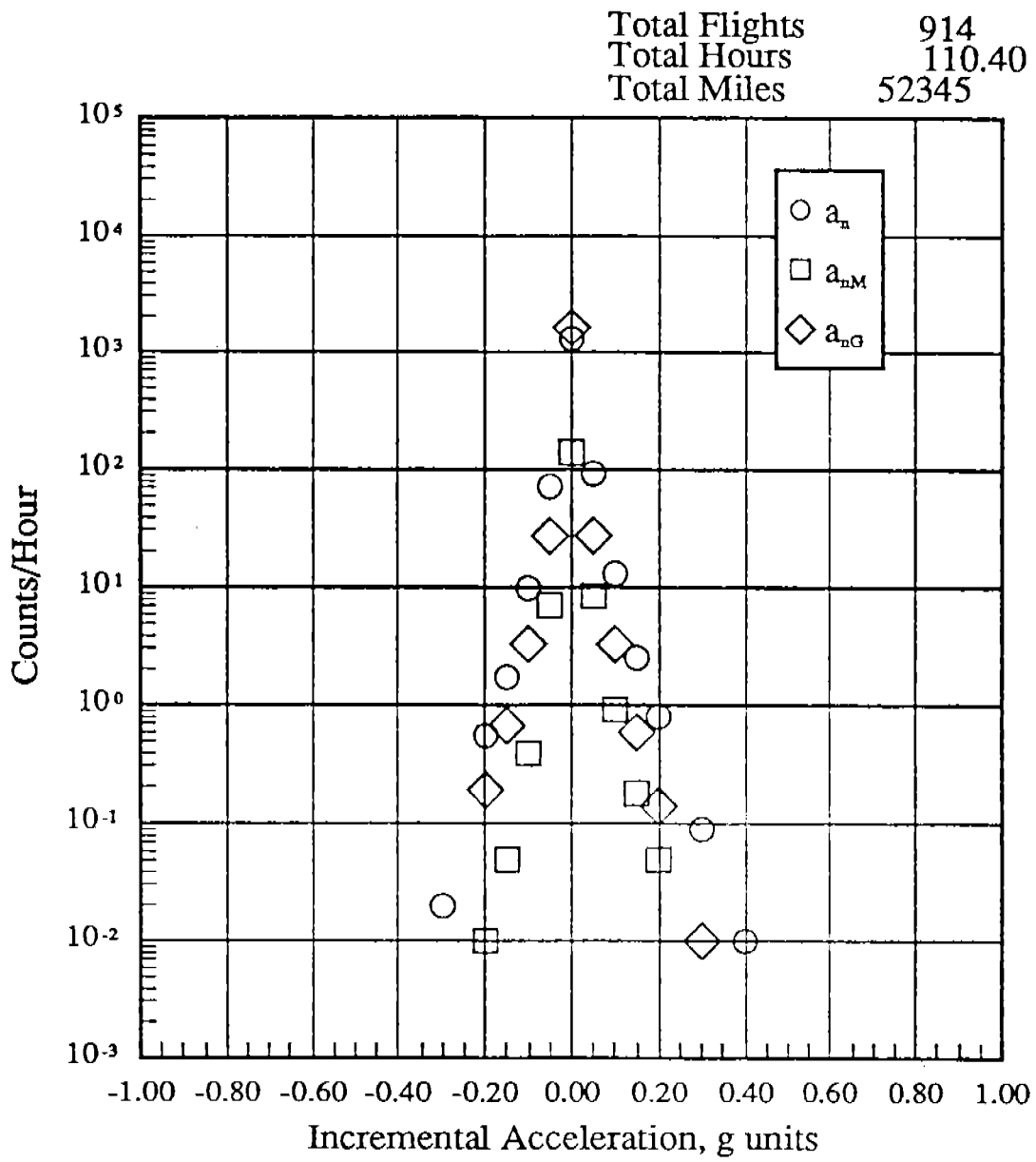
(g) a_n, a_{nM}, a_{nG}, 14500 to 19500 feet altitude

Figure 13.- Continued.



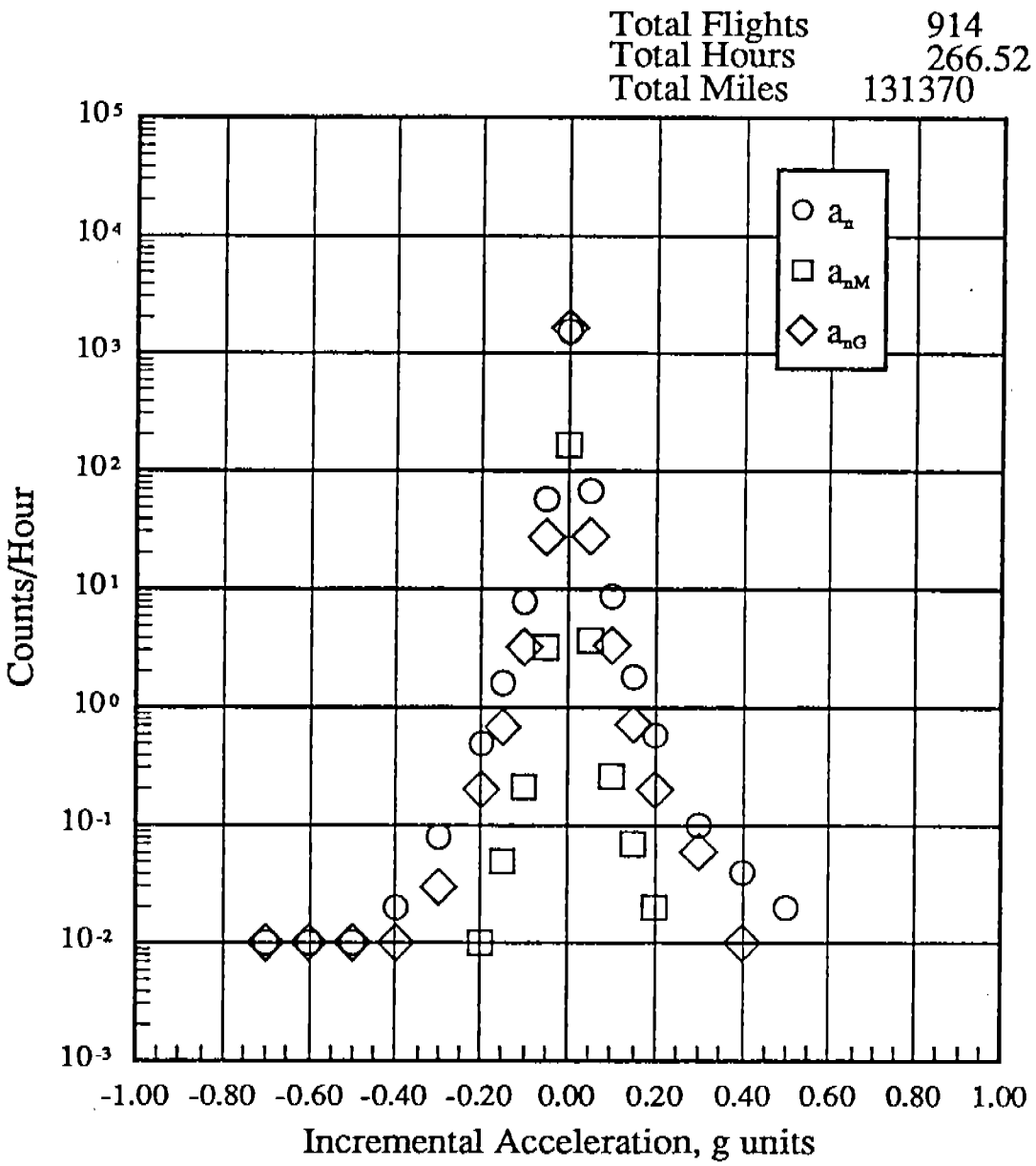
(h) a_n, a_{nM}, a_{nG}, 19500 to 24500 feet altitude

Figure 13.- Continued.



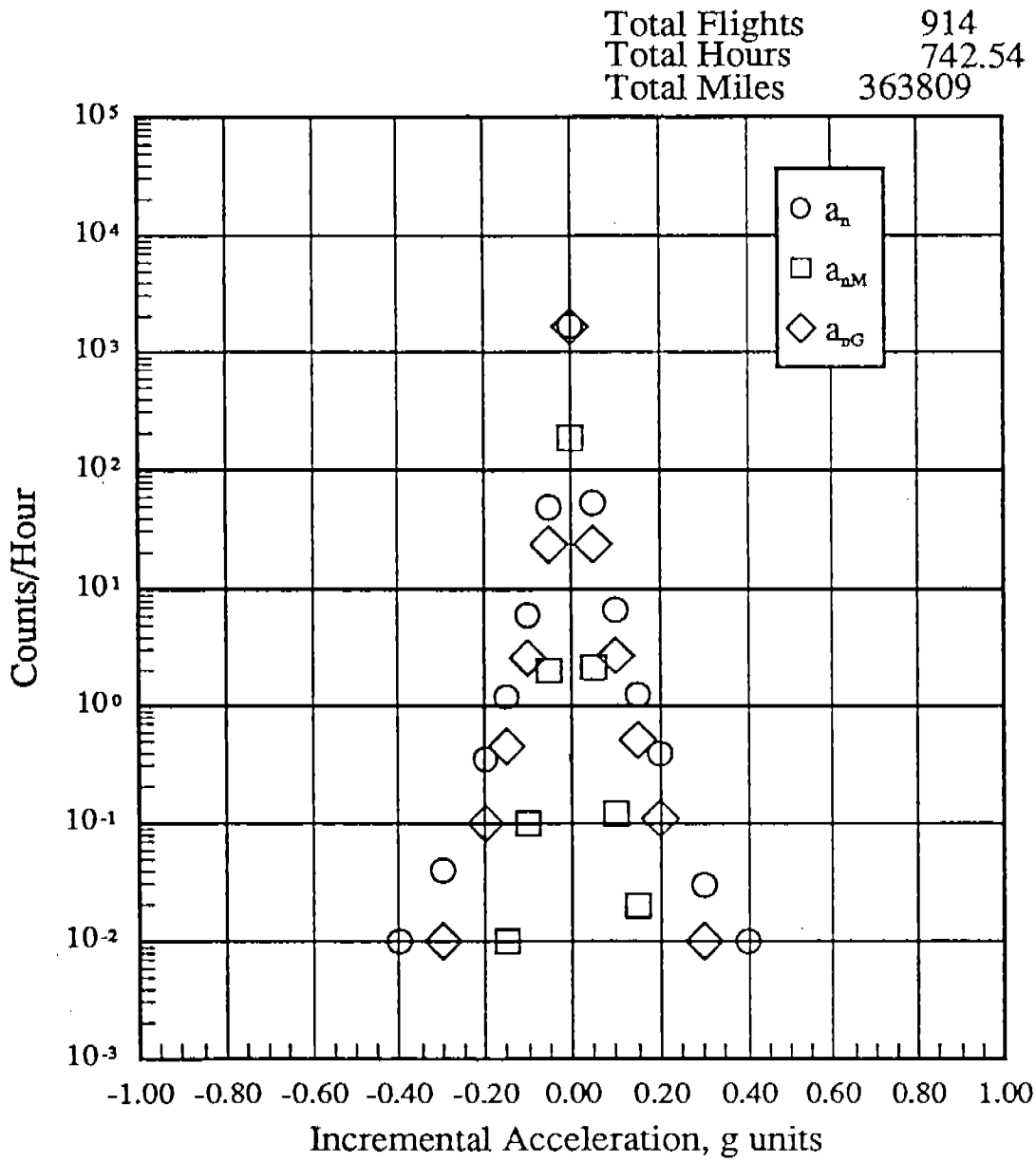
(i) a_n, a_{nM}, a_{nG}, 24500 to 29500 feet altitude

Figure 13.- Continued.



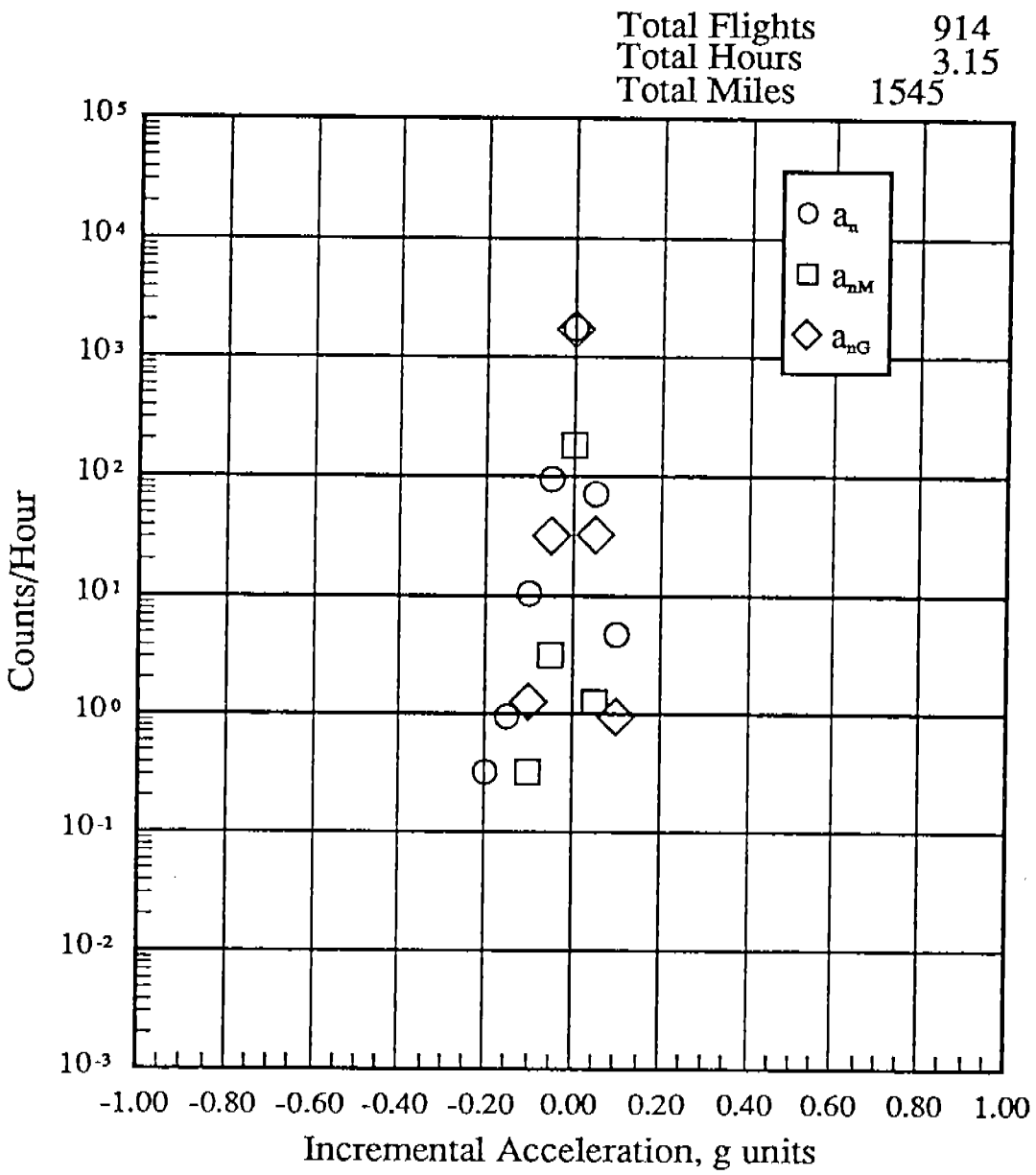
(j) a_n, a_{nM}, a_{nG}, 29500 to 34500 feet altitude

Figure 13.- Continued.



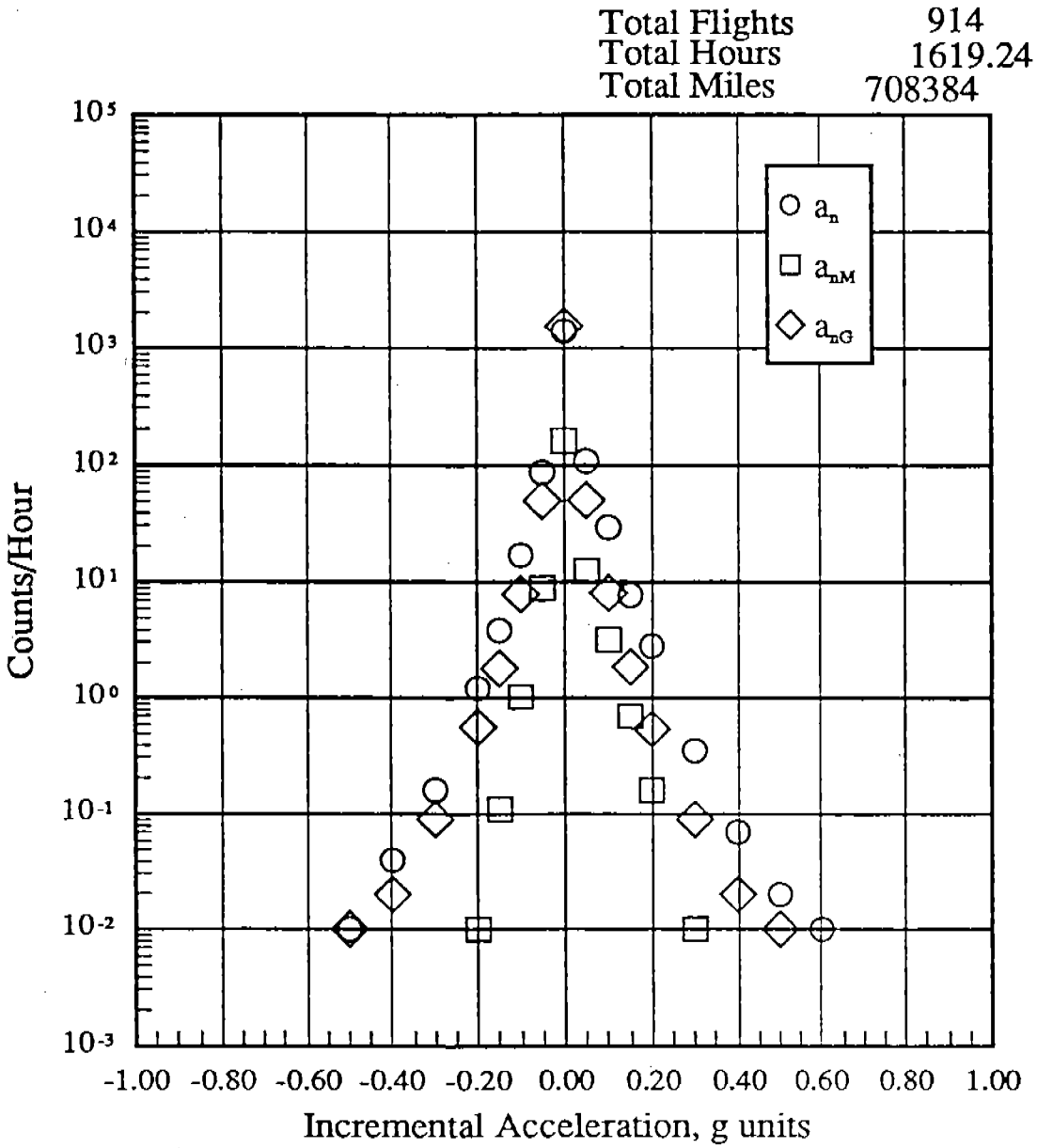
(k) a_n, a_{nM}, a_{nG}, 34500 to 39500 feet altitude

Figure 13.- Continued.



(l) a_n, a_{nM}, a_{nG}, 39500 to 44500 feet altitude

Figure 13.- Continued.



(m) a_n, a_{nM}, a_{nG}, -500 to 44500 feet altitude

Figure 13.- Concluded.

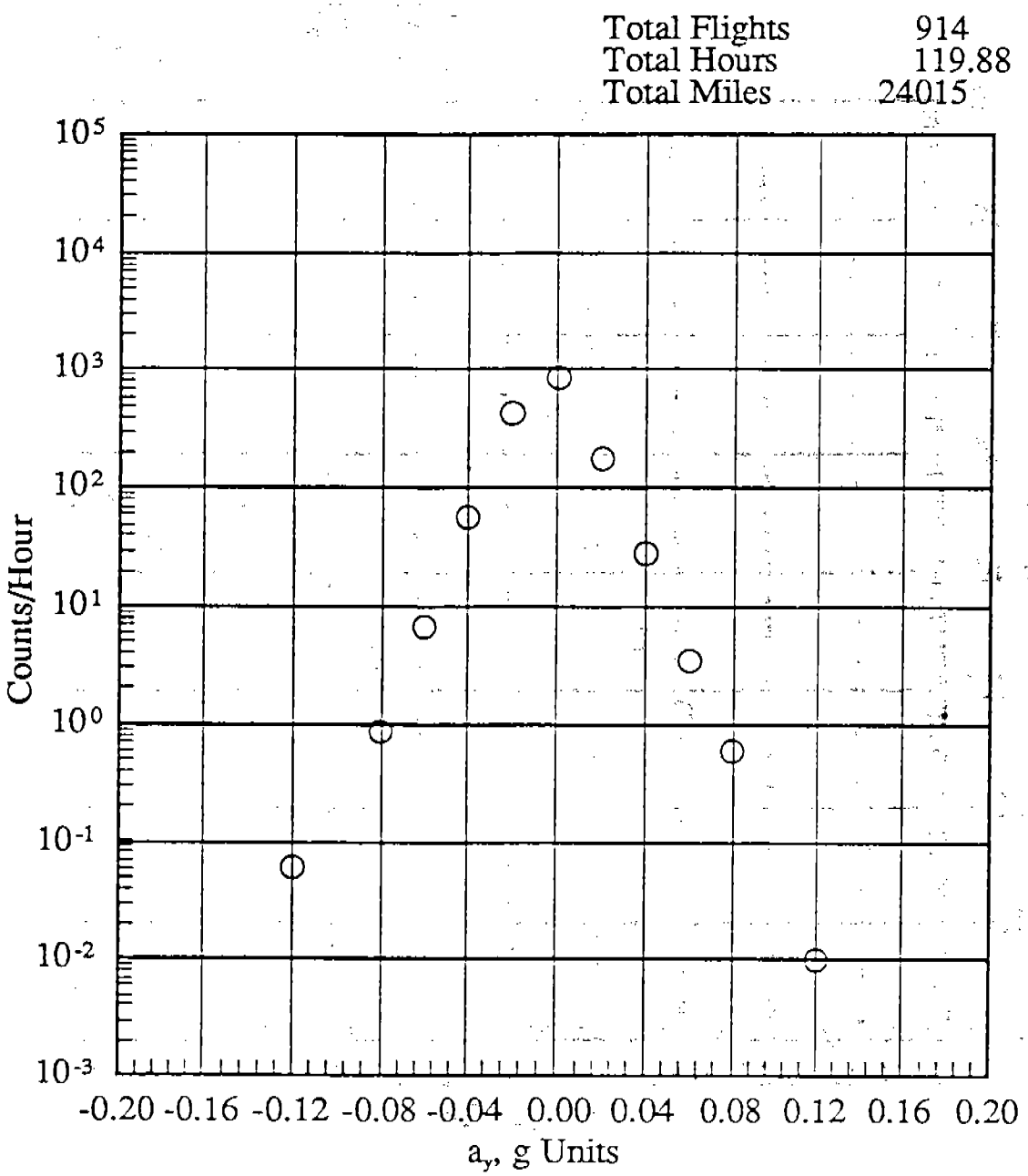
PRESSURE ALTITUDE BANDS

a_y g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
.48	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0
.16	0	0.02	0	0	0	0	0	0	0	0
.12	0.01	0.04	0.01	0.01	0.02	0	0	0	0	0.01
.08	0.59	0.43	0.43	0.27	0.08	0.11	0.08	0.04	0.32	0.16
.06	3.47	1.89	1.78	0.83	0.44	0.37	0.27	0.22	0.32	0.74
.04	28.28	12.22	10.33	6.10	3.27	2.79	2.01	1.70	3.49	5.36
.02	178.39	84.20	74.01	58.79	40.25	29.99	20.82	18.29	45.07	42.56
0	859.73	718.92	727.68	768.95	787.00	969.87	1323.92	1497.85	1679.24	1211.54
-.02	430.65	172.22	120.92	81.14	47.85	33.95	25.77	19.75	32.69	73.36
-.04	56.94	19.50	11.39	6.97	2.59	2.12	1.86	1.39	2.22	7.82
-.06	6.73	2.76	1.94	1.21	0.40	0.26	0.22	0.21	0	1.04
-.08	0.86	0.63	0.50	0.29	0.16	0.05	0.04	0.04	0	0.19
-.12	0.06	0.12	0.06	0.04	0	0	0	0	0	0.02
-.16	0	0.04	0	0.01	0	0	0	0	0	0
-.20	0	0.01	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60

TOTAL FLIGHTS	914
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN	708383.60

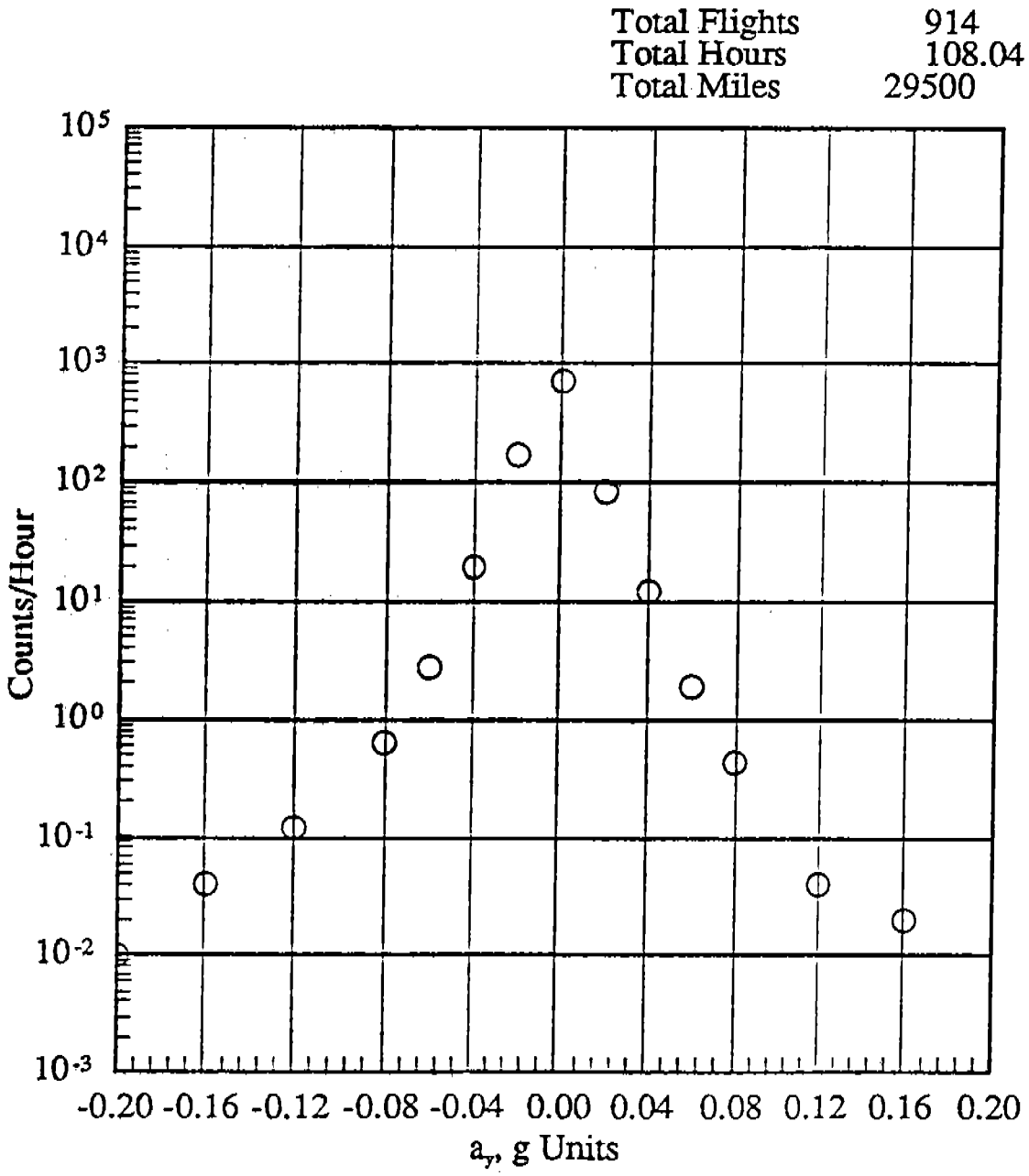
(a) a_y Level crossing counts per hour with in pressure altitude bands

Figure 14.- Lateral acceleration exceedances.



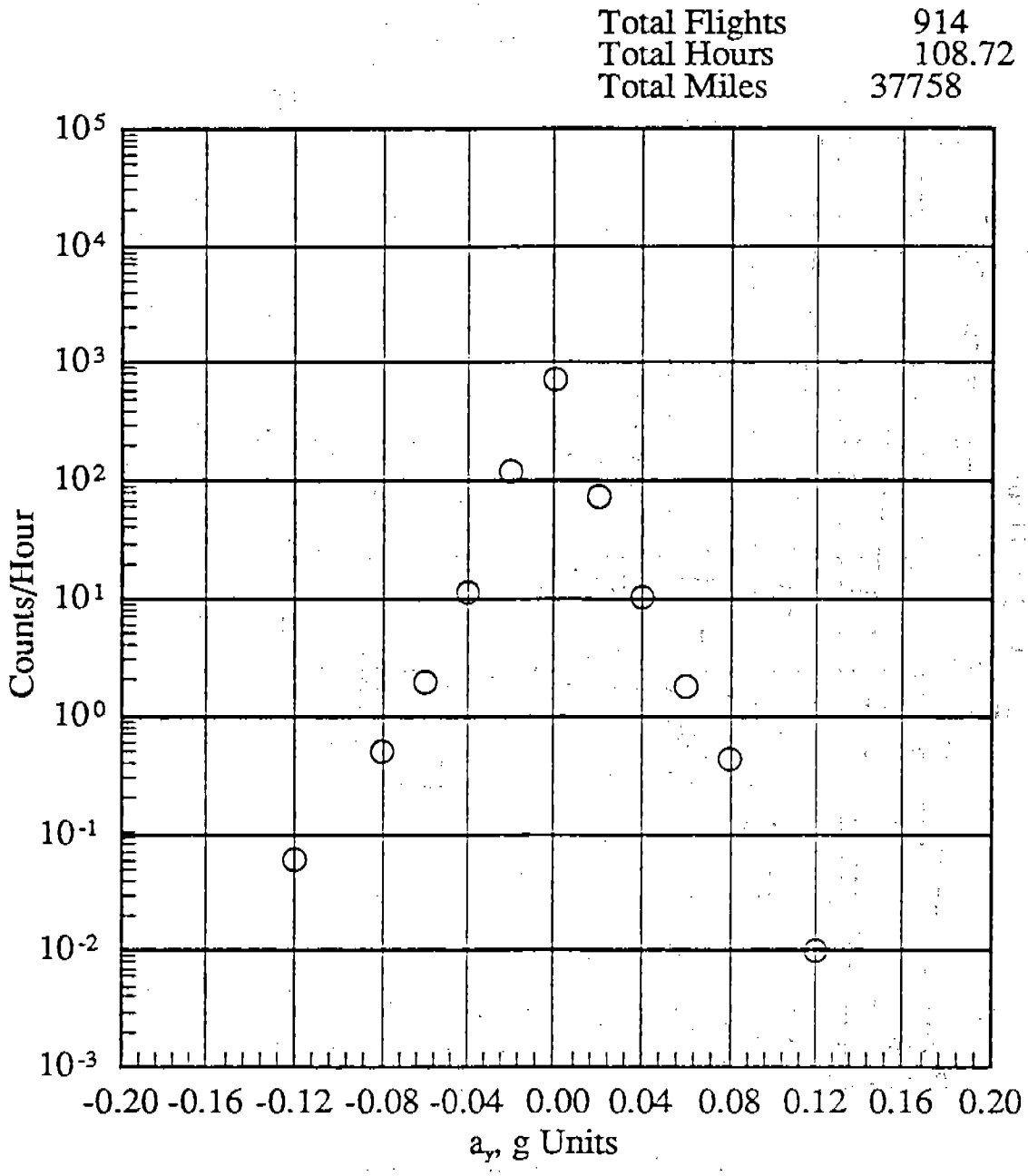
(b) -500 to 4500 feet altitude

Figure 14.- Continued.



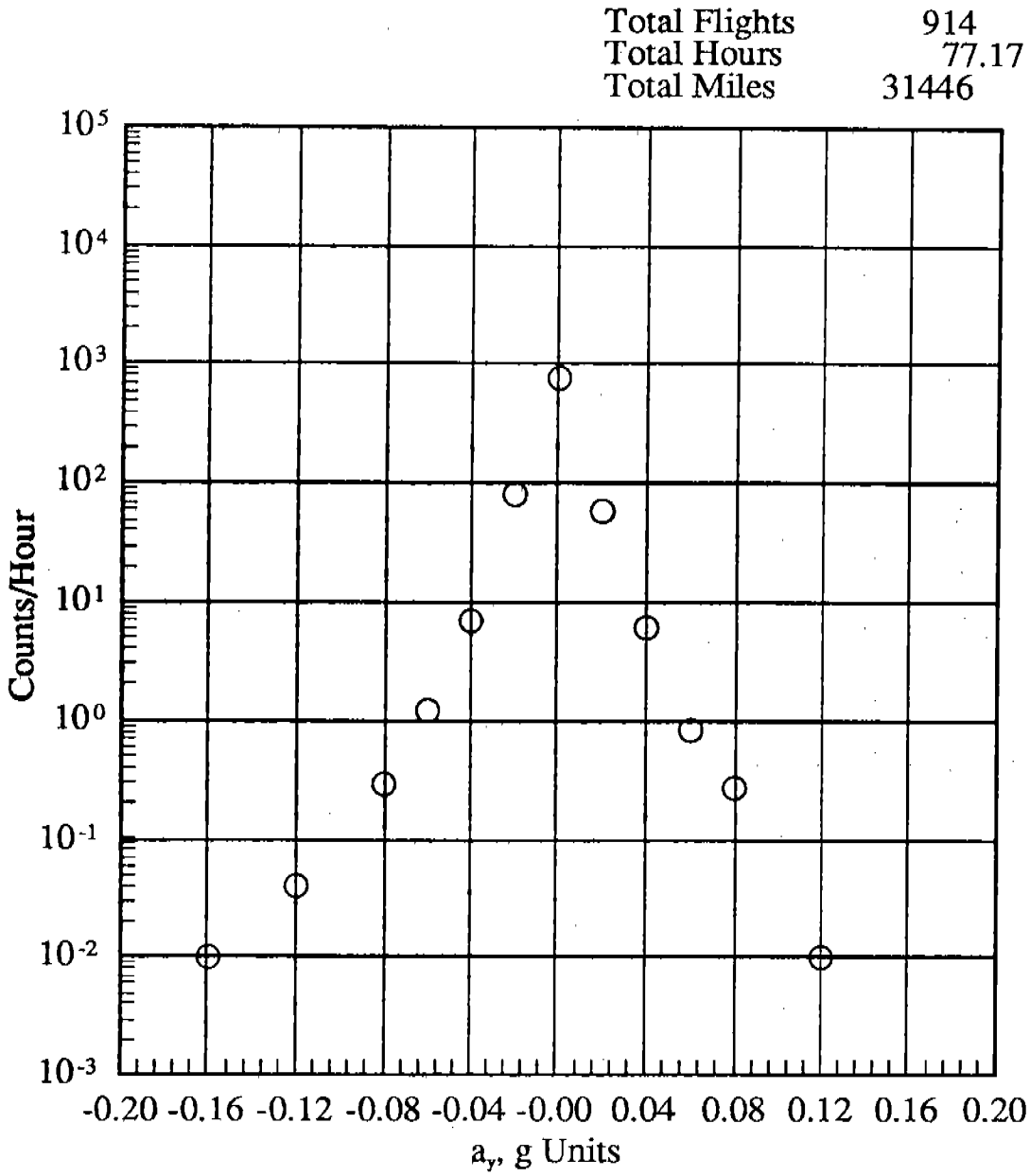
(c) 4500 to 9500 feet altitude

Figure 14.- Continued.



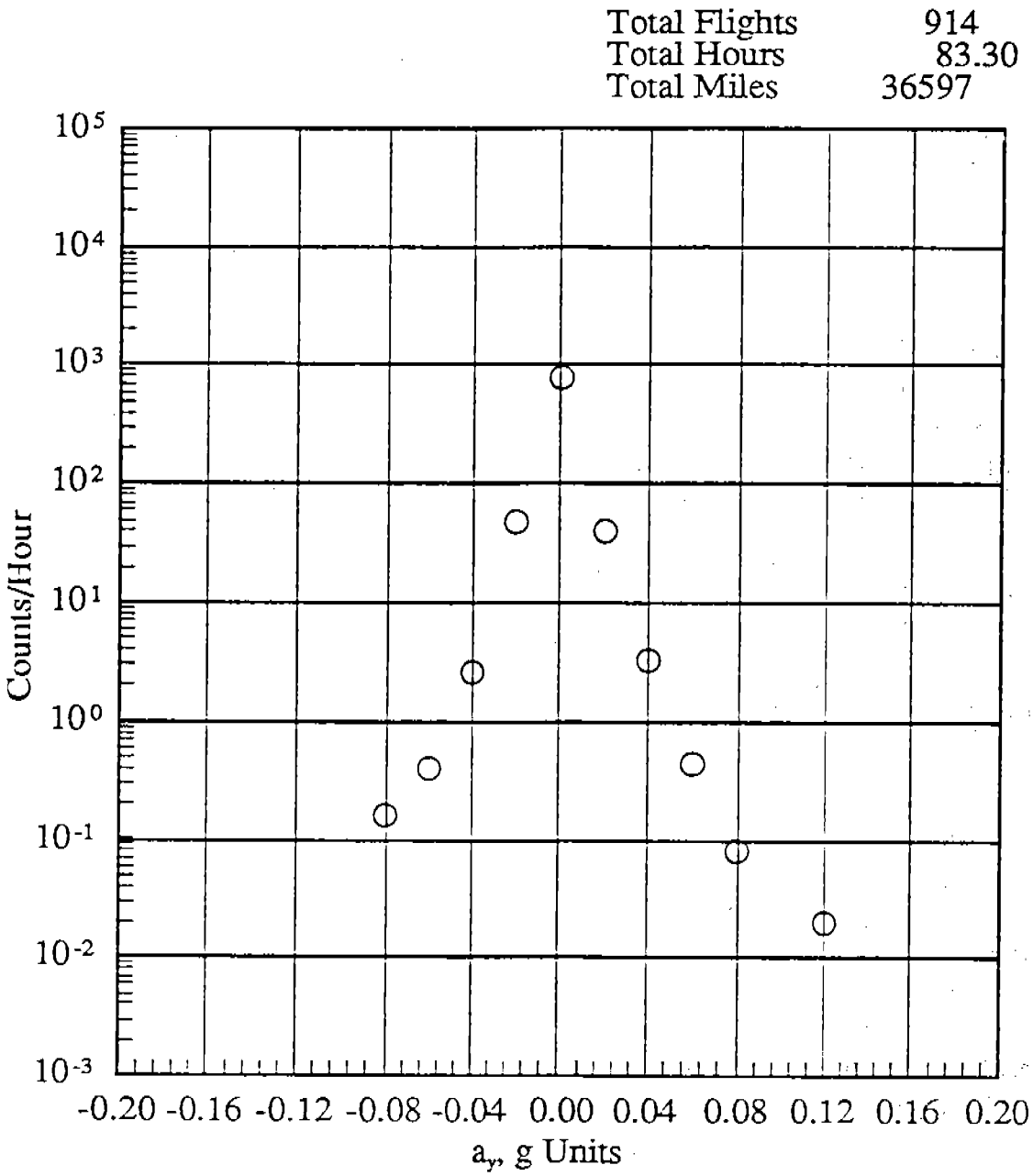
(d) 9500 to 14500 feet altitude

Figure 14.- Continued.



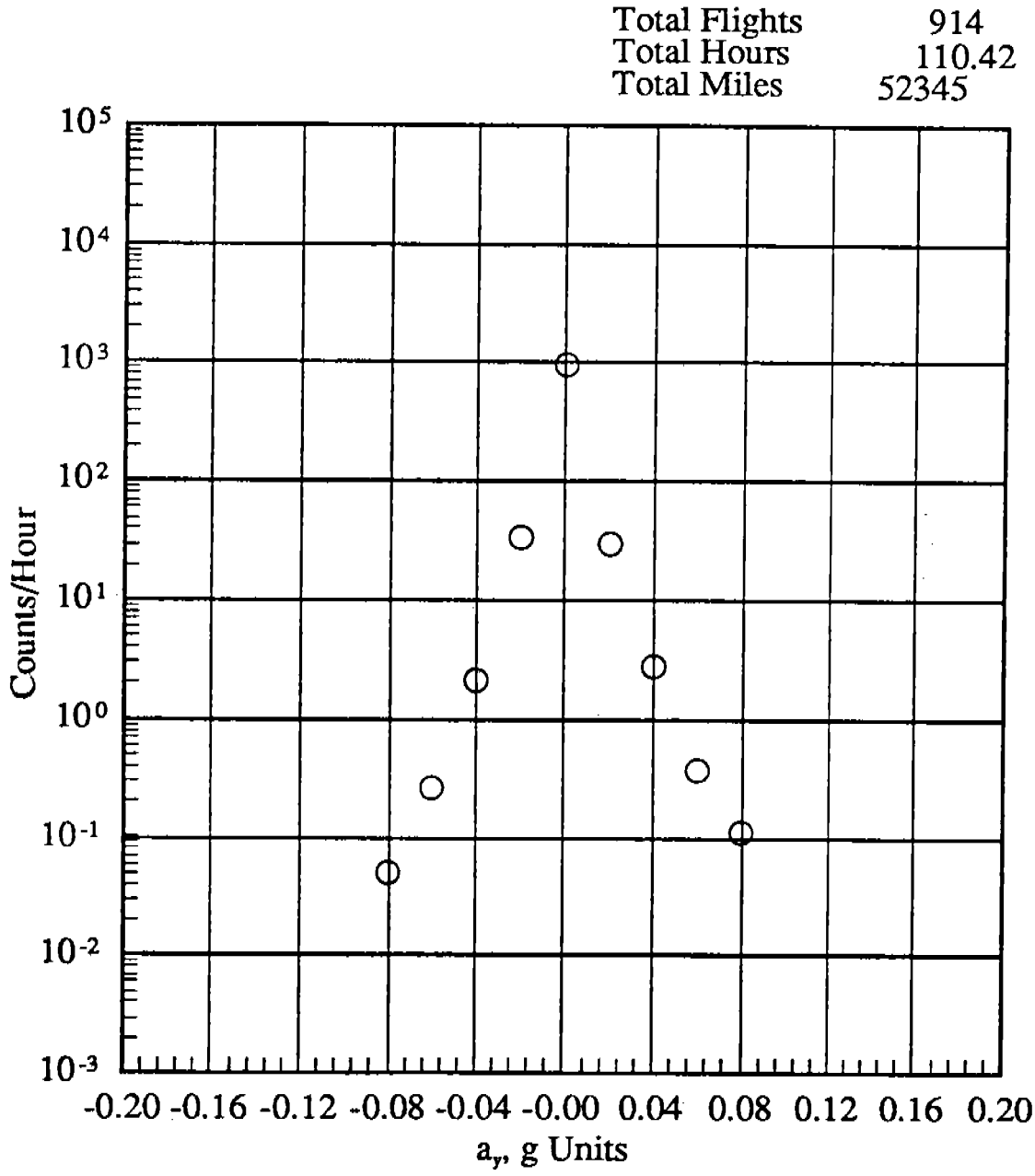
(e) 14500 to 19500 feet altitude

Figure 14.- Continued.



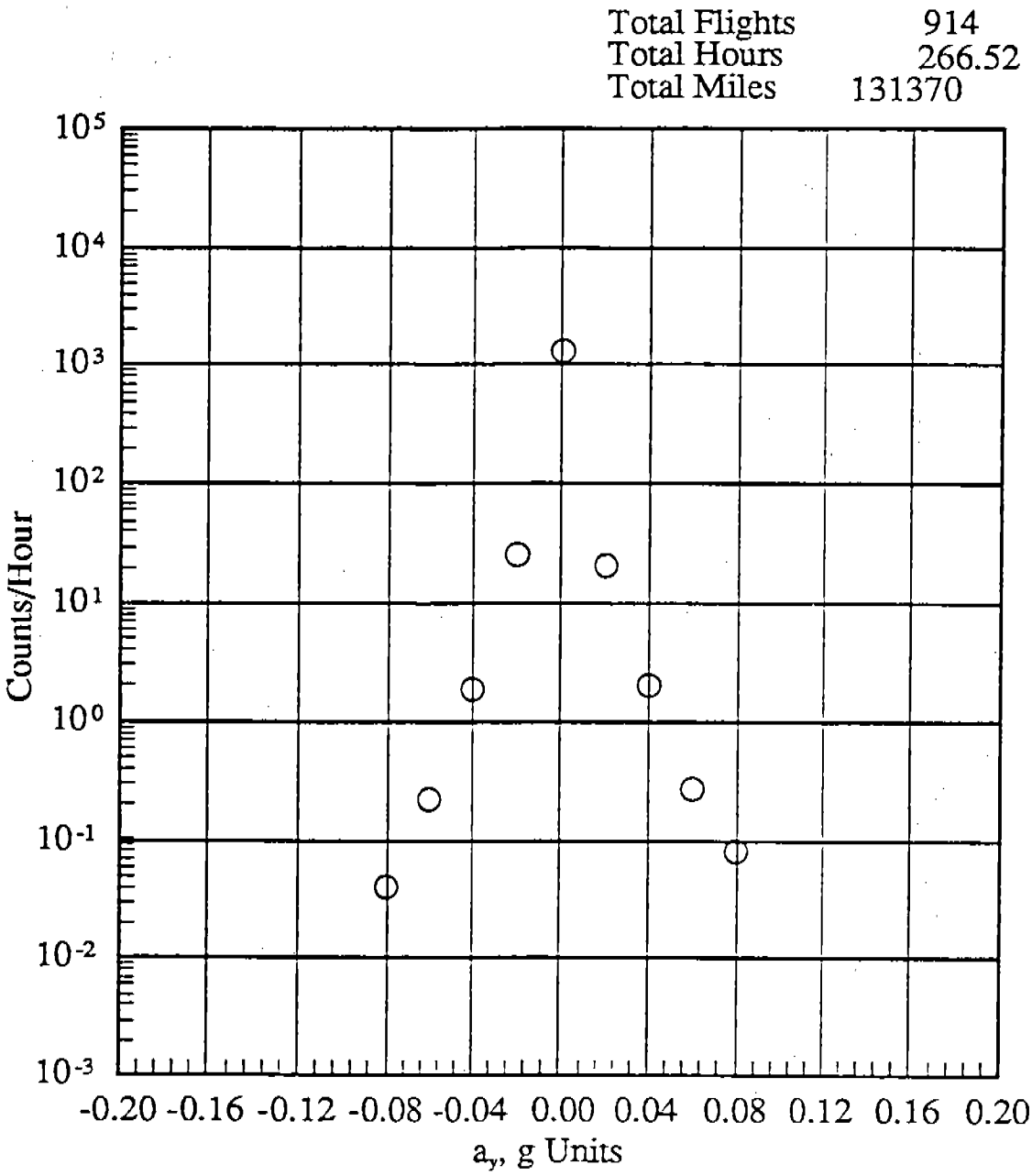
(f) 19500 to 24500 feet altitude

Figure 14.- Continued.



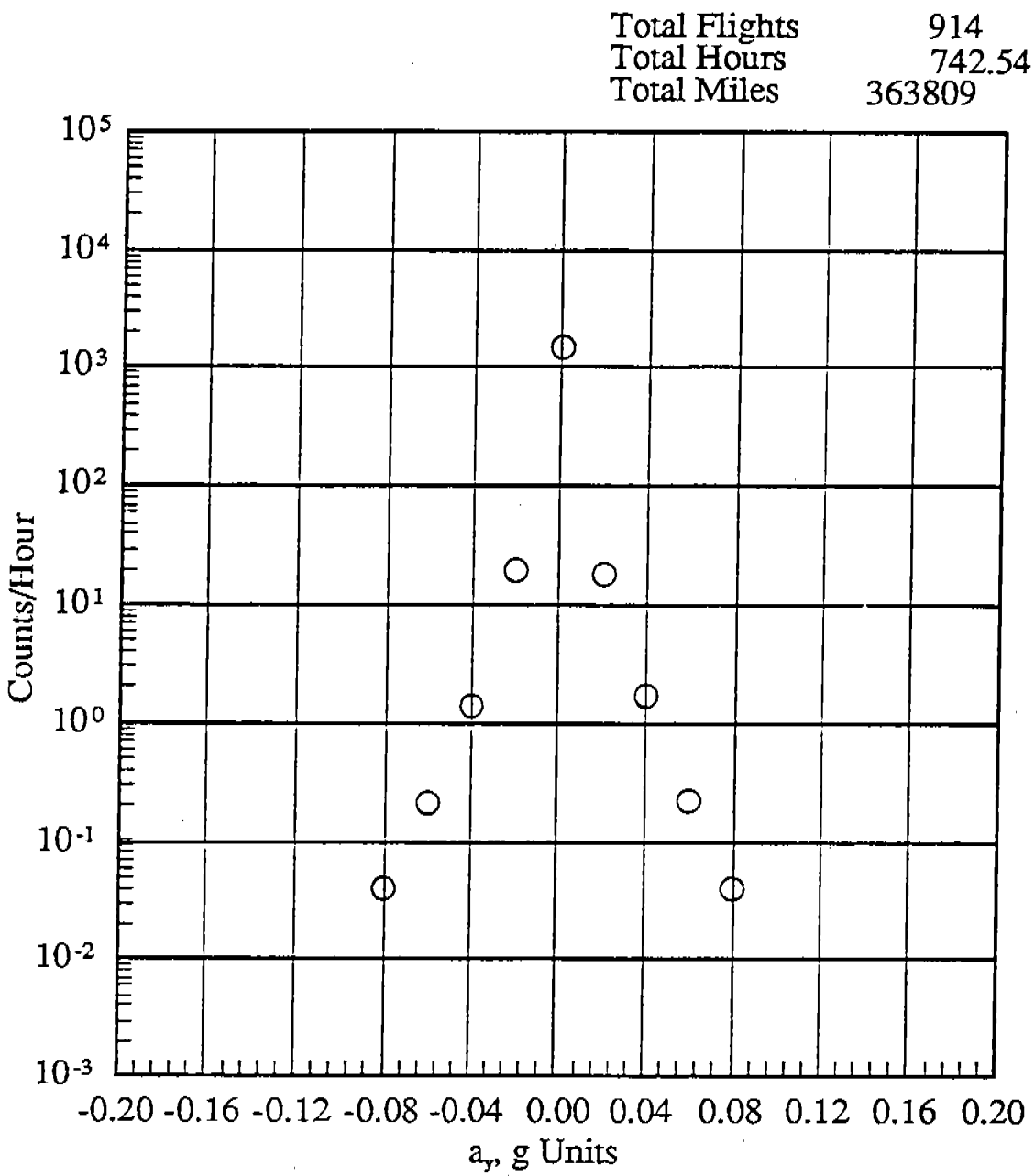
(g) 24500 to 29500 feet altitude

Figure 14.- Continued.



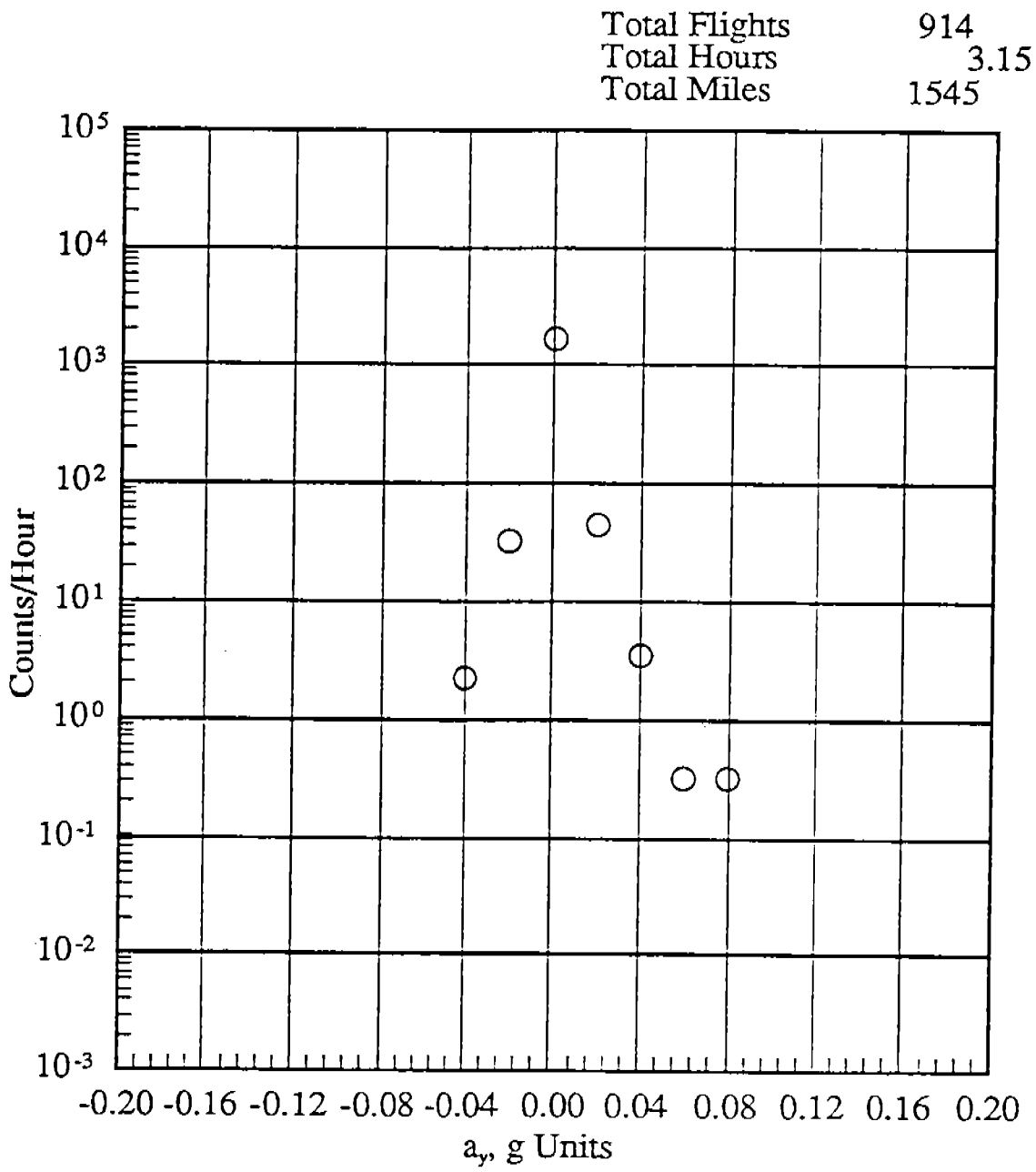
(h) 29500 to 34500 feet altitude

Figure 14.- Continued.



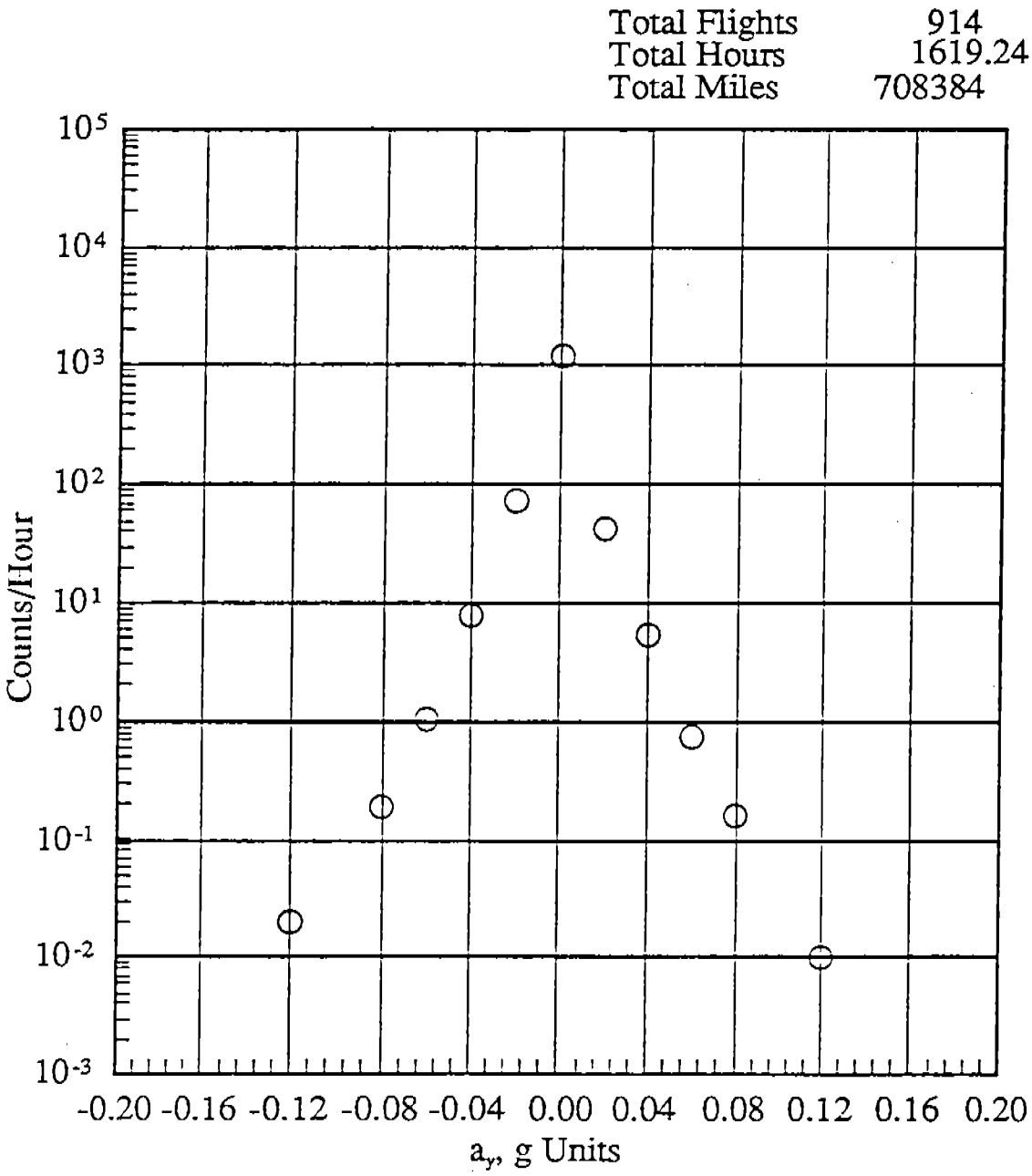
(i) 34500 to 39500 feet altitude

Figure 14.- Continued.



(j) 39500 to 44500 feet altitude

Figure 14.- Continued.



(k) -500 to 44500 feet altitude

Figure 14.- Concluded.

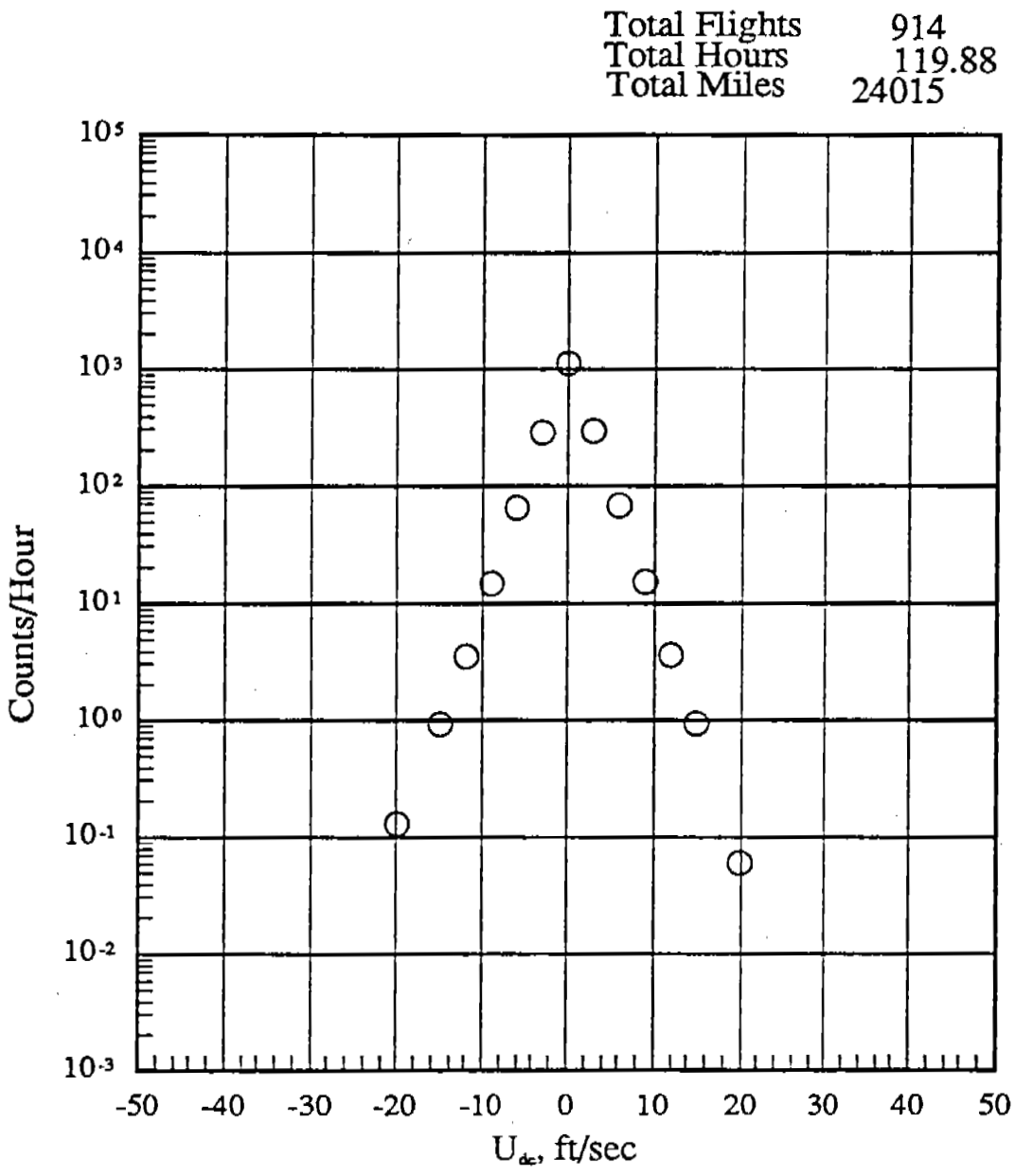
PRESSURE ALTITUDE BANDS

DERIVED GUST VELOCITY LEVEL FT/SEC	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
100	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
40	0	0	0.01	0	0	0	0	0	0	0
30	0	0.01	0.02	0	0	0	0	0	0	0
20	0.06	0.10	0.06	0.03	0	0	0	0	0	0.02
15	0.94	0.41	0.29	0.13	0.01	0	0	0	0	0.12
12	3.64	1.12	0.56	0.26	0.04	0.01	0.03	0	0	0.40
9	15.31	3.41	1.64	0.71	0.11	0.04	0.09	0.02	0	1.53
6	67.82	13.76	7.06	2.73	0.71	0.38	0.40	0.21	0	6.75
3	294.80	71.46	38.04	18.43	8.18	5.41	4.93	4.30	1.59	33.51
0	1121.52	1205.66	1383.02	1505.45	1602.97	1623.82	1647.05	1651.64	1702.41	1552.74
-3	286.81	72.53	38.67	19.37	8.34	5.30	4.78	4.14	1.90	32.98
-6	64.94	13.24	6.55	2.67	0.77	0.37	0.36	0.20	0	6.45
-9	14.83	3.46	1.89	0.67	0.14	0.06	0.06	0.03	0	1.52
-12	3.55	1.21	0.57	0.17	0.04	0	0.02	0.01	0	0.40
-15	0.93	0.51	0.24	0.08	0	0	0.01	0	0	0.12
-20	0.13	0.11	0.06	0.01	0	0	0.01	0	0	0.02
-30	0	0	0	0	0	0	0	0	0	0
-40	0	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60

TOTAL FLIGHTS	914
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN	708383.60

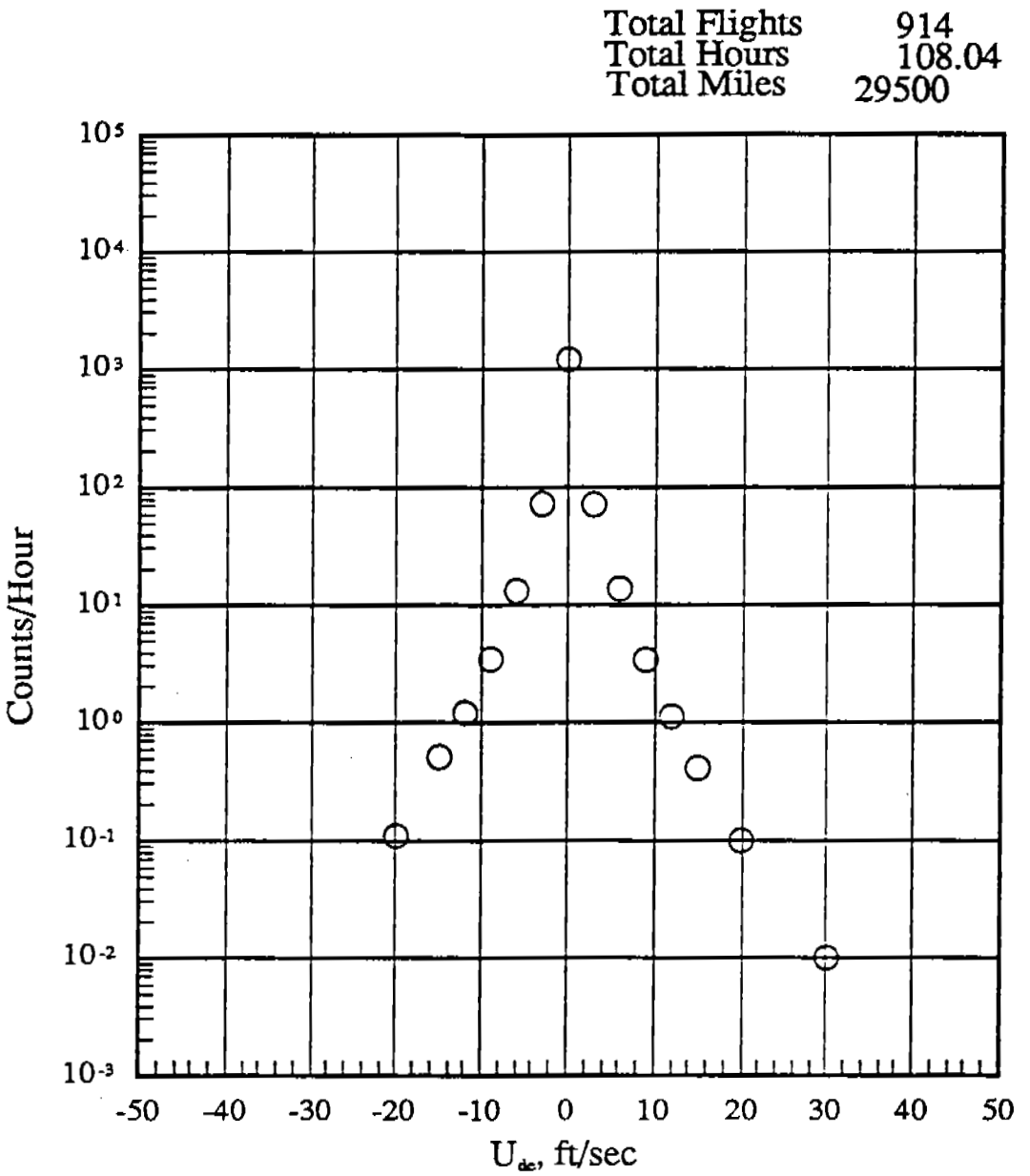
(a) U_{de} Level crossing counts per hour within pressure altitude bands.

Figure 15.- U_{de} Exceedances



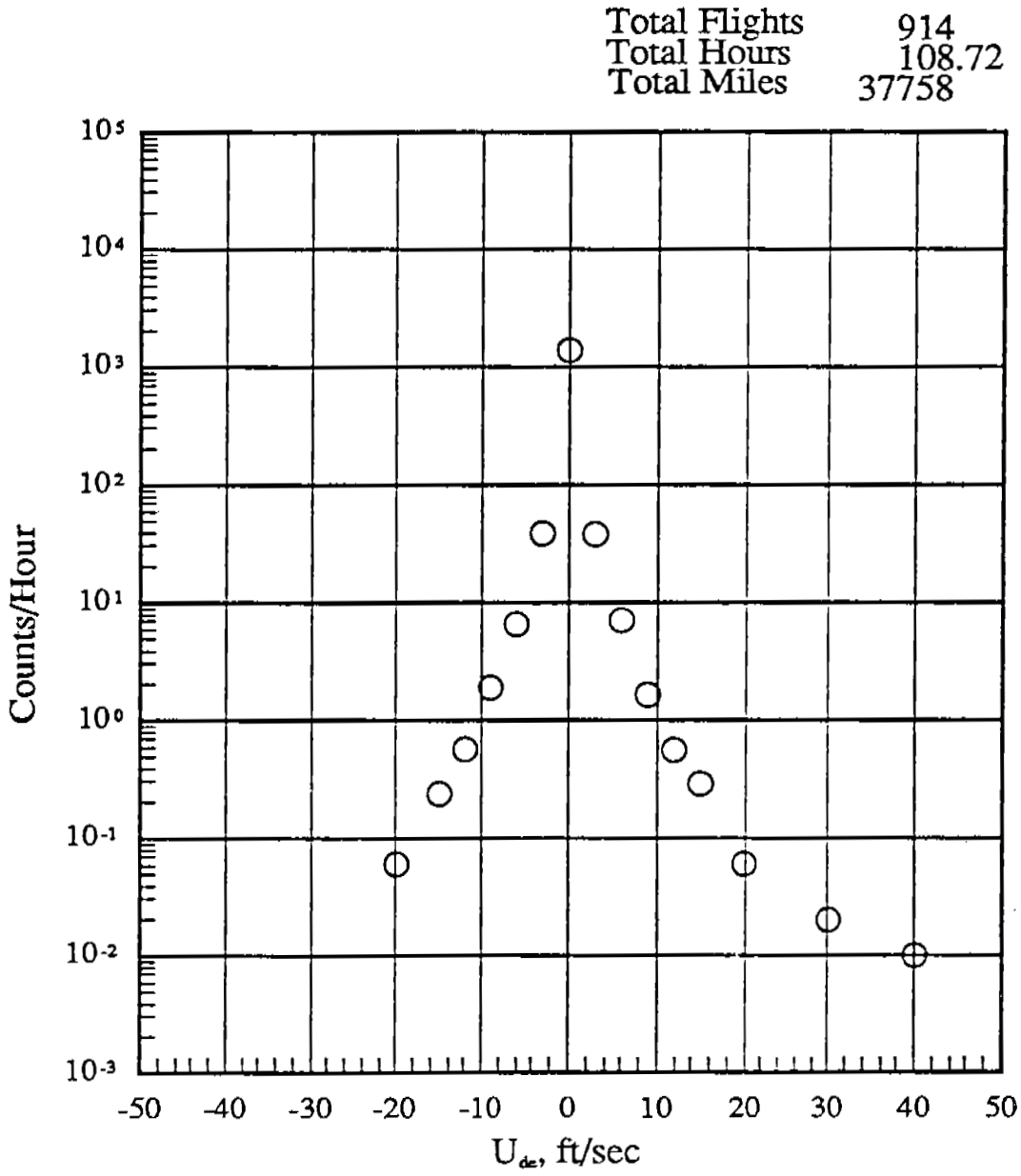
(b) -500 to 4500 feet altitude

Figure 15.- Continued.



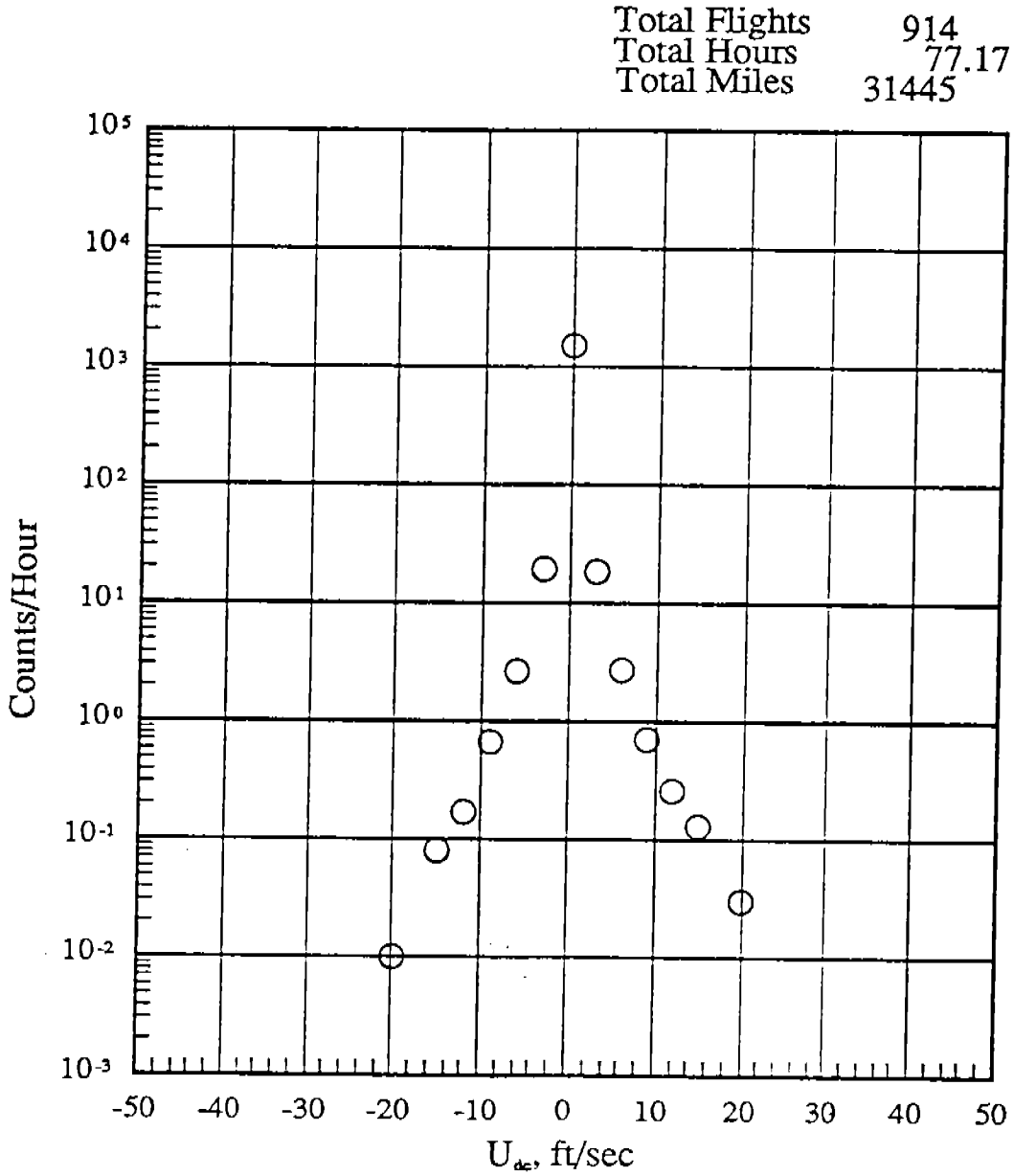
(c) 4500 to 9500 feet altitude

Figure 15.- Continued.



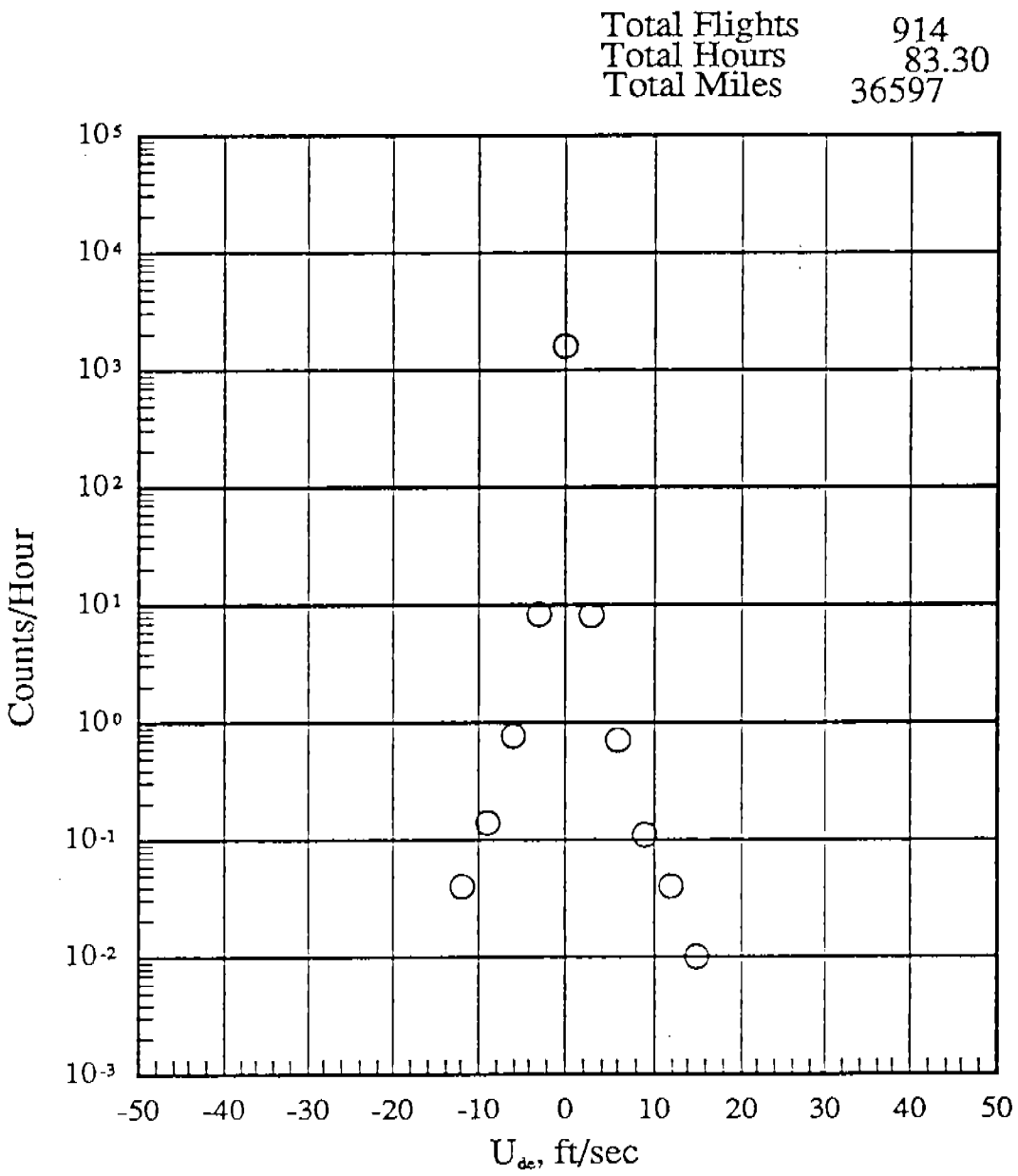
(d) 9500 to 14500 feet altitude

Figure 15.- Continued.



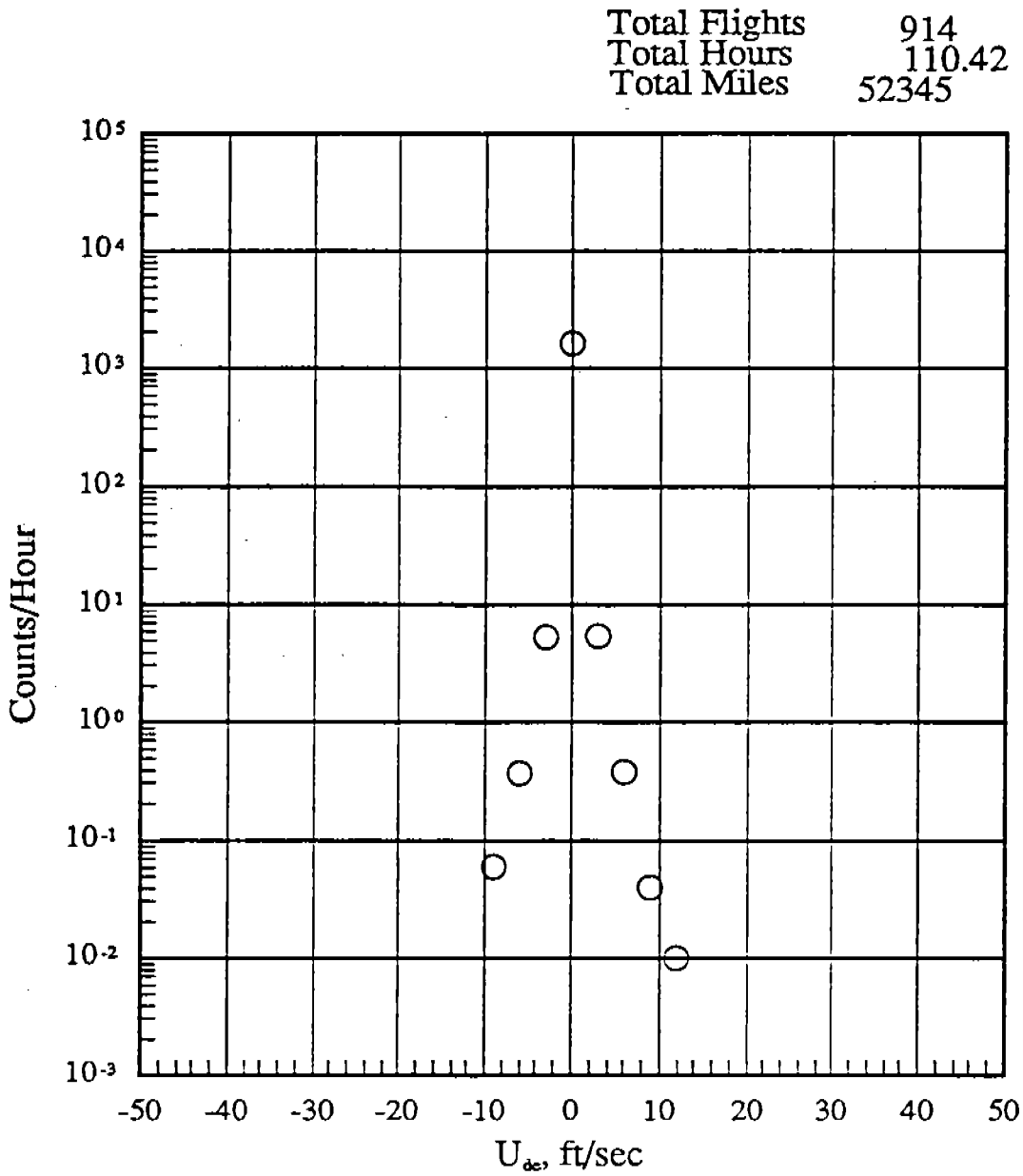
(e) 14500 to 19500 feet altitude

Figure 15.- Continued.



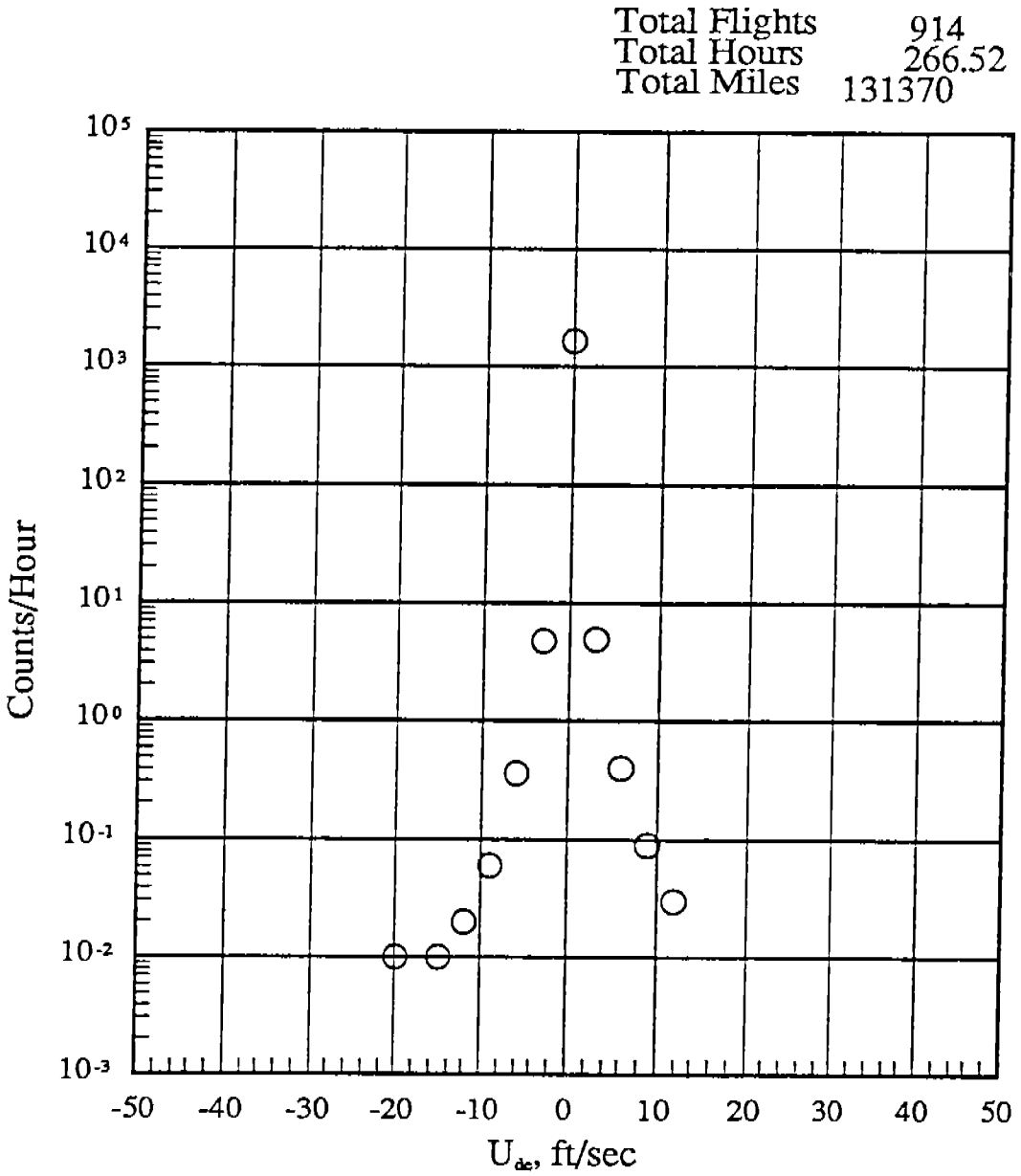
(f) 19500 to 24500 feet altitude

Figure 15.- Continued.



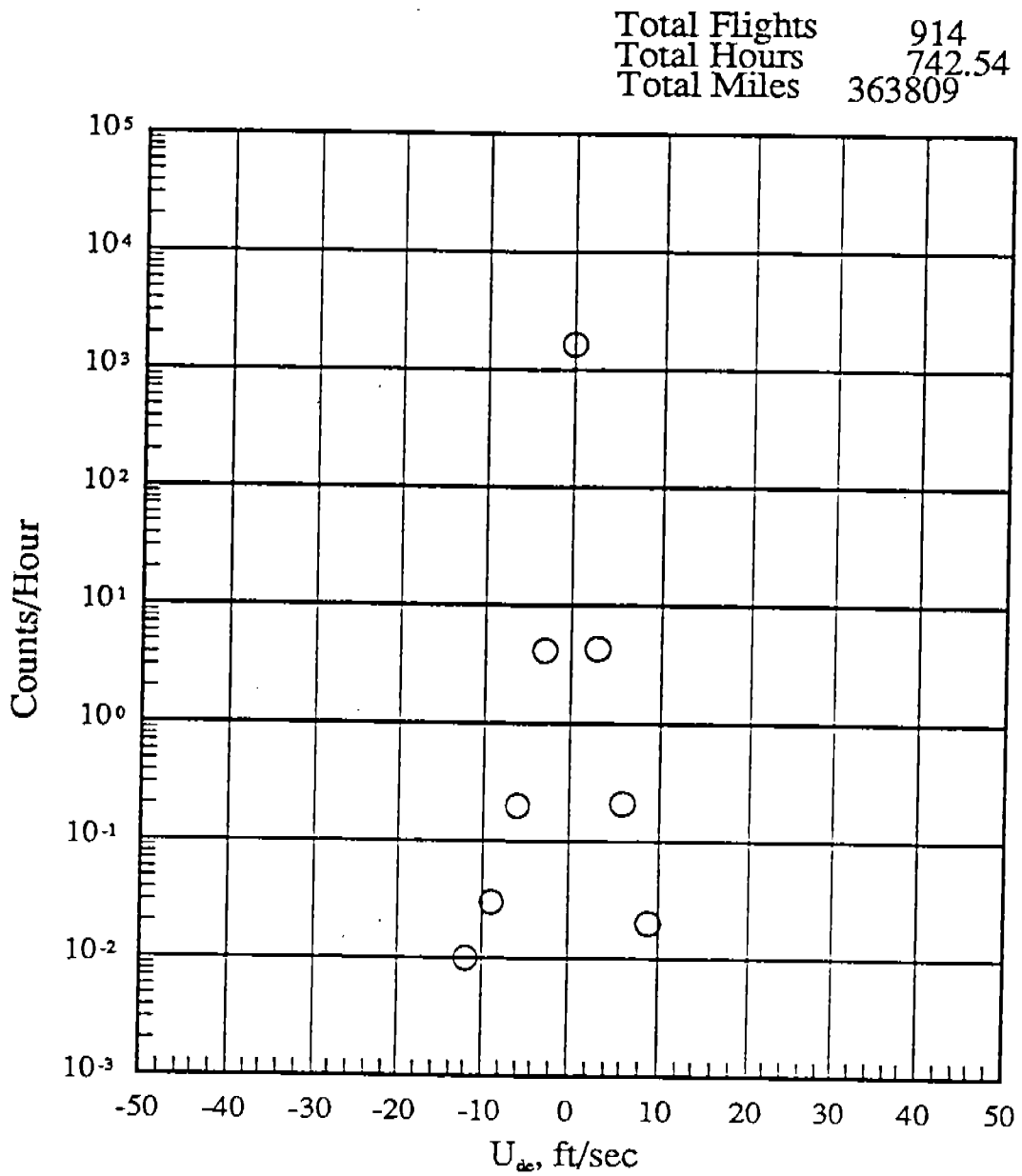
(g) 24500 to 29500 feet altitude

Figure 15.- Continued.



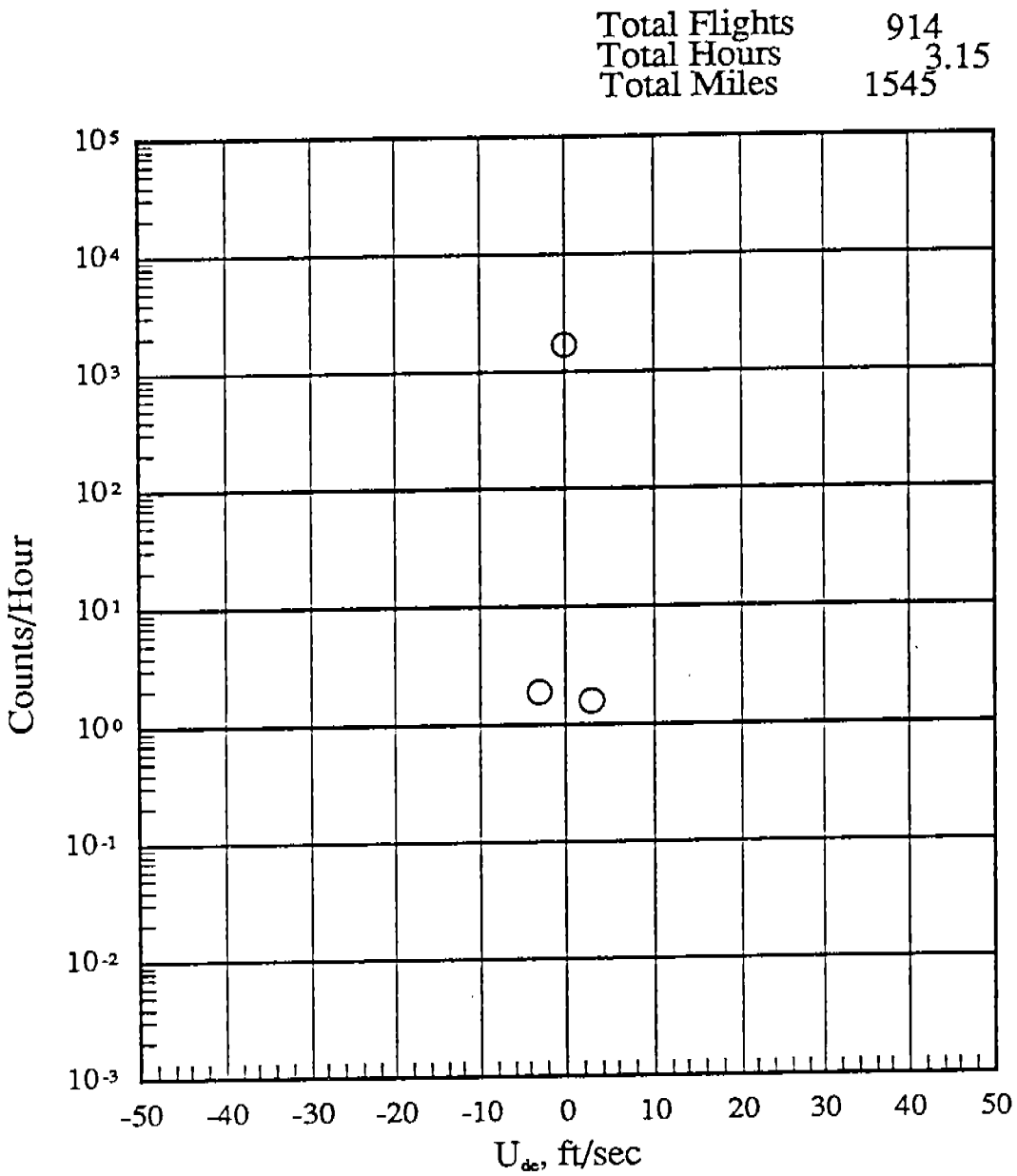
(h) 29500 to 34500 feet altitude

Figure 15.- Continued.



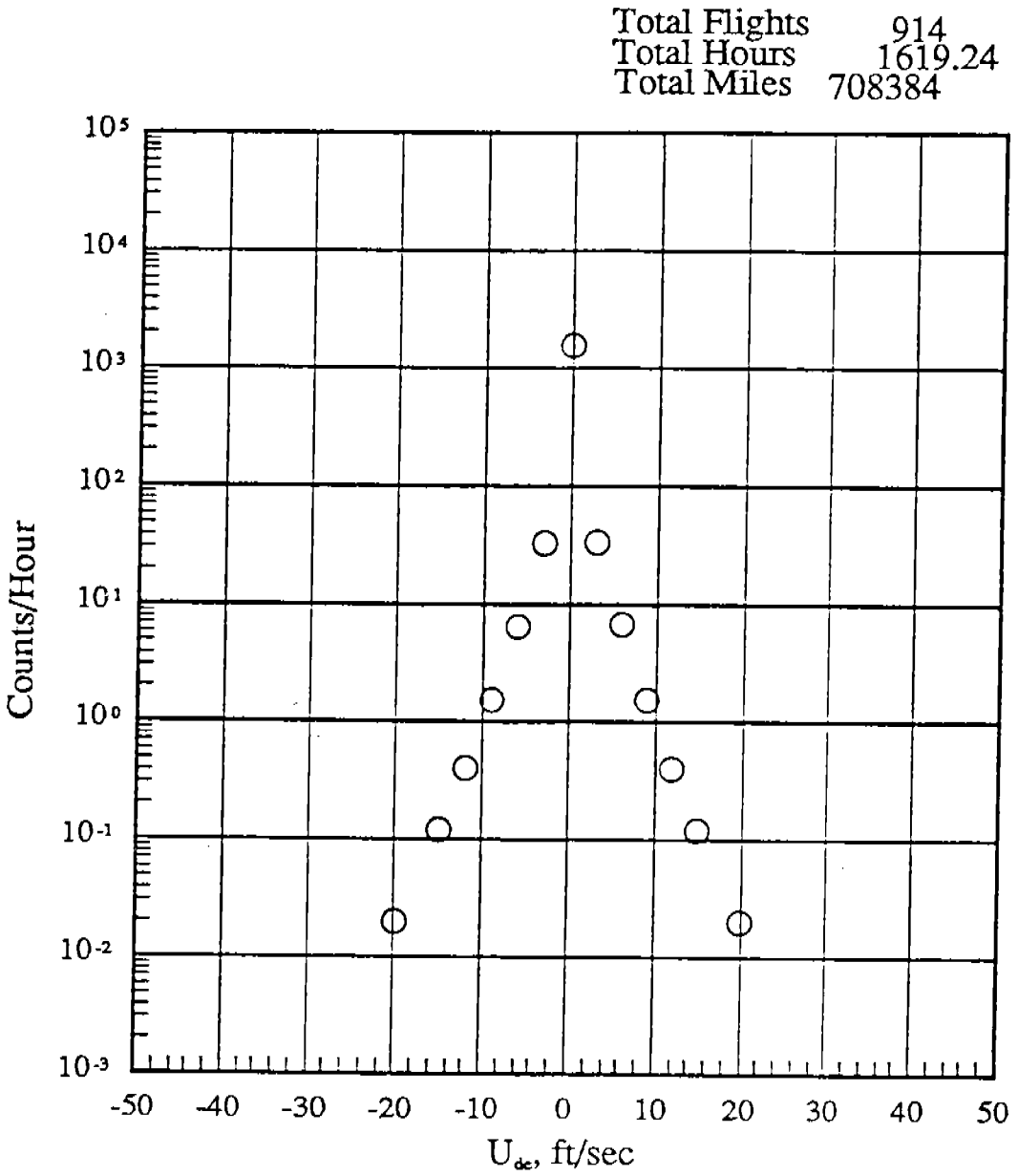
(i) 34500 to 39500 feet altitude

Figure 15.- Continued.



(j) 39500 to 44500 feet altitude

Figure 15.- Continued.



(k) -500 to 44500 feet altitude

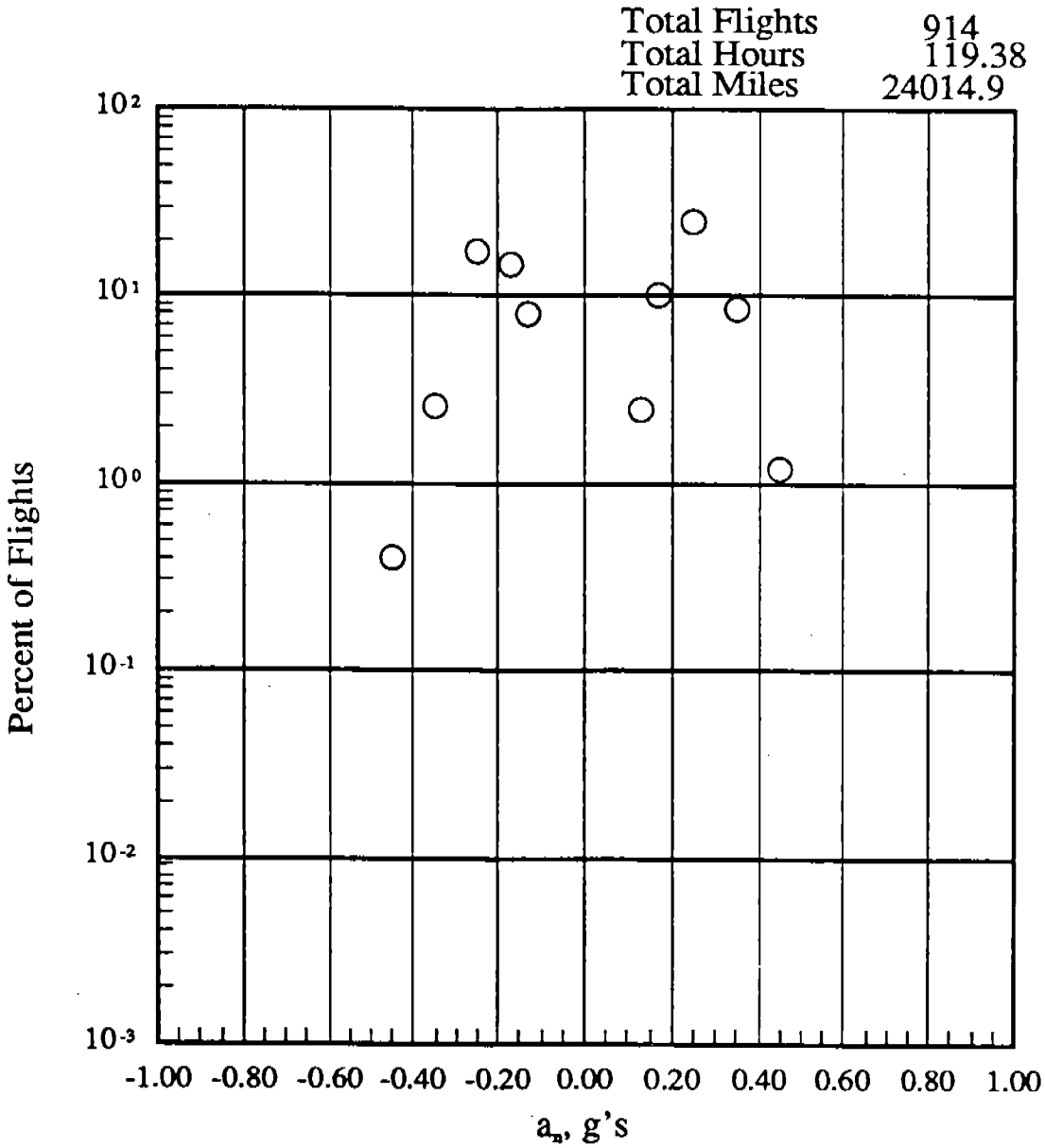
Figure 15.- Concluded

PRESSURE ALTITUDE BANDS

MAXIMUM a_n LEVEL FOR EACH FLIGHT g's FROM	TO	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	1.80	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0.1	0.1	0	0	0	0	0	0	0.2
.70	0.80	0	0.1	0	0	0	0	0	0	0	0.1
.60	0.70	0	0.2	0	0.1	0	0	0.1	0	0	0.4
.50	0.60	0	0.2	0.4	0.2	0	0	0.2	0	0	1.1
.40	0.50	1.2	1.3	0.9	0.2	0.1	0.1	0.3	0.2	0	4.4
.30	0.40	8.6	4.0	2.1	1.4	0.7	0.1	0.2	0.8	0	17.9
.20	0.30	25.1	11.9	5.6	2.5	0.8	1.1	1.3	3.6	0	51.9
.15	0.20	10.2	4.0	1.8	1.0	0.2	0.2	0.9	0.9	0	19.1
.10	0.15	2.5	1.4	0.5	0.1	0	0.1	0.1	0	0	4.8
.05	0.10	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	8.1	3.5	2.1	0.7	0.7	0.2	0.3	1.2	0	16.7
-.15	-0.20	14.9	5.9	3.6	1.4	0.7	0.8	0.9	2.0	0	30.1
-.20	-0.30	17.4	6.5	5.9	2.5	1.2	1.6	2.3	3.4	0	40.8
-.30	-0.40	2.6	1.9	1.9	0.8	0	0.1	0.9	0.5	0	8.6
-.40	-0.50	0.4	0.7	0.4	0.1	0.2	0	0.1	0.3	0	2.3
-.50	-0.60	0	0.2	0.3	0.2	0	0	0	0	0	0.8
-.60	-0.70	0	0.2	0	0.1	0	0	0	0.1	0	0.4
-.70	-0.80	0	0.1	0	0	0	0	0	0	0	0.1
-.80	-1.00	0	0	0	0	0	0	0.1	0	0	0.1
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT		119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT		24014.89	29500.10	37757.94	31445.86	36596.71	52344.5	131369.93	363808.56	1545.14	708383.64
							TOTAL FLIGHTS				914

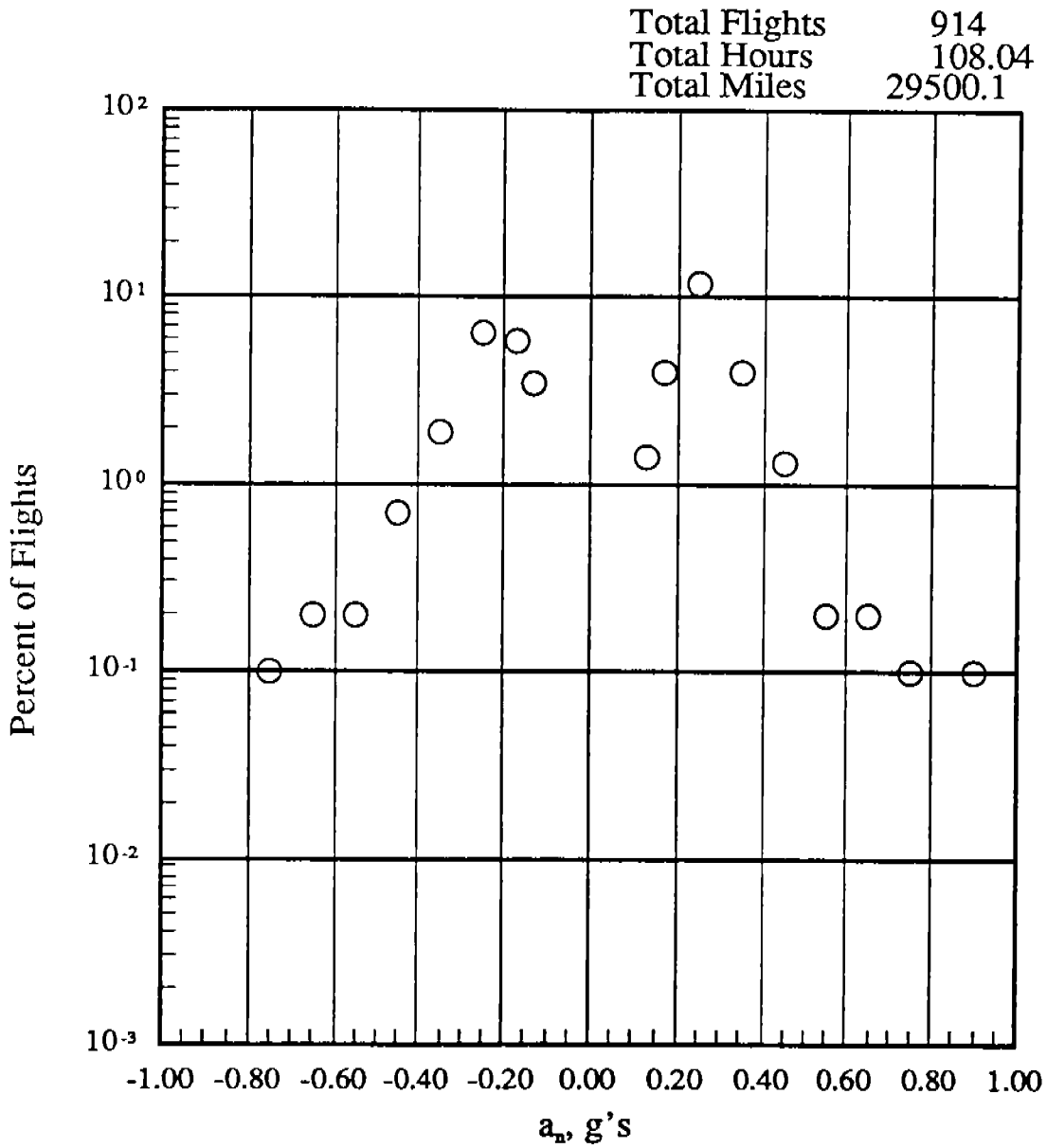
(a) Percent of flights where peak positive and negative a_n per flight occurs within pressure altitude bands, any flap

Figure 16.- Peak positive and negative a_n vs altitude.



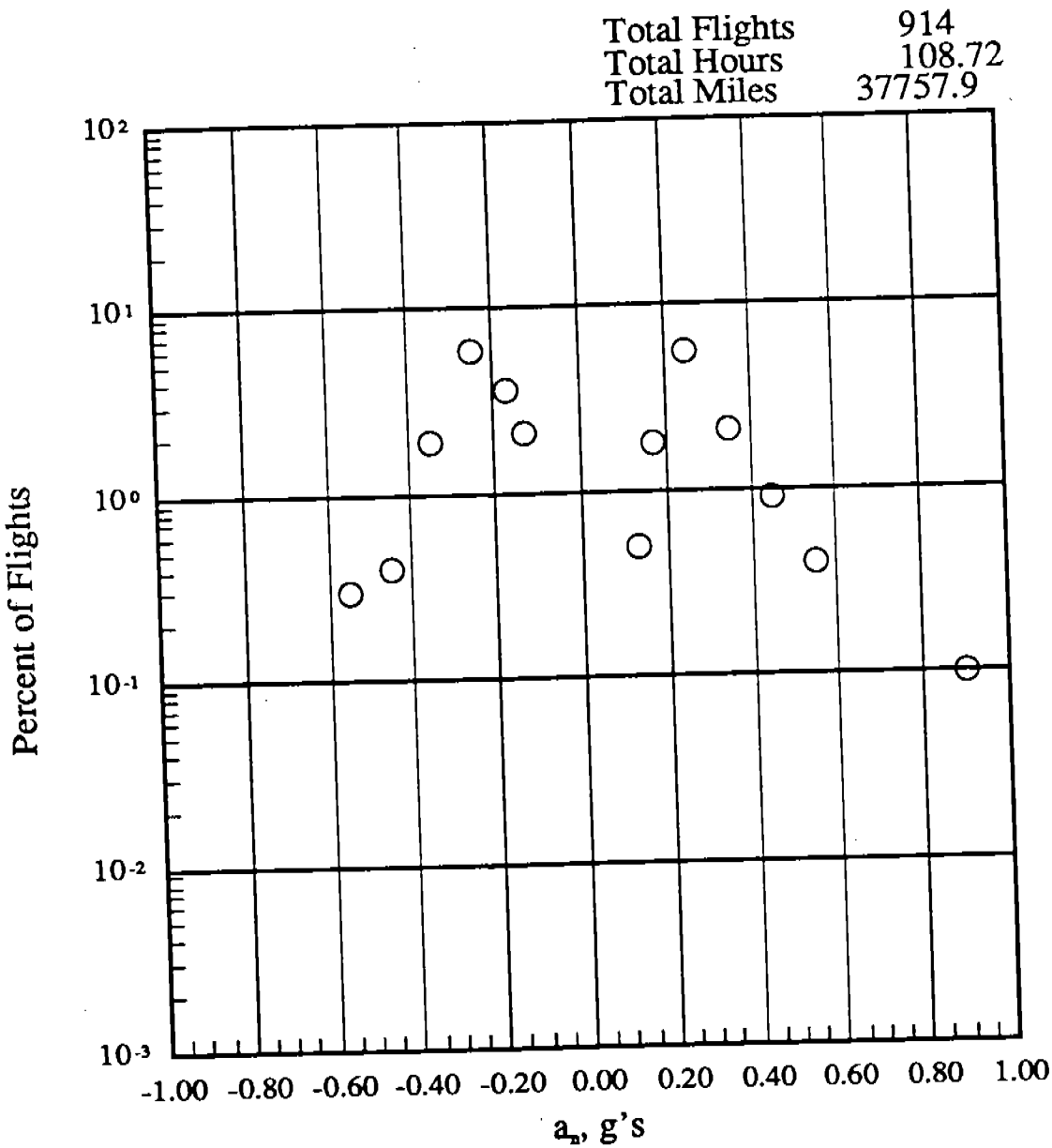
(b) -500 to 4500 feet altitude

Figure 16.- Continued.



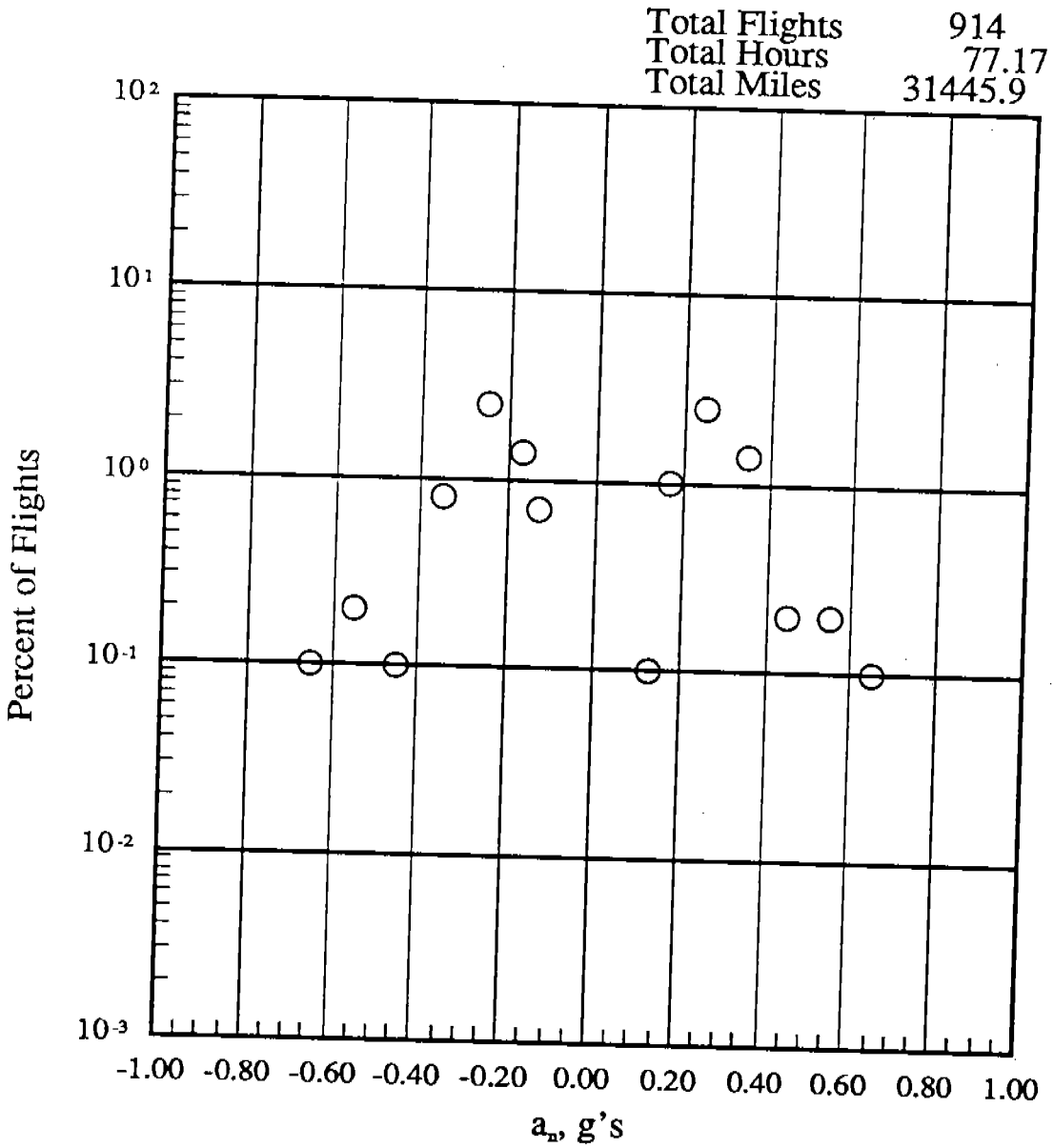
(c) 4500 to 9500 feet altitude

Figure 16.- Continued.



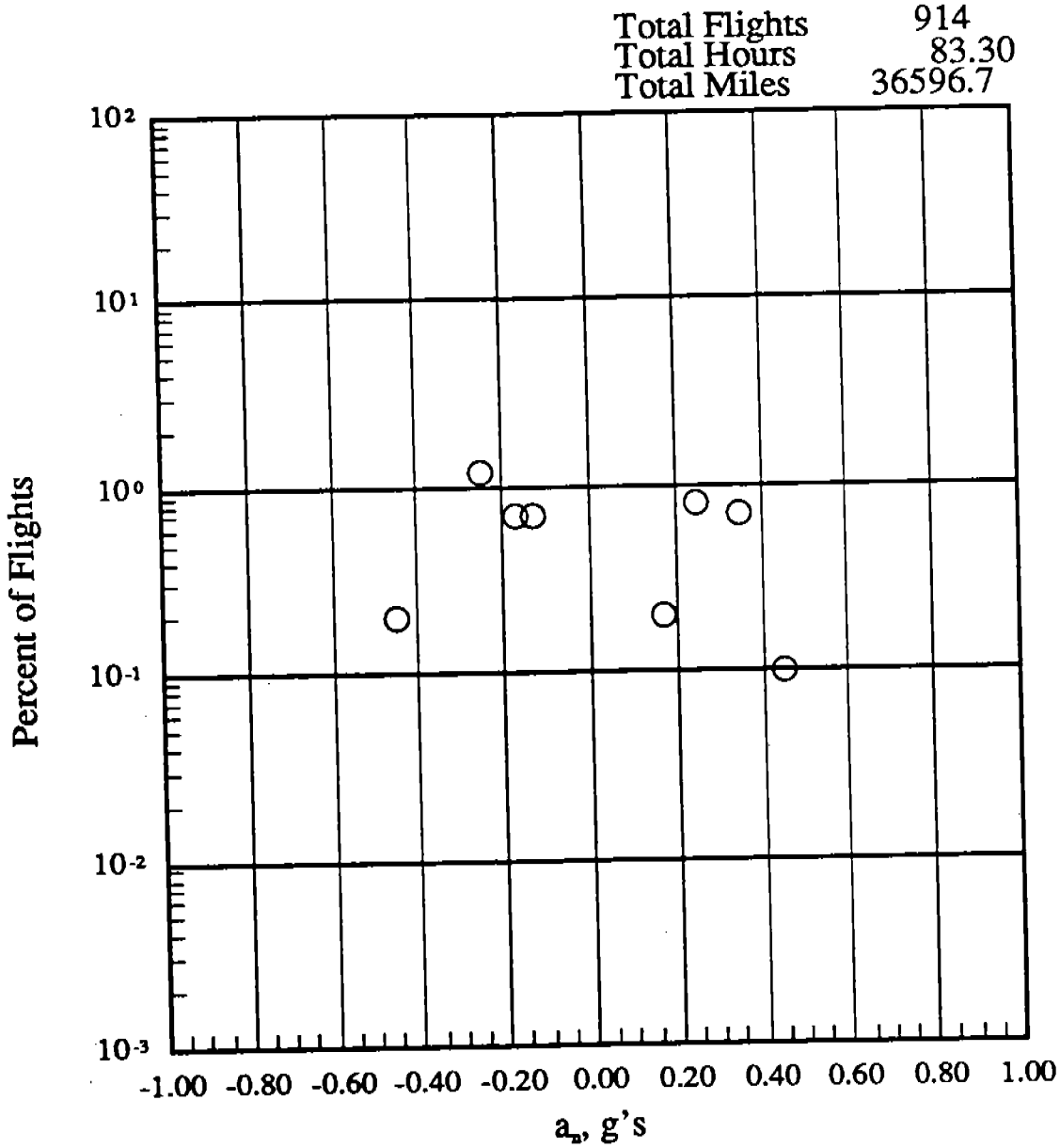
(d) 9500 to 14500 feet altitude

Figure 16.- Continued.



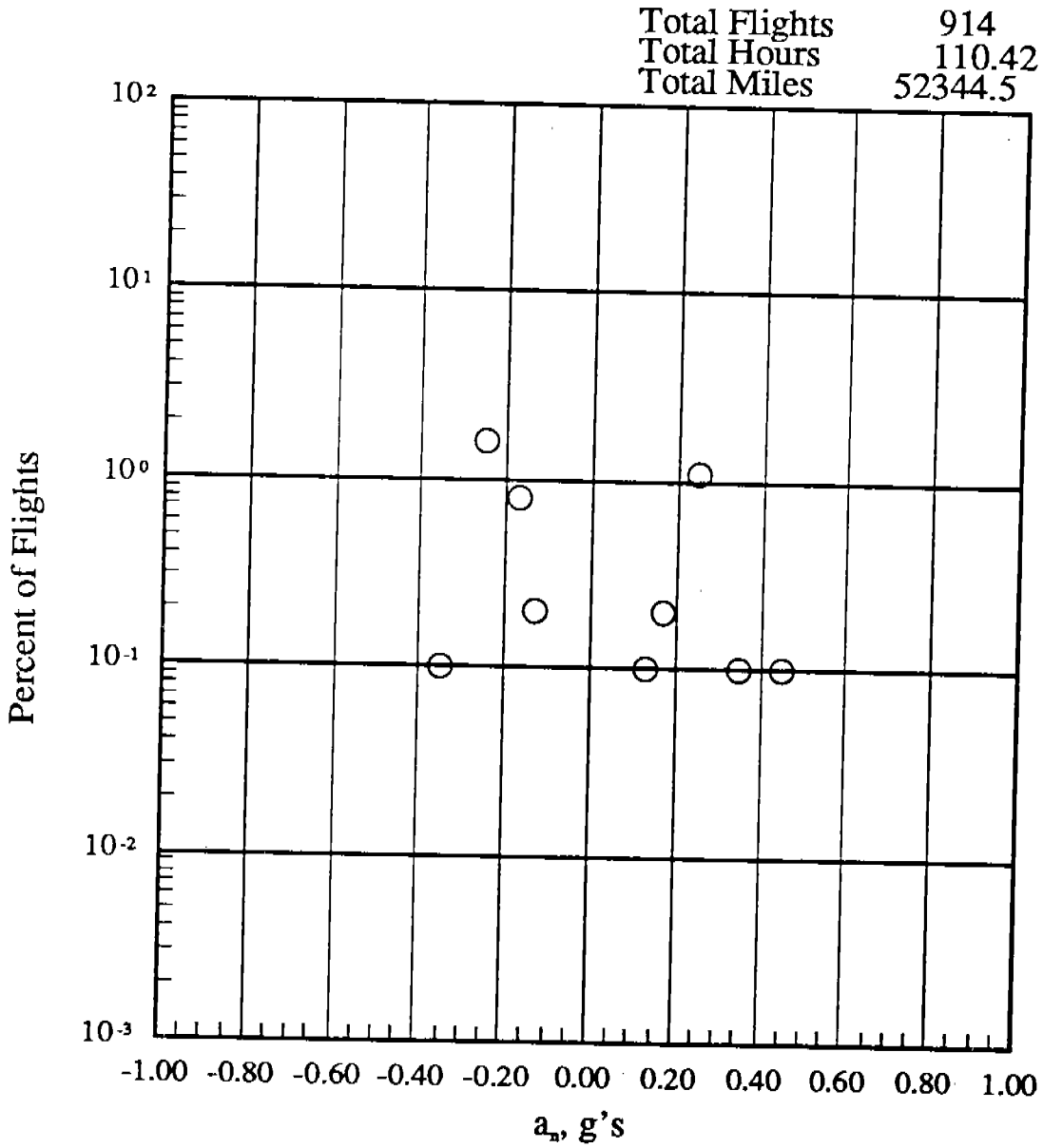
(e) 14500 to 19500 feet altitude

Figure 16.- Continued.



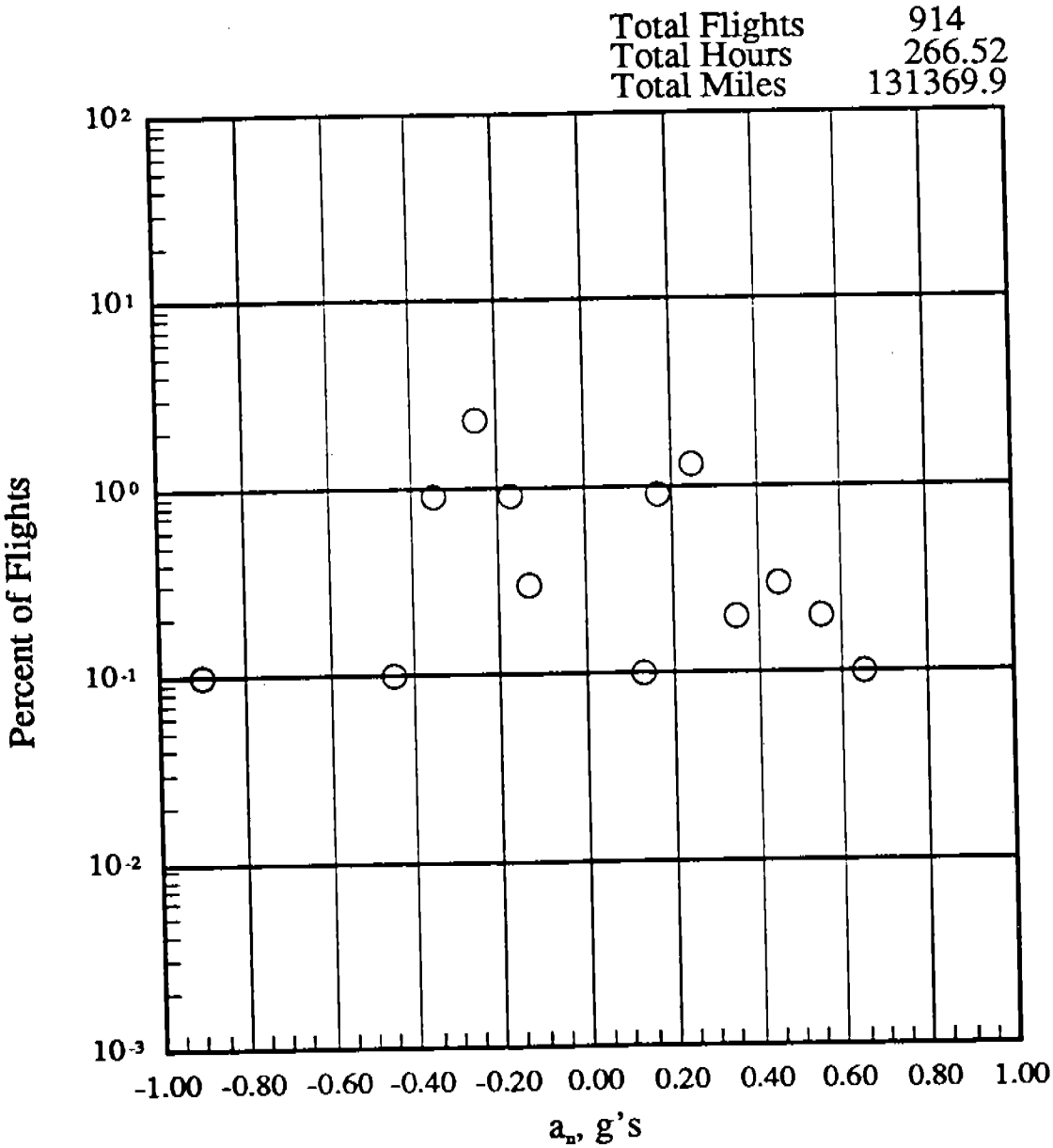
(f) 19500 to 24500 feet altitude

Figure 16.- Continued.



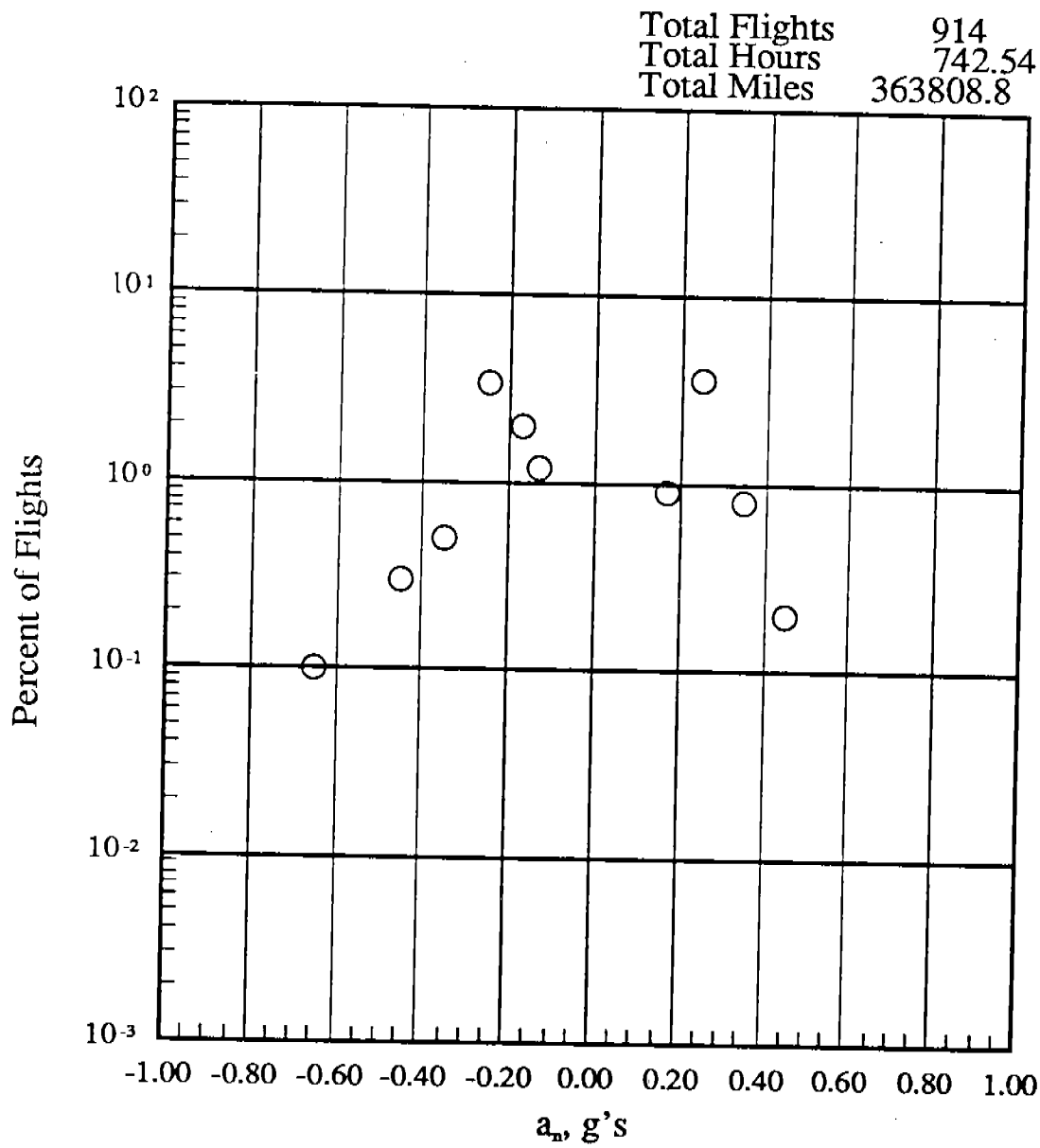
(g) 24500 to 29500 feet altitude

Figure 16.- Continued.



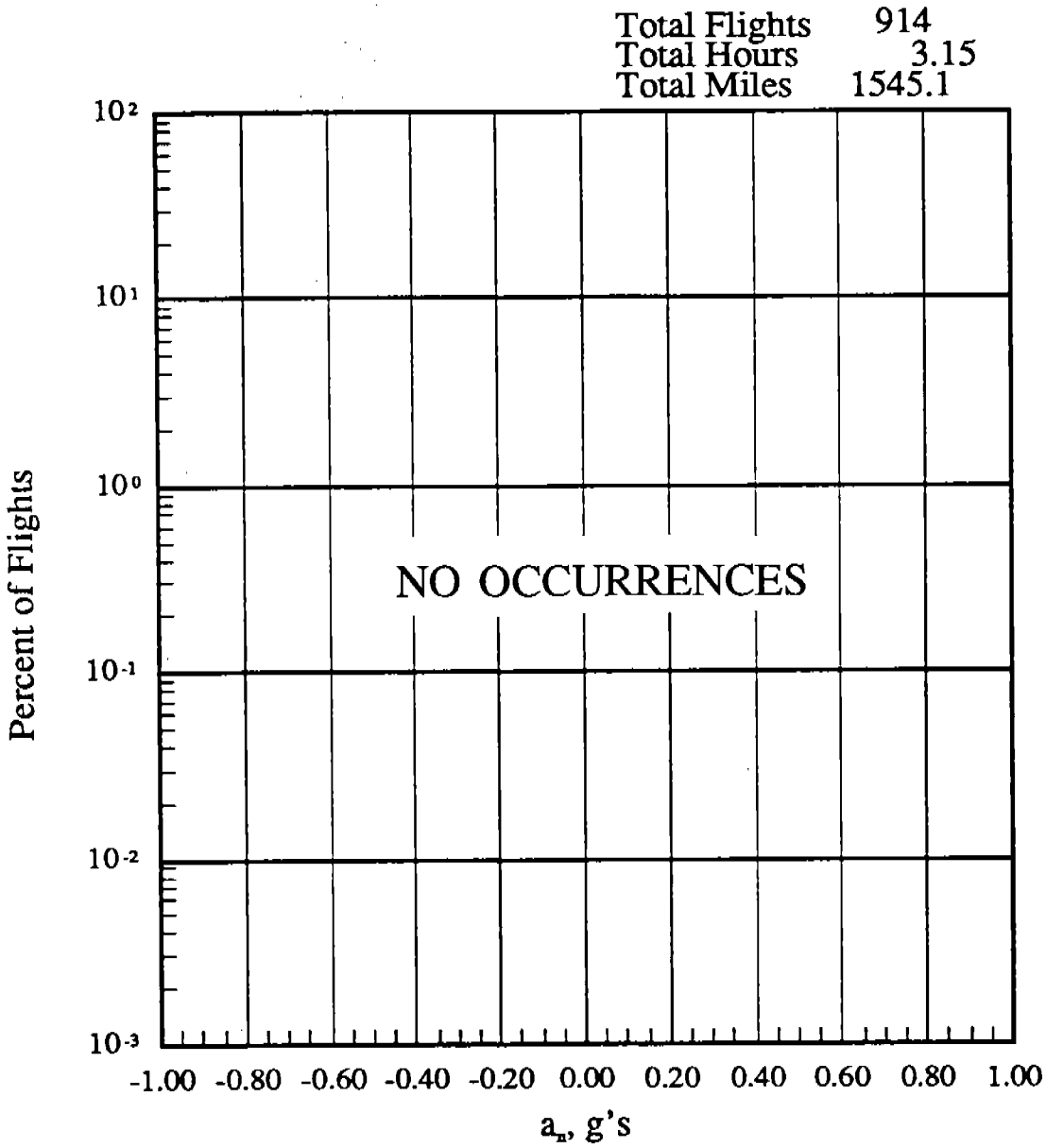
(h) 29500 to 34500 feet altitude

Figure 16.- Continued.



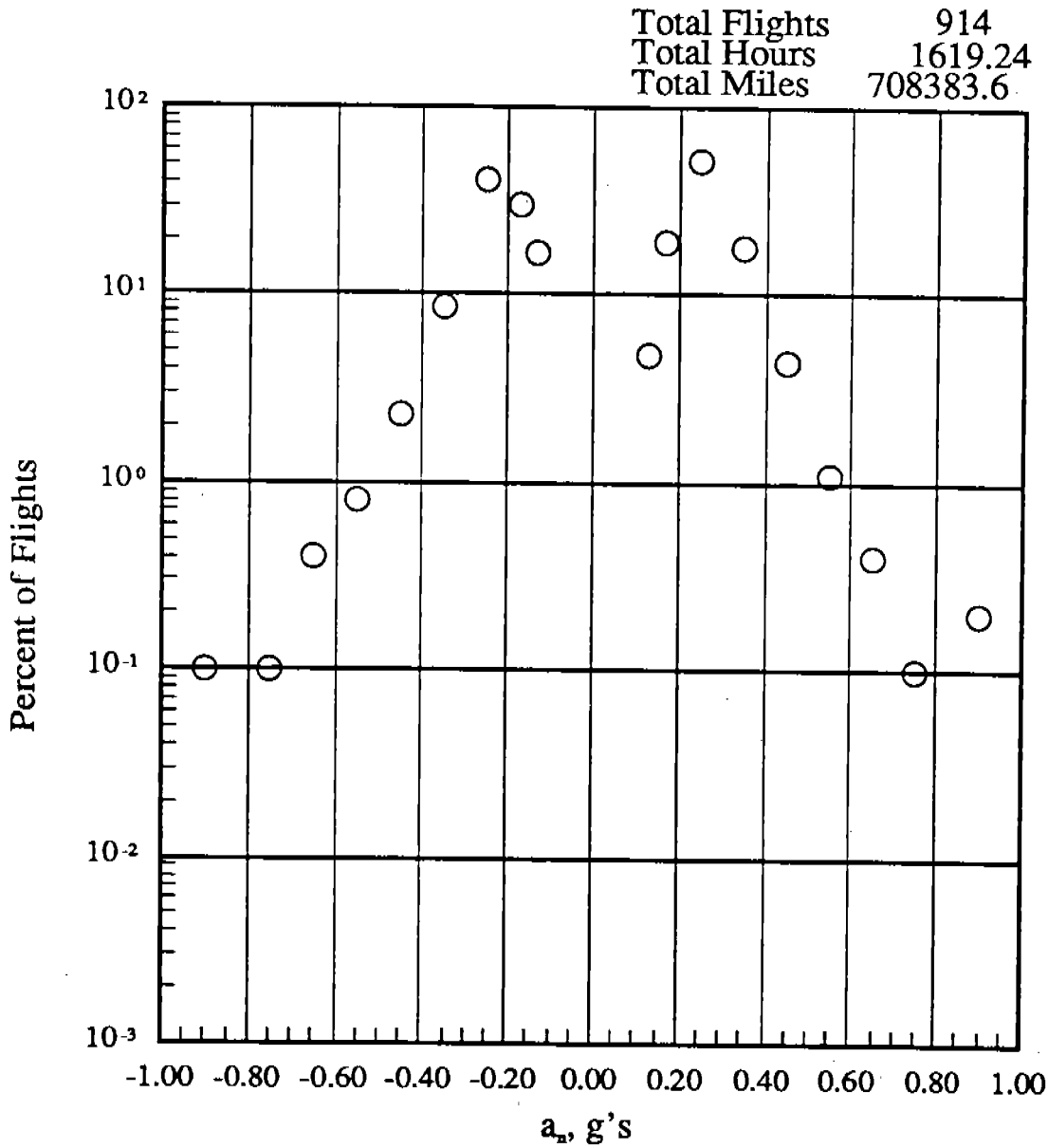
(i) 34500 to 39500 feet altitude

Figure 16.- Continued.



(j) 39500 to 44500 feet altitude

Figure 16.- Continued.



(k) -500 to 44500 feet altitude

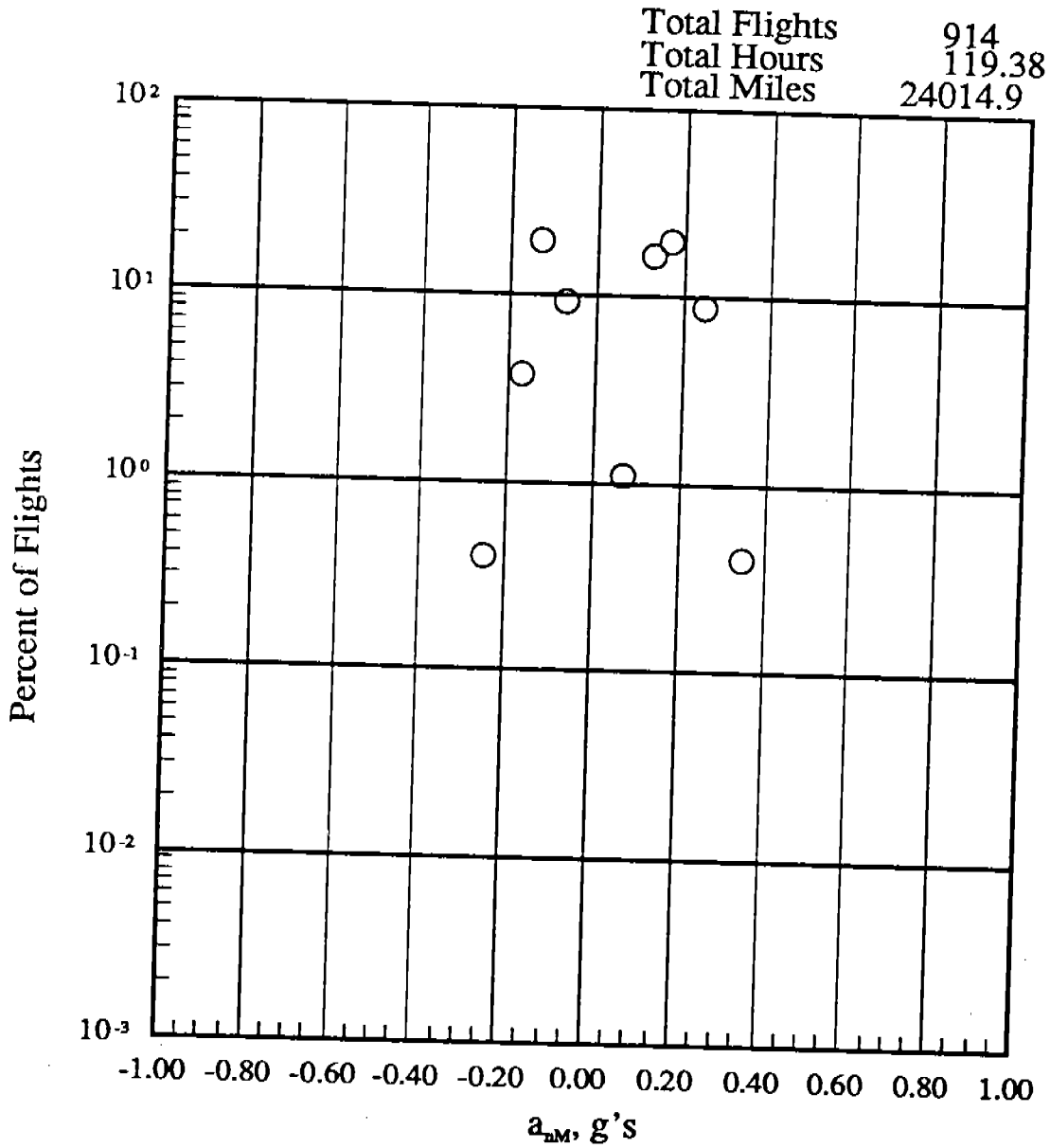
Figure 16.- Concluded.

PRESSURE ALTITUDE BANDS

MAXIMUM a_{nM} LEVEL FOR EACH FLIGHT g's FROM	TO	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	1.80	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0
.70	.80	0	0	0	0	0	0	0	0	0	0
.60	.70	0	0	0	0	0	0	0	0	0	0
.50	.60	0	0	0	0	0	0	0	0	0	0
.40	.50	0	0	0.1	0	0	0	0	0	0	0.1
.30	.40	0.4	0.7	0.2	0.2	0.1	0	0.1	0	0	1.8
.20	.30	8.9	5.9	1.5	1.0	0.4	0.4	0.3	0.2	0	18.7
.15	.20	19.9	12.3	4.2	1.4	1.2	0.5	1.0	0.3	0	40.8
.10	.15	16.7	11.6	4.6	1.4	0.2	0.1	0.3	0.2	0	35.2
.05	.10	1.1	1.2	0.5	0.3	0	0	0.1	0.1	0	3.4
-.05	-.10	9.4	4.7	5.0	1.8	0.5	0.9	0.9	1.0	0	24.2
-.10	-.15	19.7	16.1	11.2	6.0	2.1	1.1	1.5	1.4	0	59.1
-.15	-.20	3.8	3.5	3.1	1.6	0.8	0.4	0.9	0.3	0	14.4
-.20	-.30	0.4	0.7	0.3	0.2	0.1	0.1	0.2	0.2	0	2.3
-.30	-.40	0	0	0	0	0	0	0	0	0	0
-.40	-.50	0	0	0	0	0	0	0	0	0	0
-.50	-.60	0	0	0	0	0	0	0	0	0	0
-.60	-.70	0	0	0	0	0	0	0	0	0	0
-.70	-.80	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT		119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT		24014.89	29500.10	37757.94	31445.86	36596.71	52344.52	131369.93	363808.56	1545.14	708383.64
							TOTAL FLIGHTS				914.0

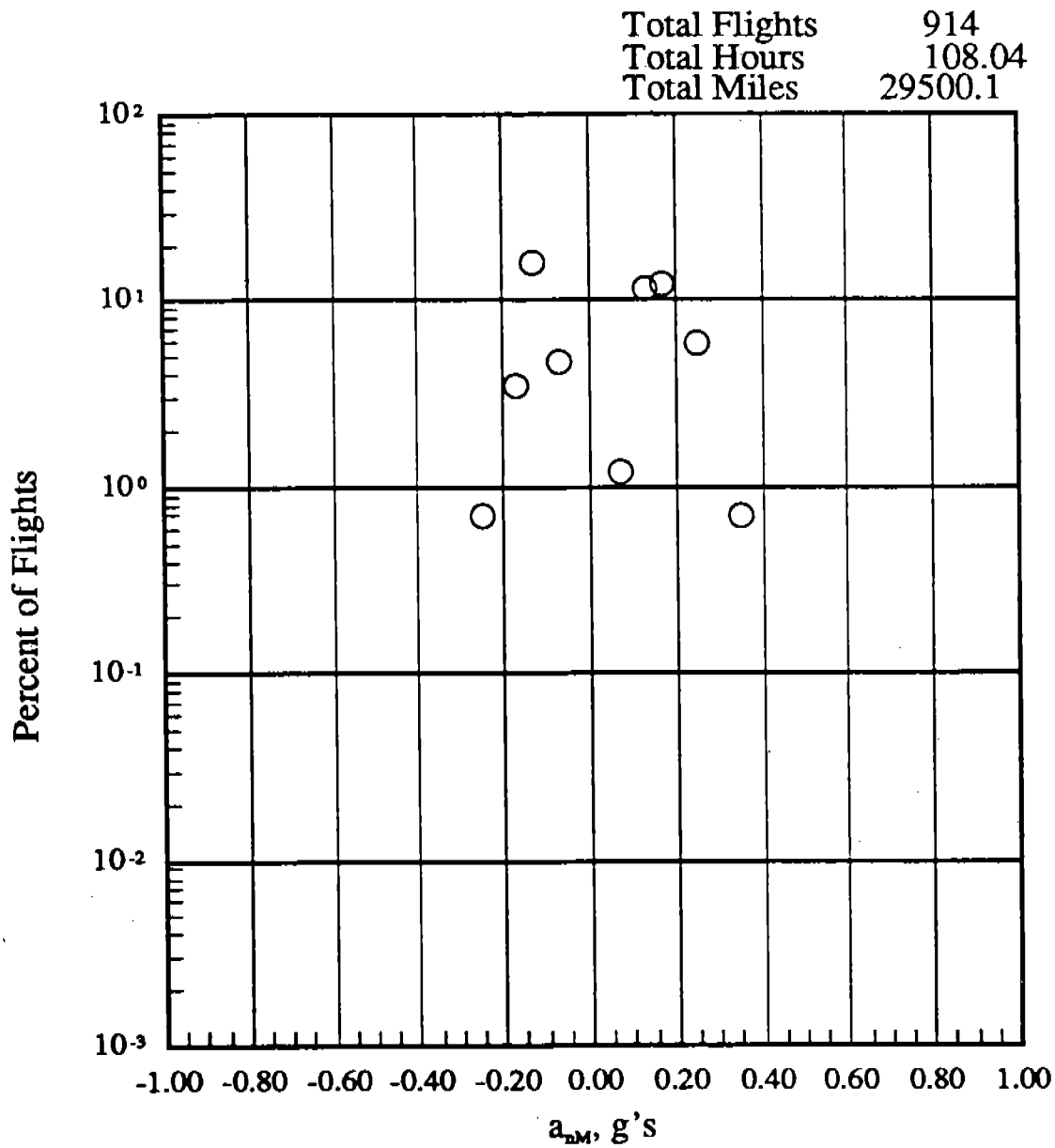
(a) Percent of flights where peak positive and negative a_{nM} per flight occurs within pressure altitude bands, any flap

Figure 17.- Peak Positive and negative a_{nM} vs. altitude.



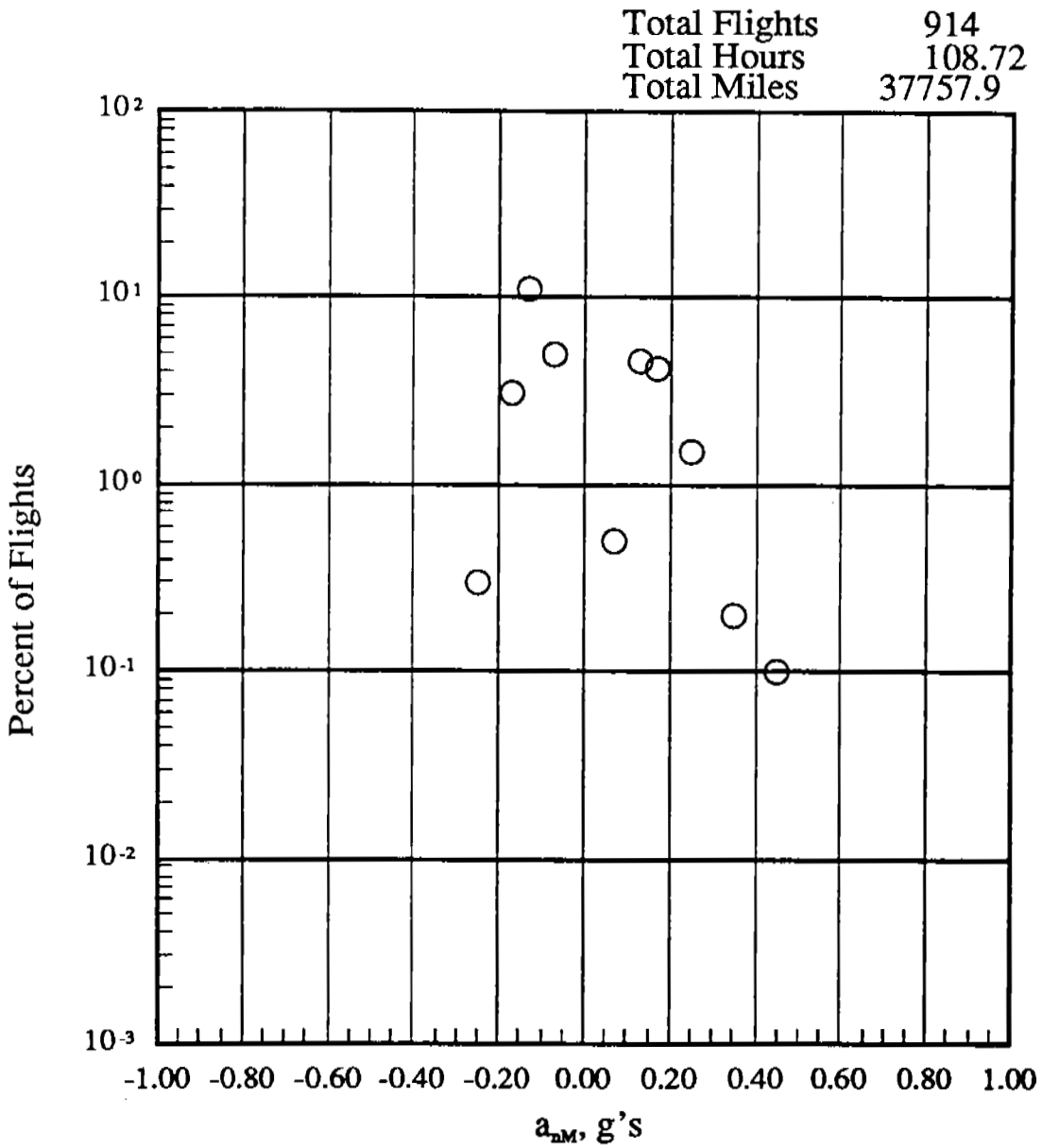
(b) -500 to 4500 feet altitude

Figure 17.- Continued.



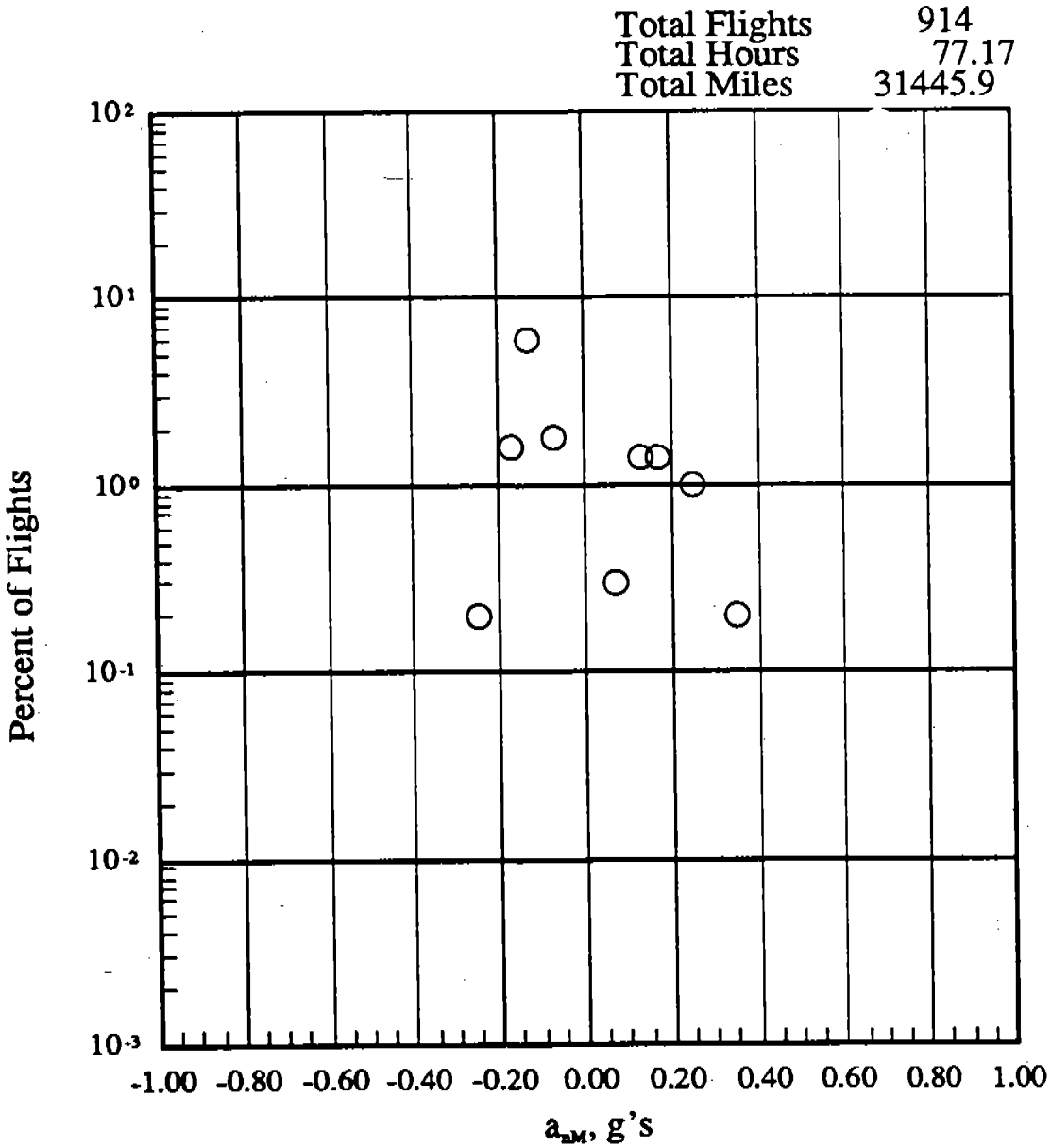
(c) 4500 to 9500 feet altitude

Figure 17.- Continued.



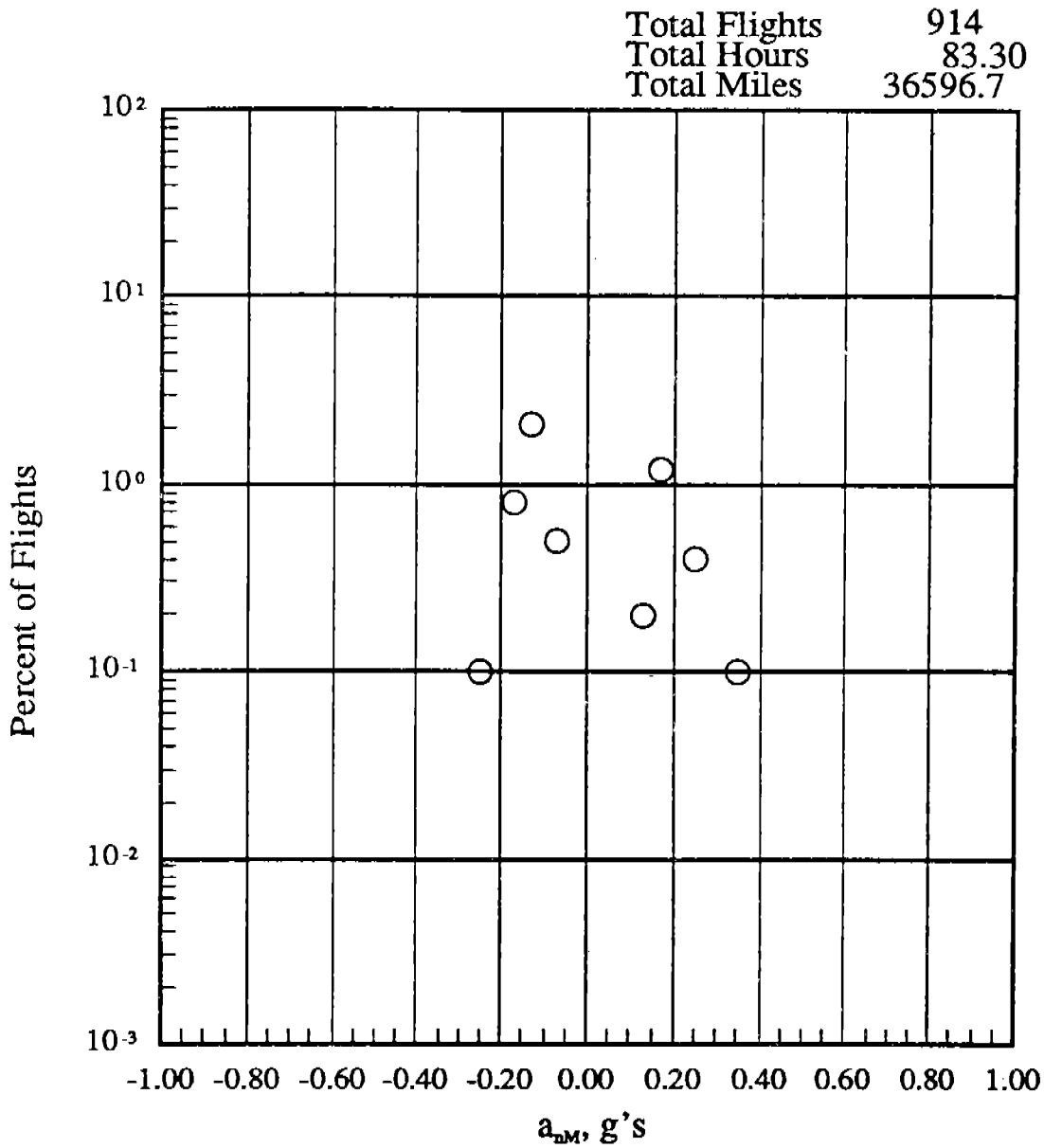
(d) 9500 to 14500 feet altitude

Figure 17.- Continued.



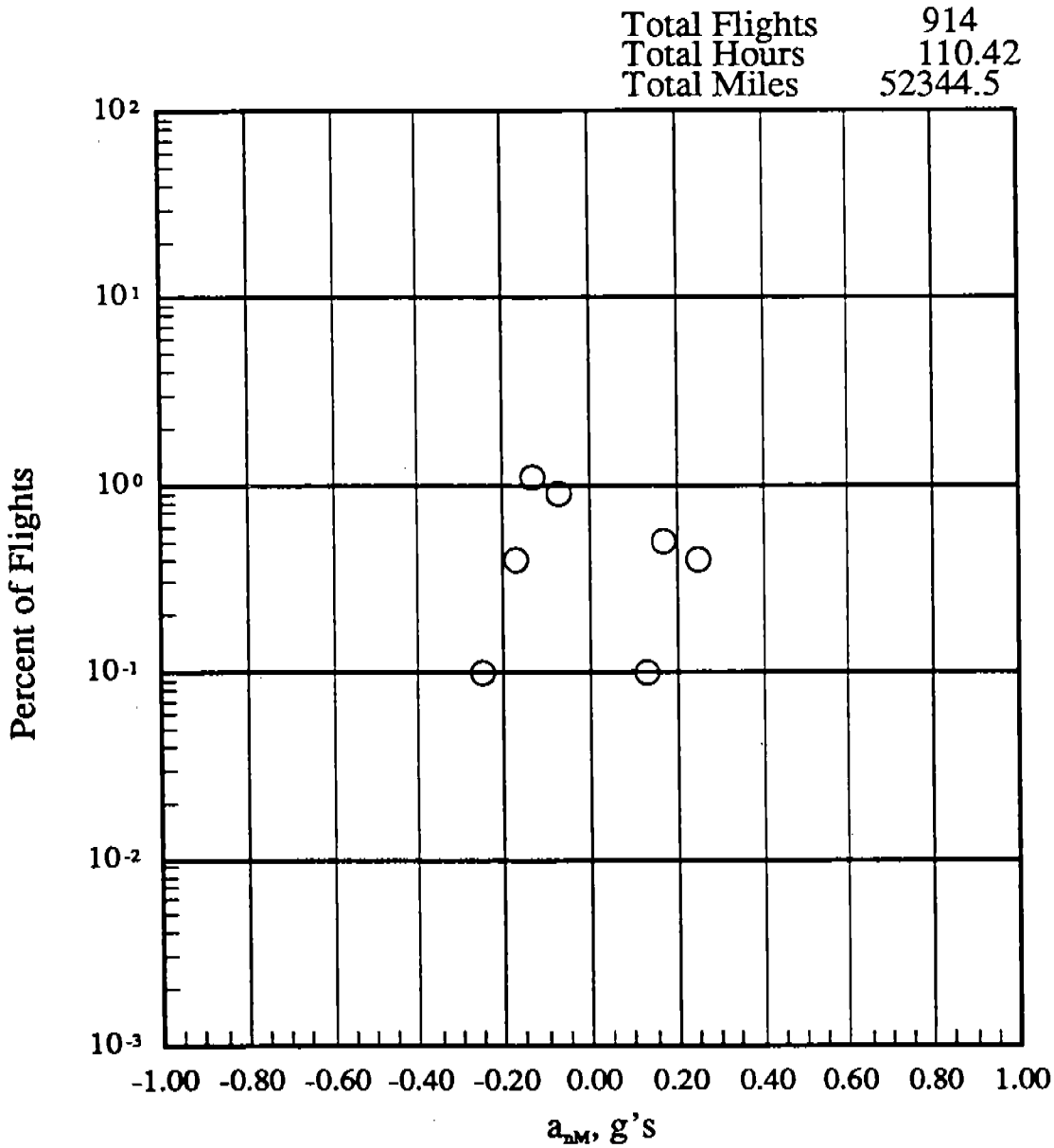
(e) 14500 to 19500 feet altitude

Figure 17.- Continued.



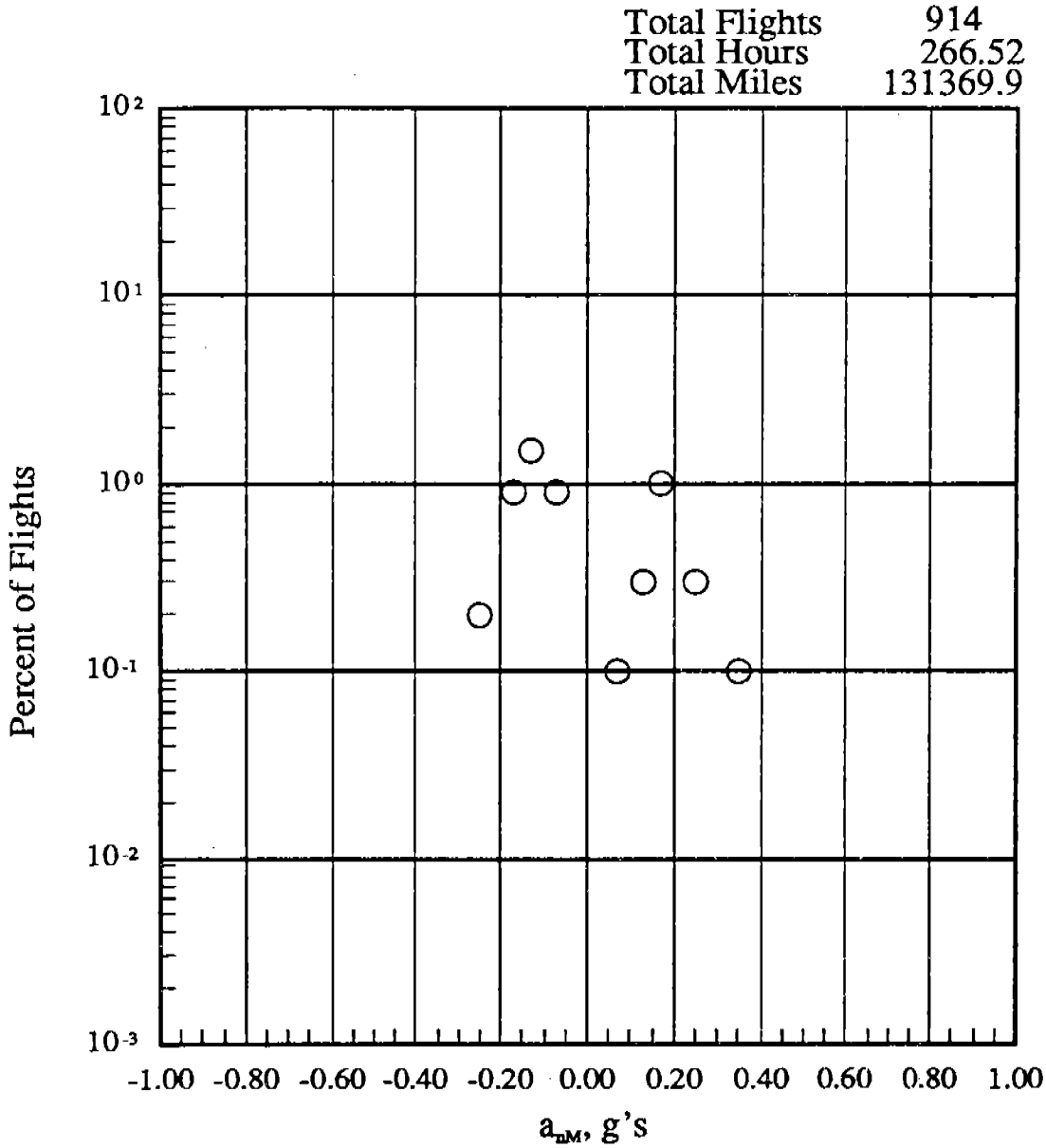
(f) 19500 to 24500 feet altitude

Figure 17.- Continued.



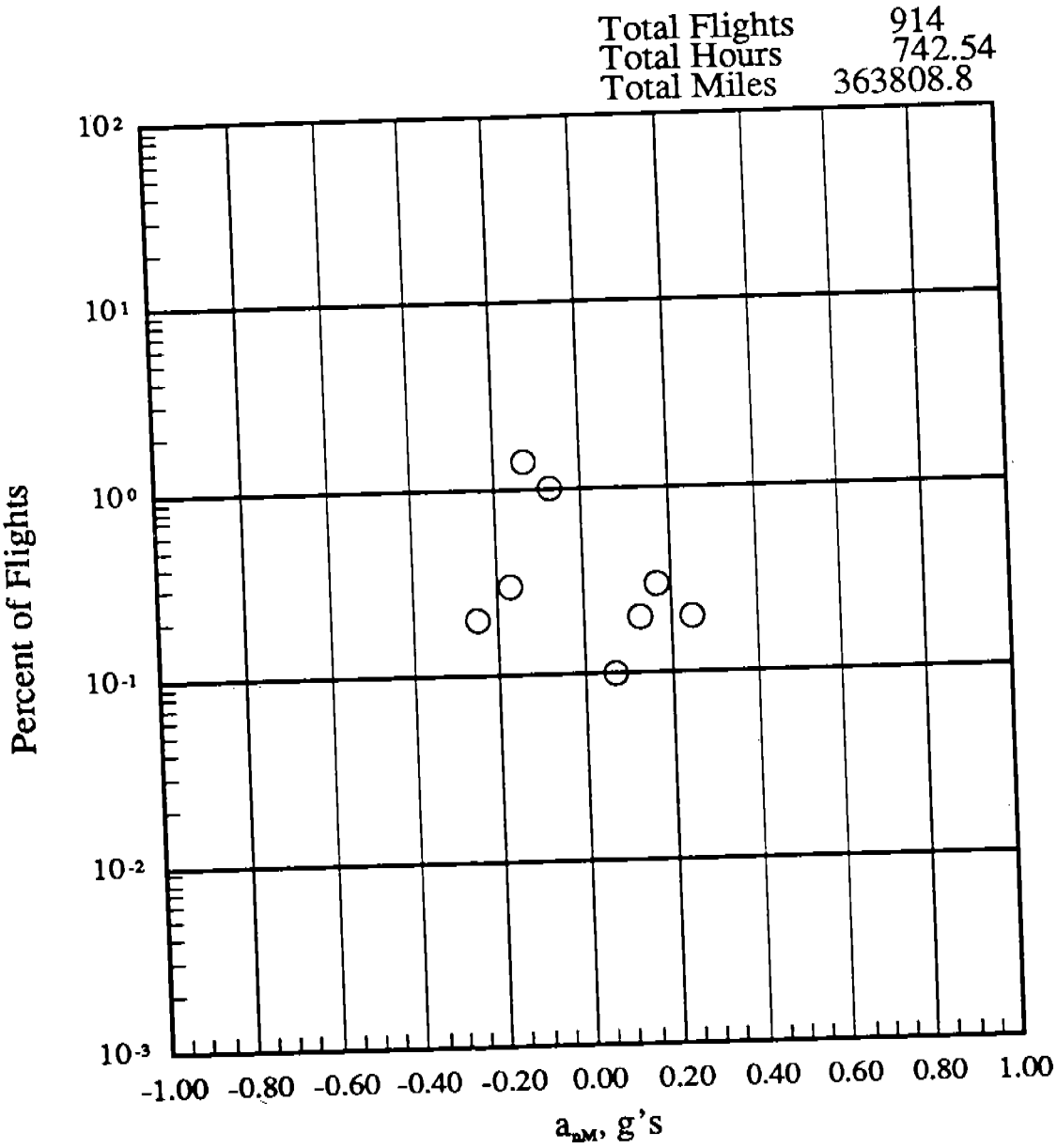
(g) 24500 to 29500 feet altitude

Figure 17.- Continued.



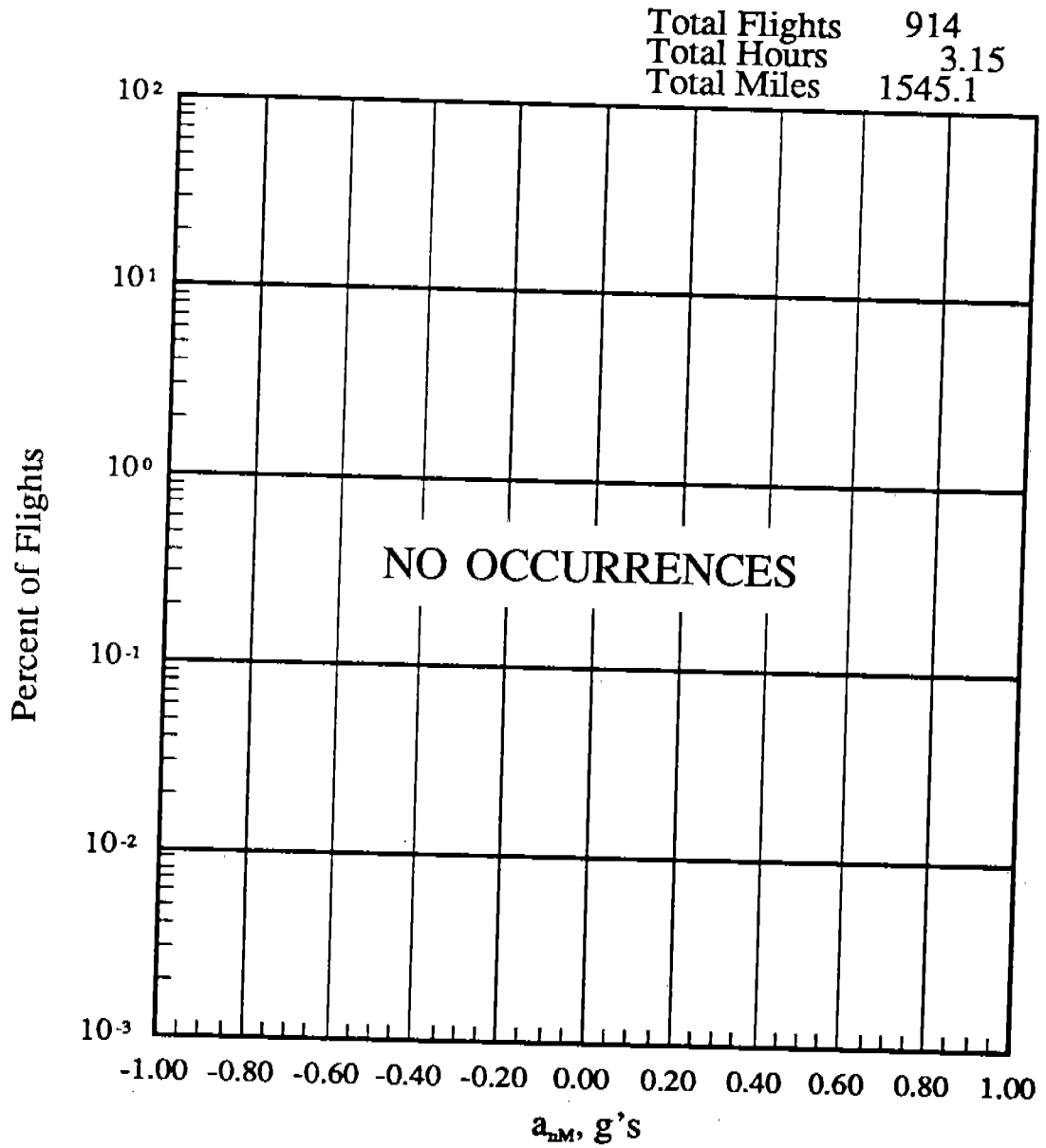
(h) 29500 to 34500 feet altitude

Figure 17.- Continued.



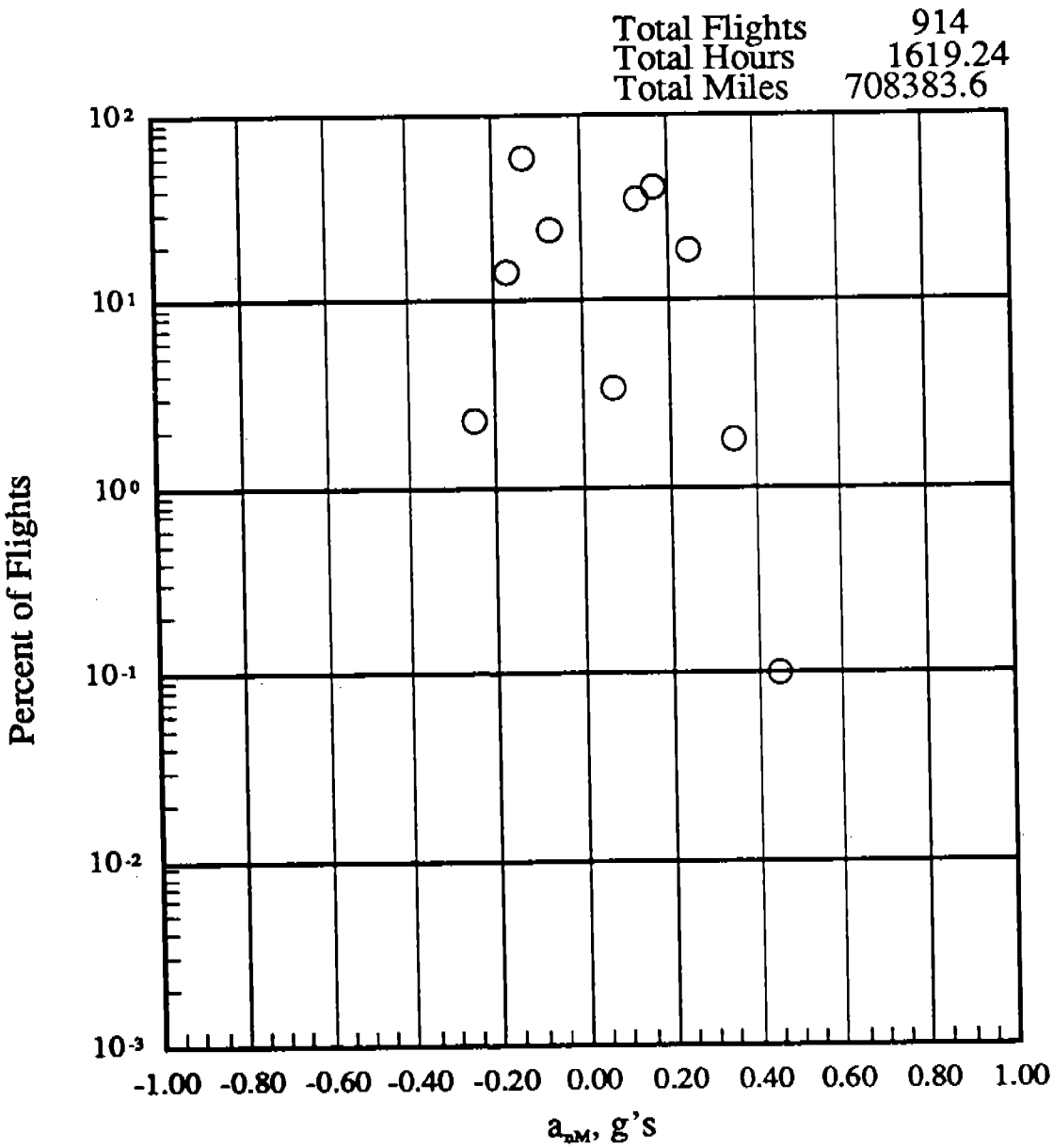
(i) 34500 to 39500 feet altitude

Figure 17.- Continued.



(j) 39500 to 44500 feet altitude

Figure 17.- Continued.



(k) -500 to 44500 feet altitude

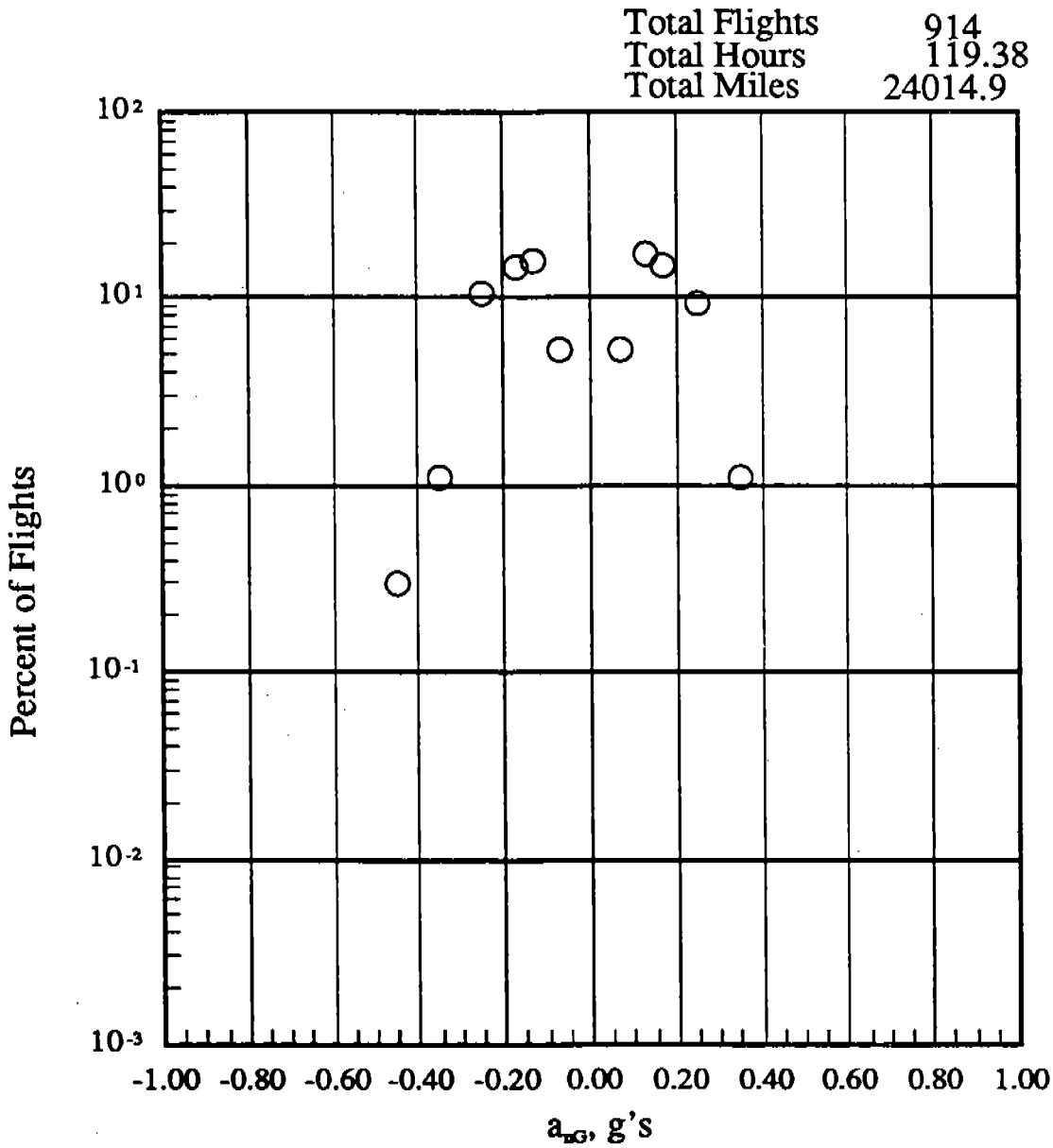
Figure 17.- Concluded.

PRESSURE ALTITUDE BANDS

MAXIMUM a_{nG} LEVEL FOR EACH FLIGHT g's FROM	TO	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	1.80	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0
.70	.80	0	0	0.1	0	0	0	0	0	0	0.1
.60	.70	0	0.2	0	0	0	0	0	0	0	0.2
.50	.60	0	0.3	0	0.2	0	0	0	0	0	0.5
.40	.50	0	0.4	0.7	0	0.1	0	0.1	0	0	1.3
.30	.40	1.1	0.9	1.5	0.4	0	0.1	0.8	0.3	0	5.1
.20	.30	9.4	4.5	3.3	1.6	0.8	0.5	0.8	2.6	0	23.5
.15	.20	15.0	4.0	2.6	1.0	0.7	0.9	2.1	3.8	0	30.1
.10	.15	17.3	4.0	2.3	0.7	1.4	0.7	1.6	1.6	0	29.6
.05	.10	5.3	1.3	0.9	0.5	0.3	0.2	0.5	0.3	0	9.4
-.05	-.10	5.3	1.9	0.5	0.4	0.2	0.1	0.5	0.8	0	9.7
-.10	-.15	15.9	4.5	2.3	1.1	0.9	0.7	1.6	2.5	0	29.4
-.10	-.20	14.7	3.5	2.7	1.4	0.9	0.5	1.3	3.3	0	28.3
-.20	-.30	10.6	4.6	4.4	1.1	0.2	0.8	1.2	2.2	0	25.1
-.30	-.40	1.1	1.3	1.0	0.5	0	0	0.4	0.5	0	5.0
-.40	-.50	0.3	0.8	0.2	0.1	0	0	0	0.1	0	1.5
-.50	-.60	0	0.3	0.2	0	0	0	0	0	0	0.5
-.60	-.70	0	0	0	0.1	0	0	0	0	0	0.1
-.70	-.80	0	0	0	0	0	0	0.1	0	0	0.1
-.80	-1.00	0	0.1	0	0	0	0	0	0	0	0.1
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT		119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT		24014.89	29500.10	37757.94	31445.86	36596.71	52344.52	131369.93	363808.56	1545.14	708383.64
							TOTAL FLIGHTS				914

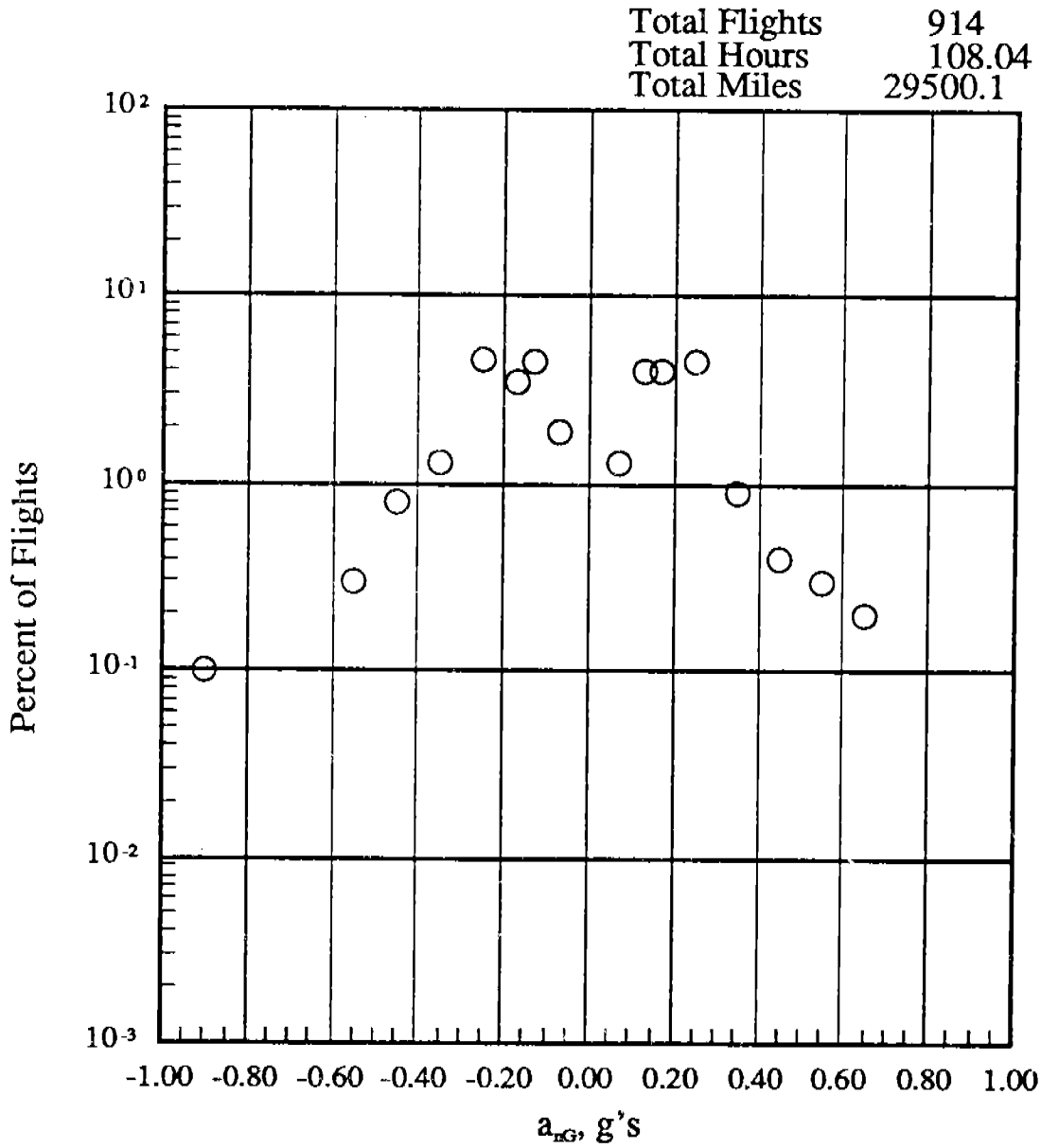
(a) a_{nG} Percent of flights where peak positive and negative a_{nG} per flight occurs within pressure altitude bands, any flap

Figure 18.- Peak positive and negative a_{nG} vs altitude.



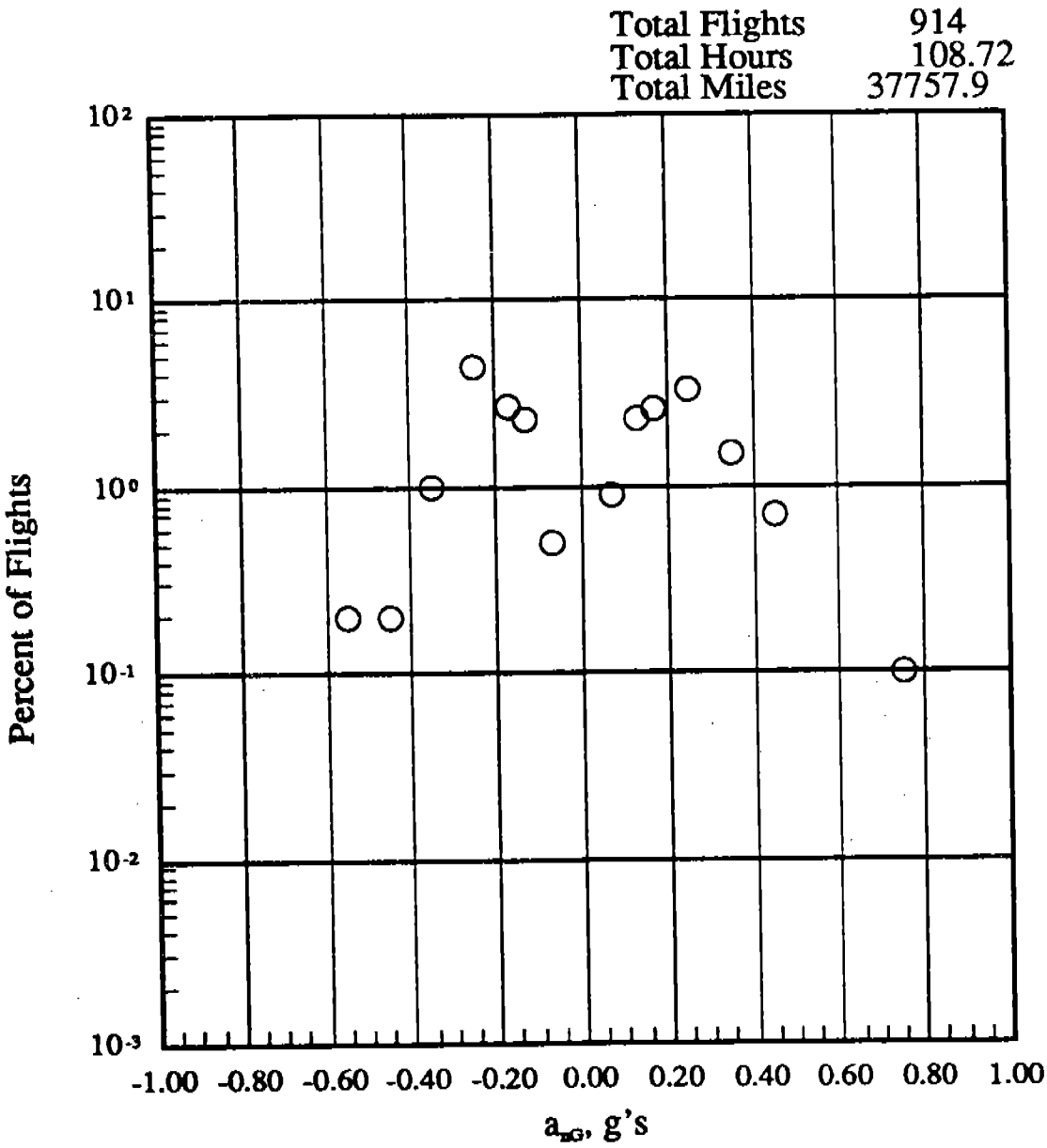
(b) -500 to 4500 feet altitude

Figure 18.- Continued.



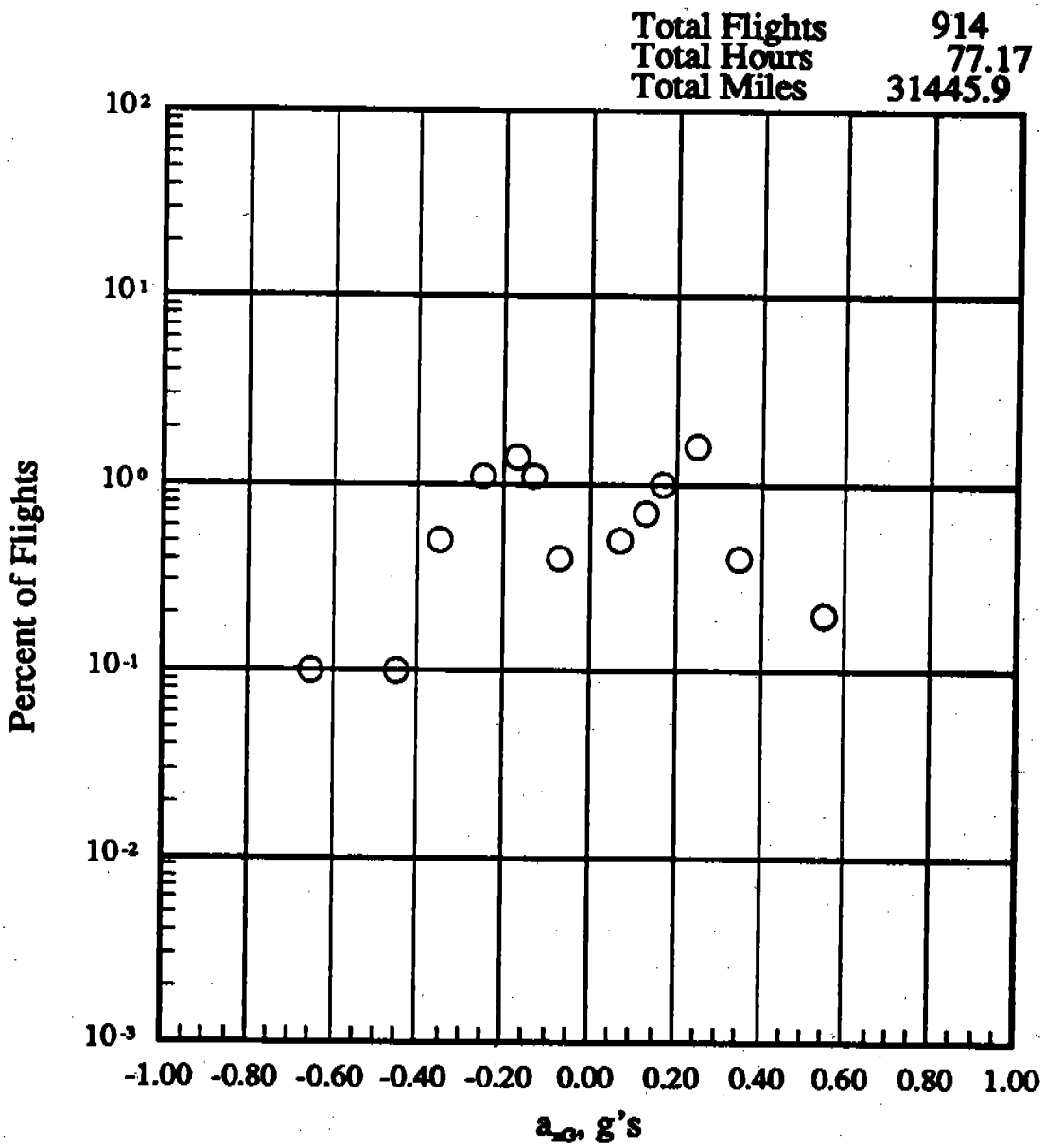
(c) 4500 to 9500 feet altitude

Figure 18.- Continued.



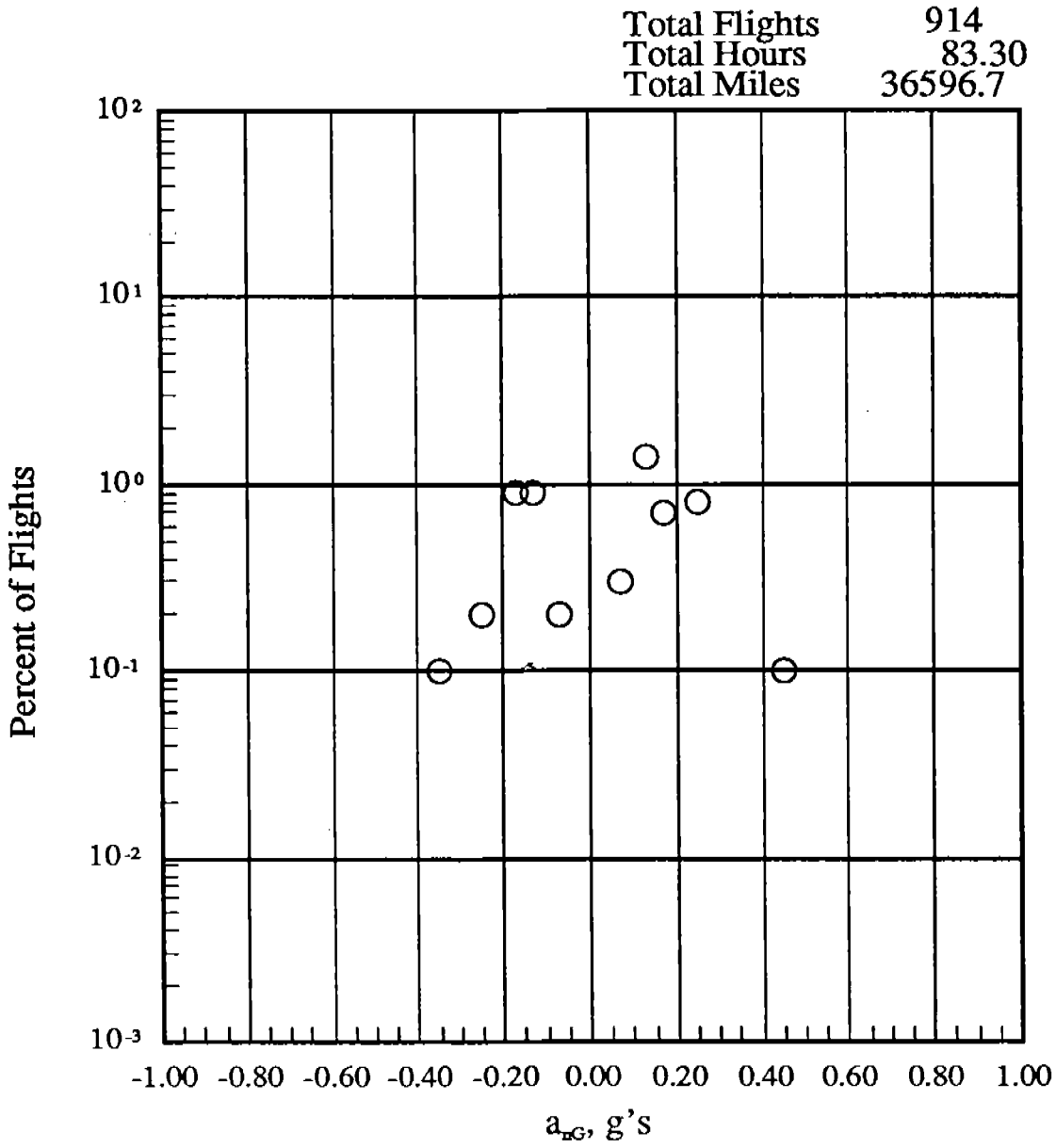
(d) 9500 to 14500 feet altitude

Figure 18.- Continued.



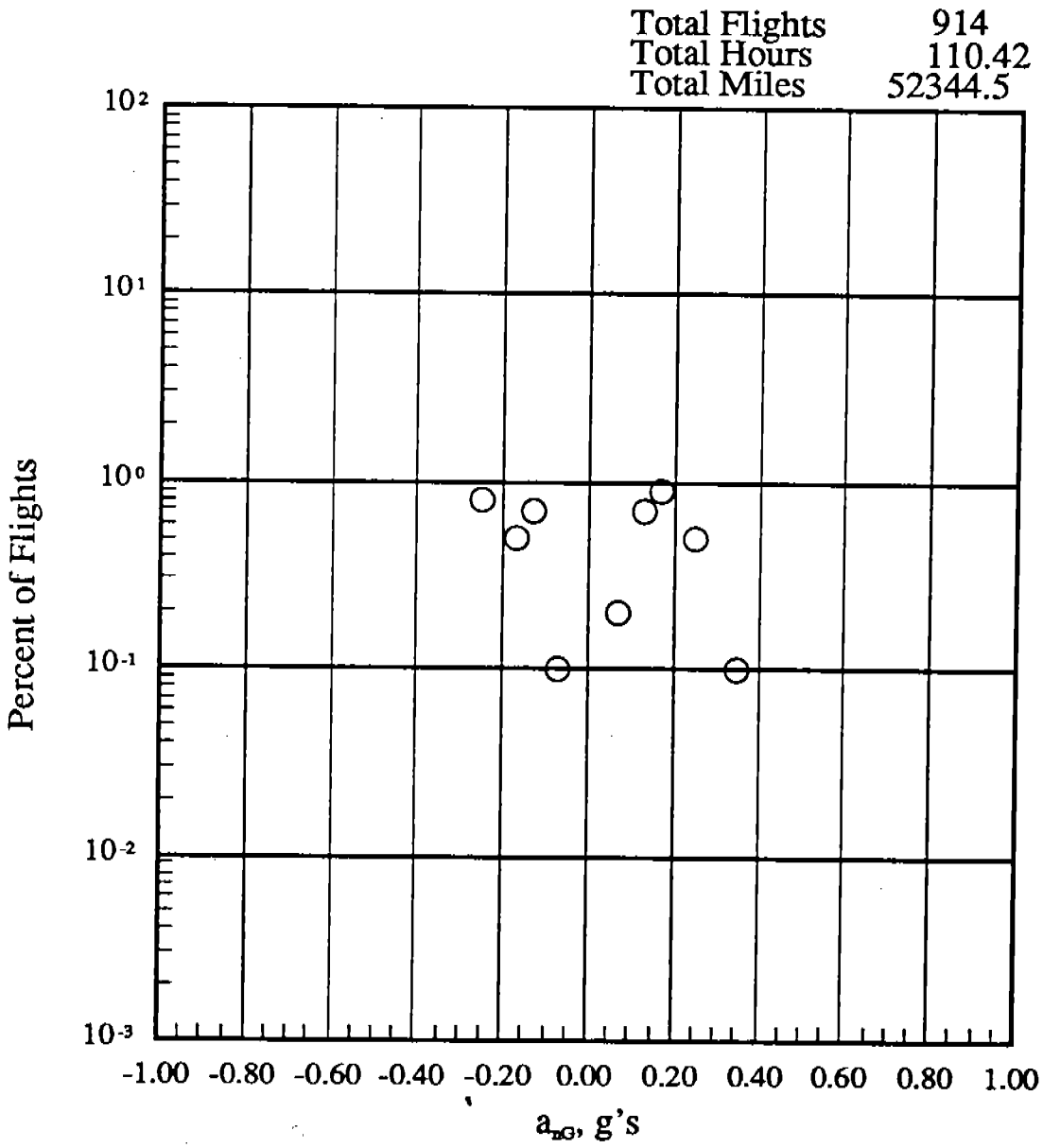
(e) 14500 to 19500 feet altitude

Figure 18.- Continued.



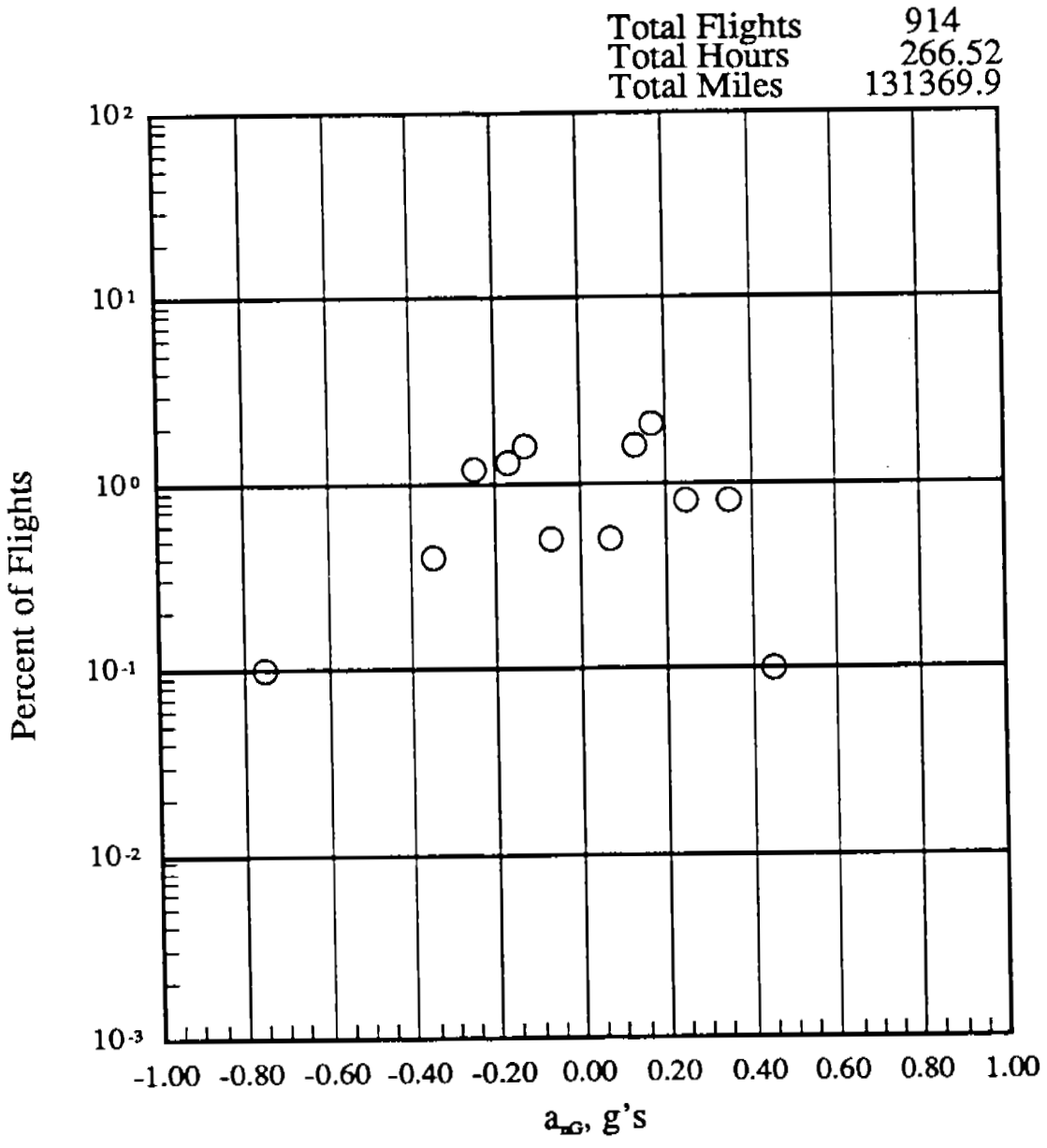
(f) 19500 to 24500 feet altitude

Figure 18.- Continued.



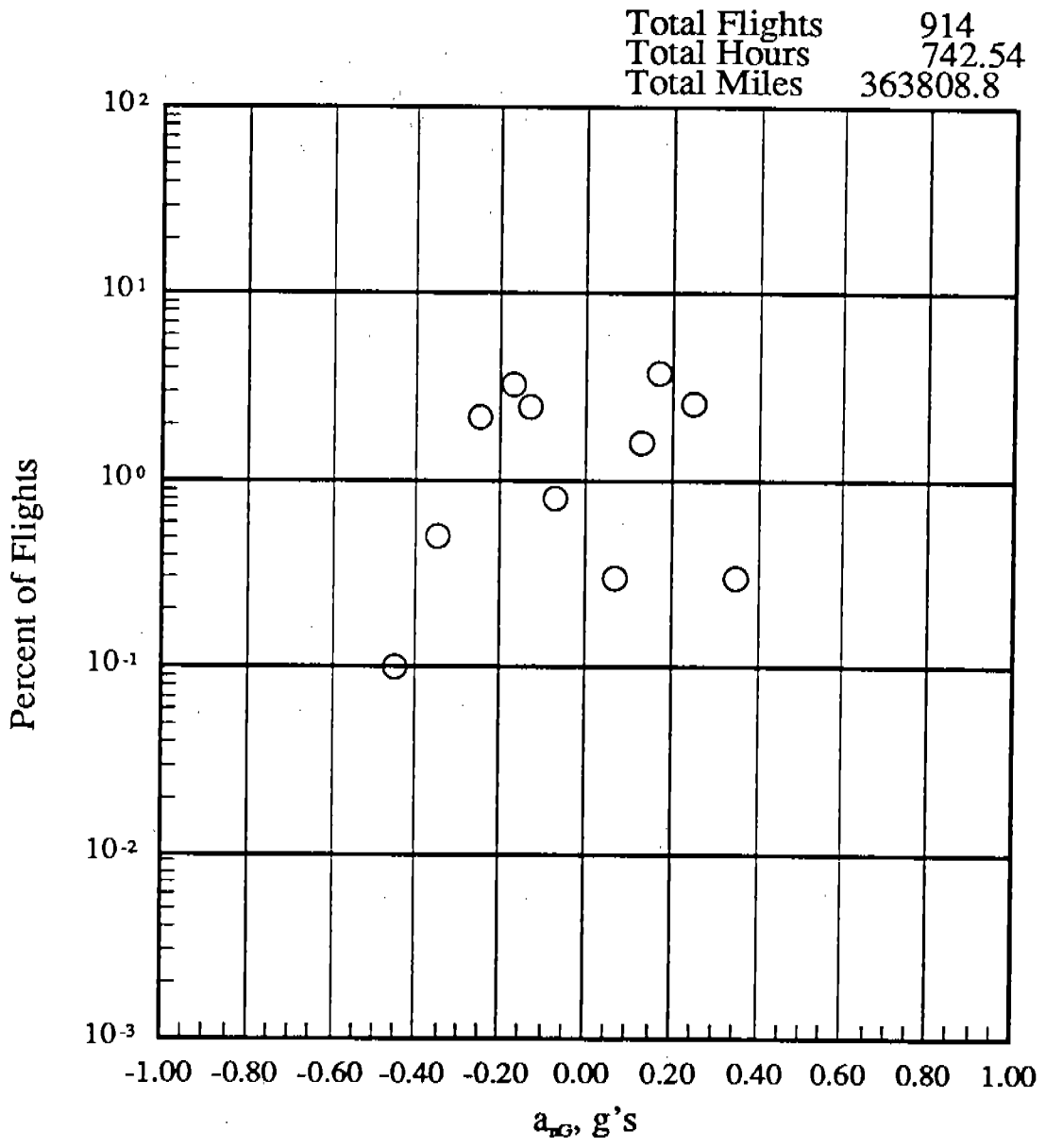
(g) 24500 to 29500 feet altitude

Figure 18.- Continued.



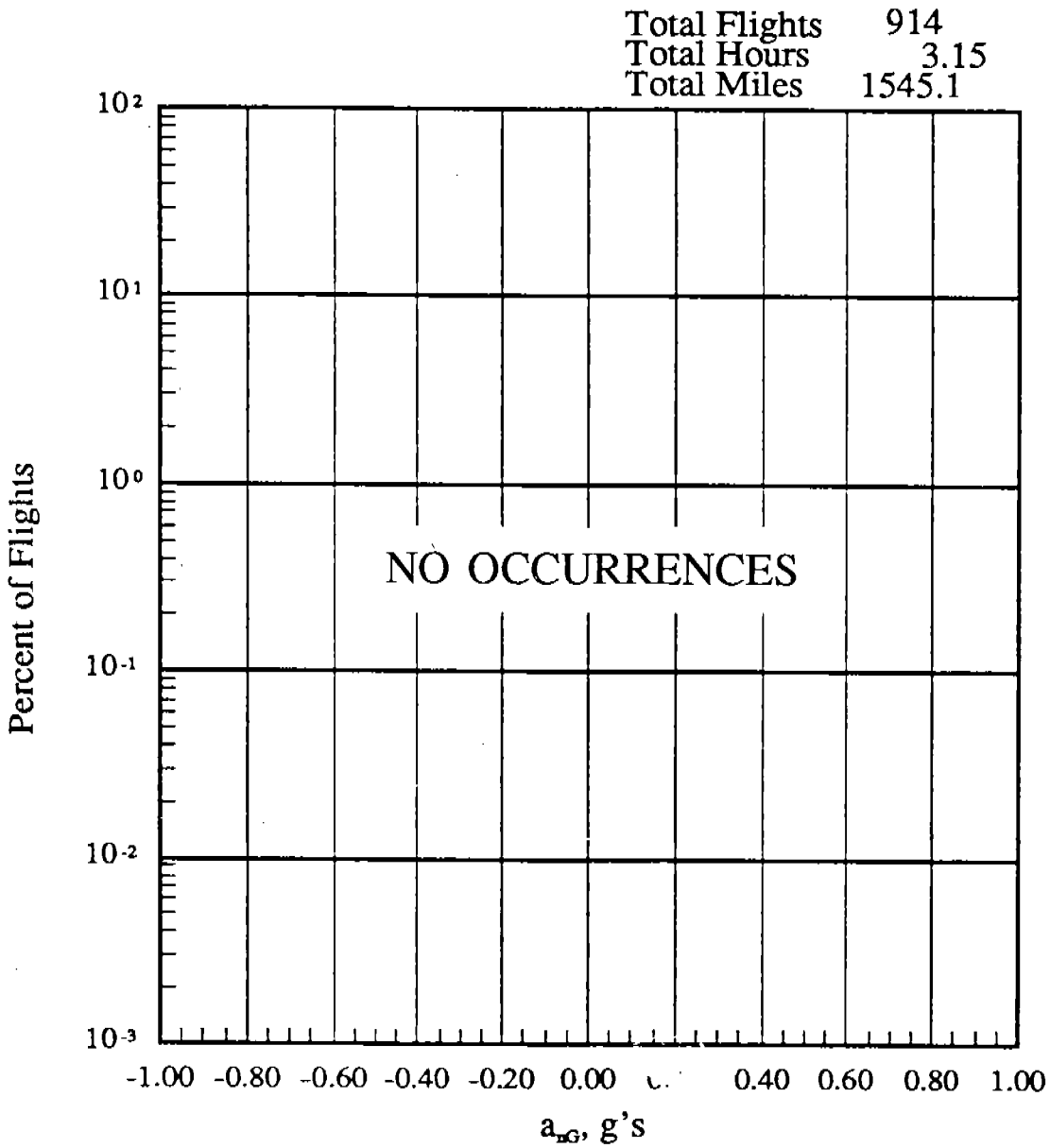
(h) 29500 to 34500 feet altitude

Figure 18.- Continued.



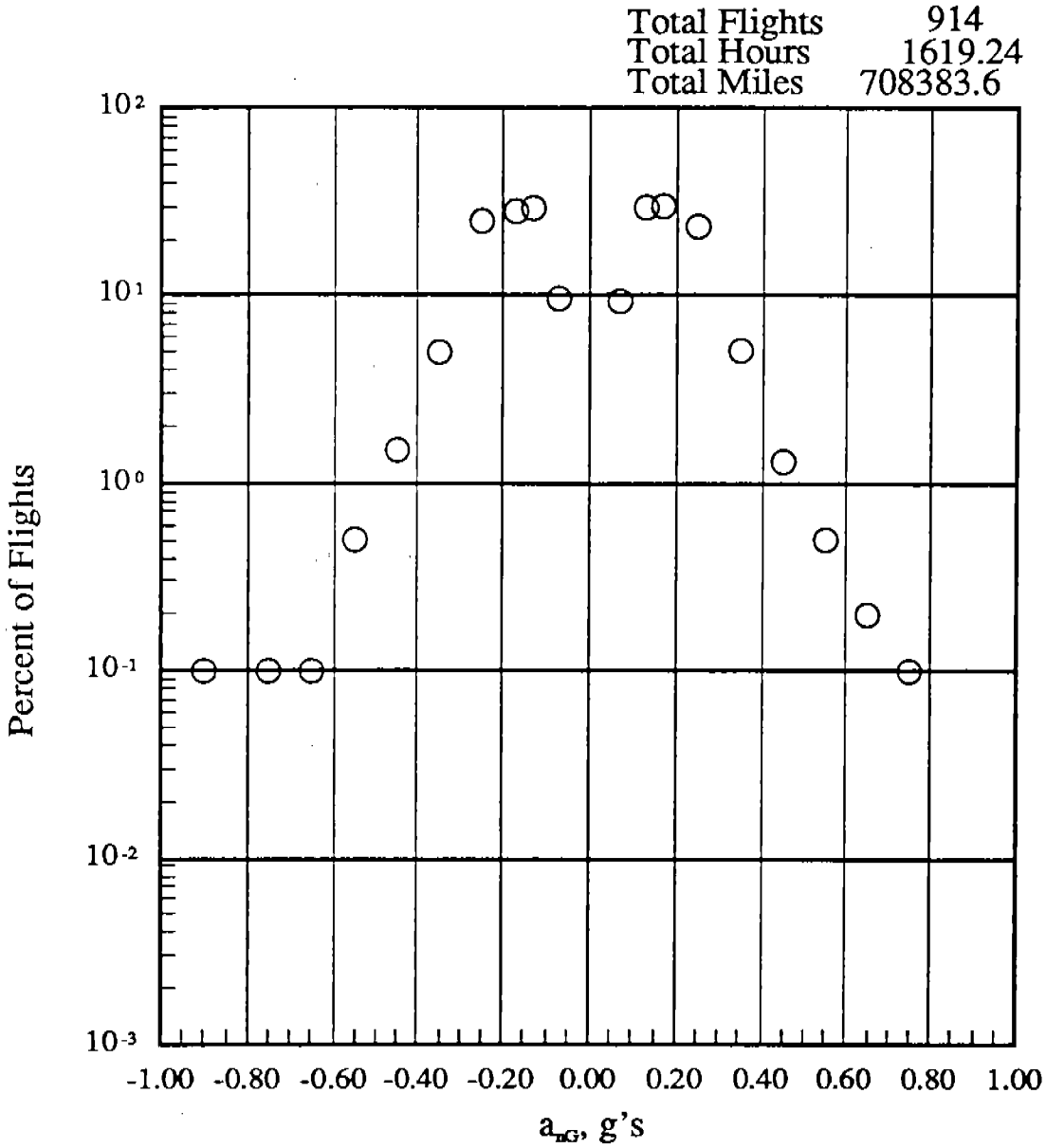
(i) 34500 to 39500 feet altitude

Figure 18.- Continued.



(j) 39500 to 44500 feet altitude

Figure 18.- Continued.



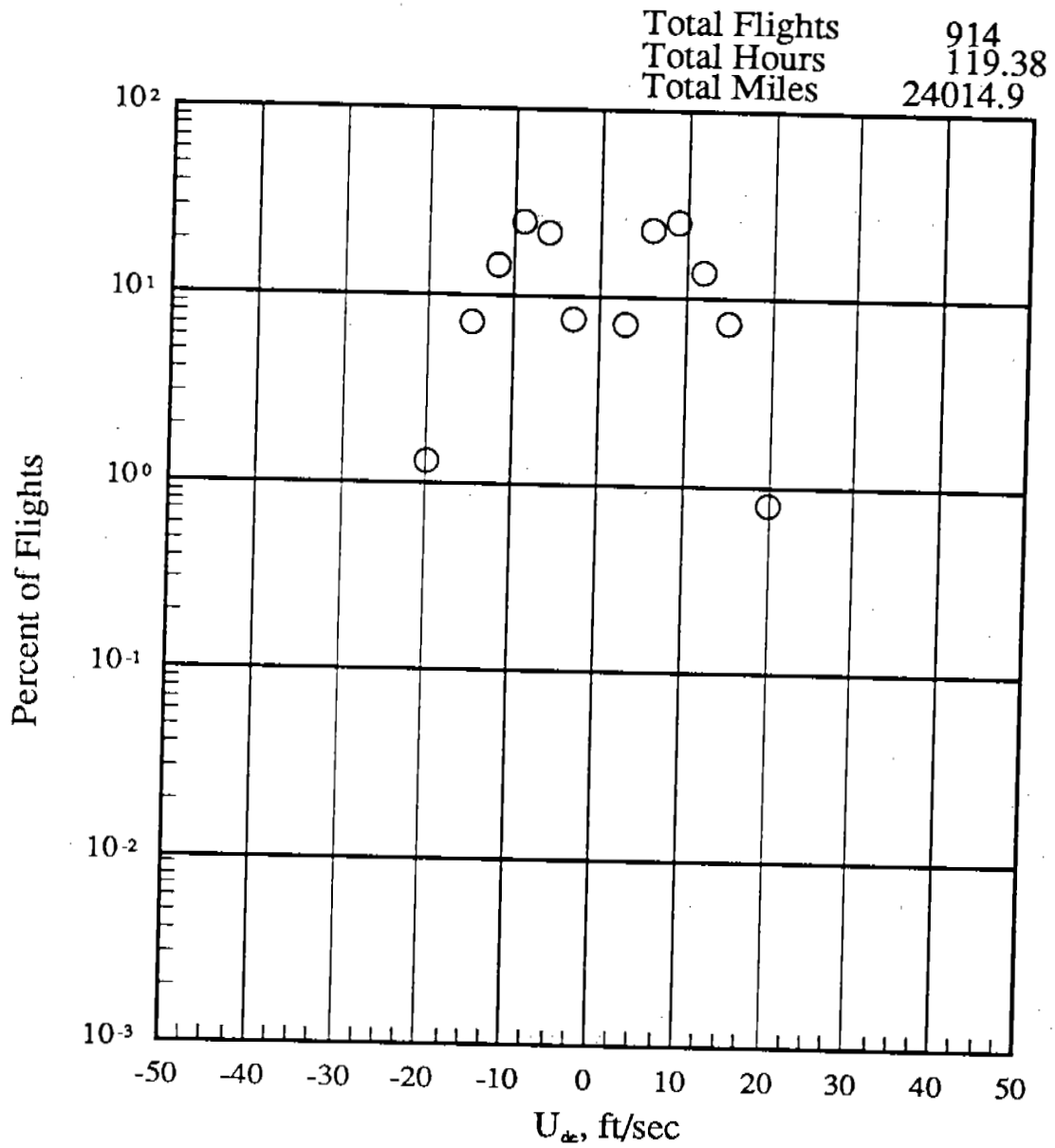
(k) -500 to 44500 feet altitude

Figure 18.- Concluded.

MAXIMUM U_{DE} LEVEL FOR EACH FLIGHT FT/SEC	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
100	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
40	0	0	0.1	0	0	0	0	0	0	0.1
30	0	0.1	0	0	0	0	0	0	0	0.1
20	0.8	0.5	0.1	0.2	0	0	0	0	0	1.6
15	7.5	1.8	1.4	0.2	0.1	0	0.1	0	0	11.2
12	14.0	1.8	0.8	0	0.1	0	0.3	0	0	17.0
9	25.7	3.6	1.3	0.4	0.1	0.1	0.1	0.3	0	31.7
6	23.3	2.7	1.9	0.4	0.1	0.1	0.3	0.7	0	29.5
3	7.3	0.7	0.3	0	0	0.1	0	0.3	0	8.8
-3	7.7	0.7	0.4	0.1	0.1	0	0	0.2	0	9.2
-6	22.2	2.7	1.3	0.5	0.1	0.1	0.4	1.3	0	28.8
-9	25.3	2.5	2.0	0.4	0.1	0.3	0.1	0.2	0	31.0
-12	14.8	1.6	0.7	0.2	0	0	0.1	0.3	0	17.7
-15	7.3	2.3	0.8	0.1	0	0	0	0	0	10.5
-20	1.3	1.0	0.3	0	0	0	0.1	0	0	2.7
-30	0	0	0		0	0	0	0	0	0
-40	0	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.94	31445.86	36596.71	52344.52	131369.93	363808.56	1545.14	708383.64
							TOTAL FLIGHTS			914

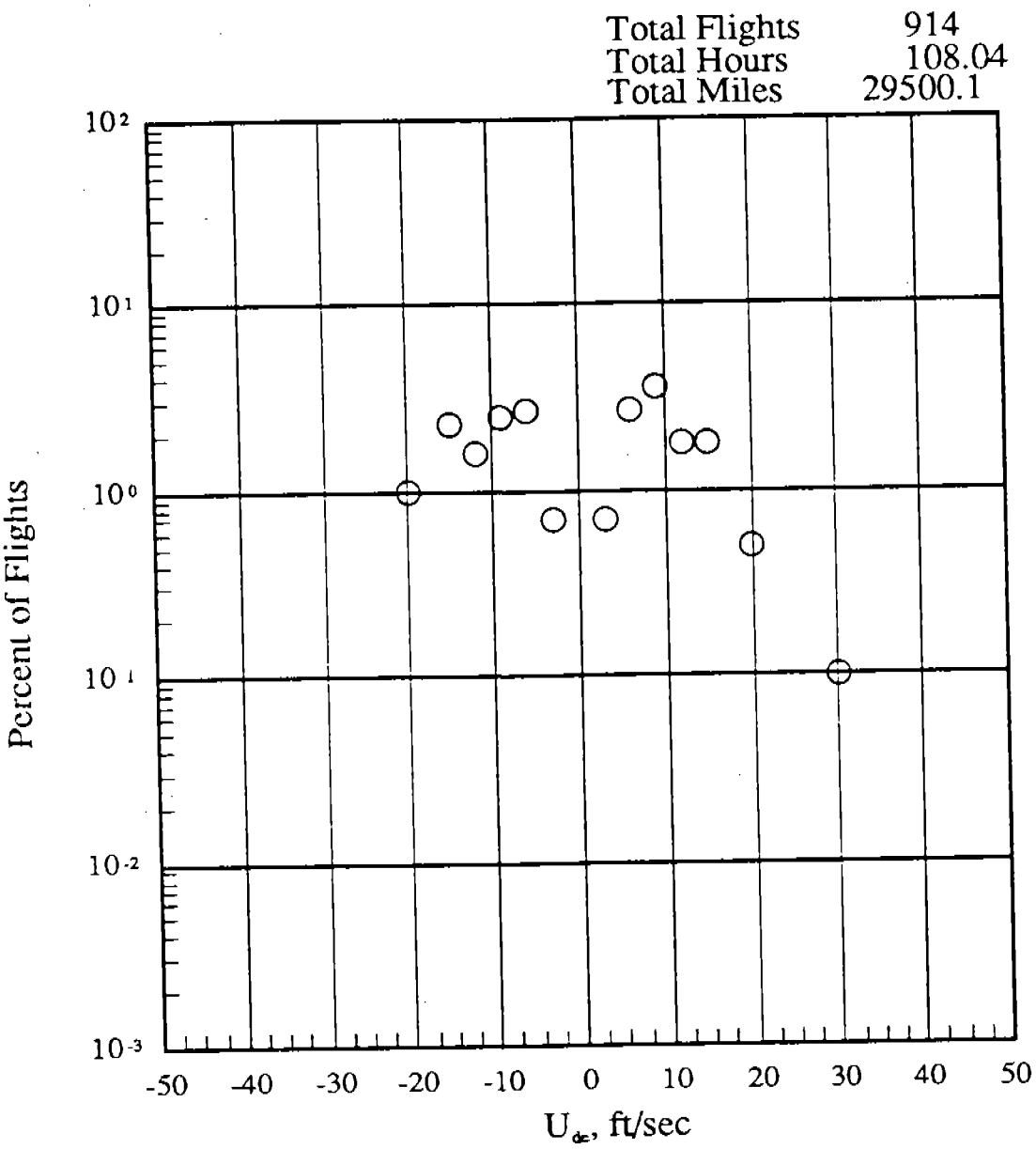
(a) Percent of flights where peak positive and negative U_{de} per flight occurs within pressure altitude bands, any flap

Figure 19.- Peak positive and negative U_{de} vs altitude.



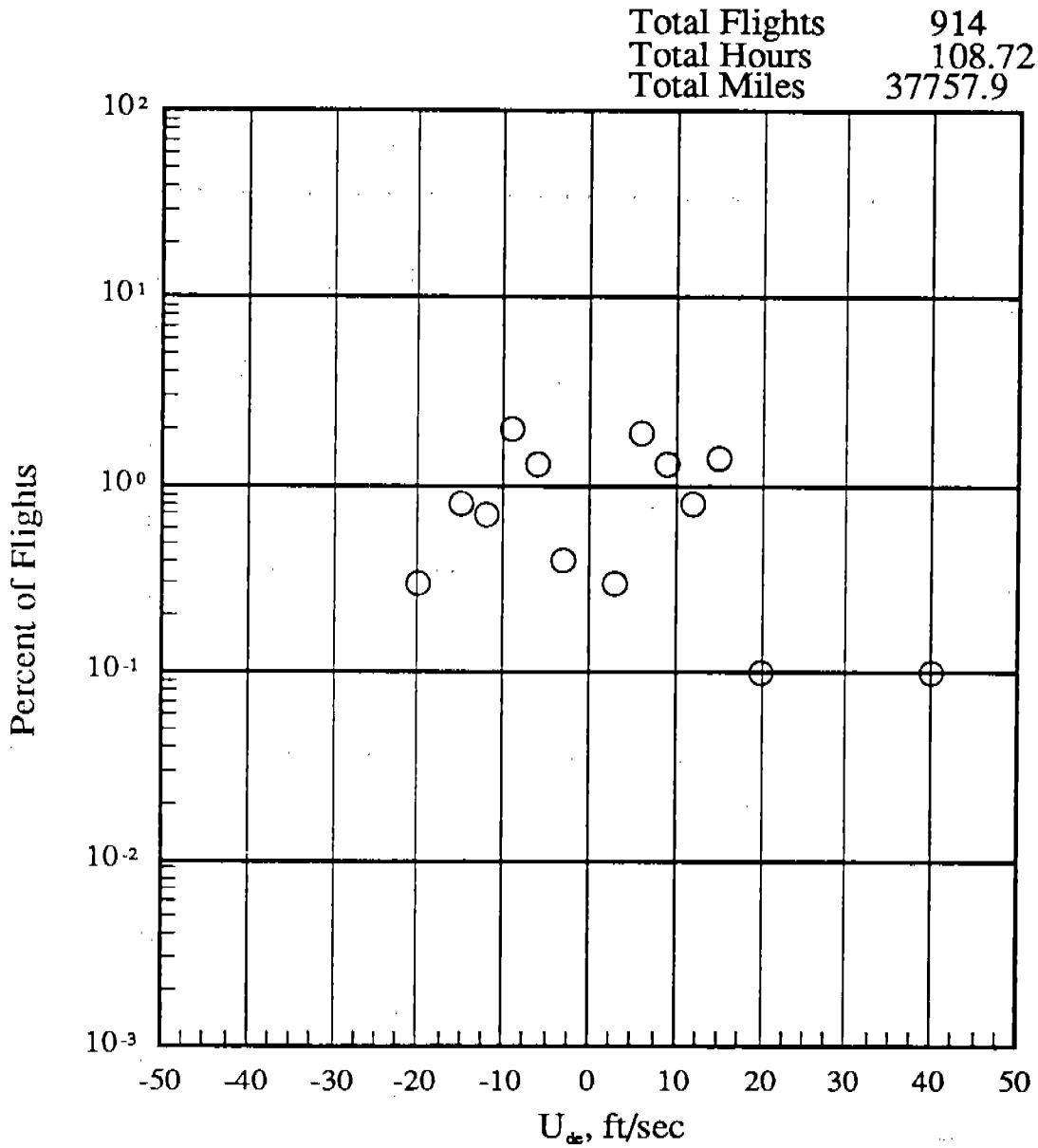
(b) -500 to 4500 feet altitude

Figure 19.- Continued.



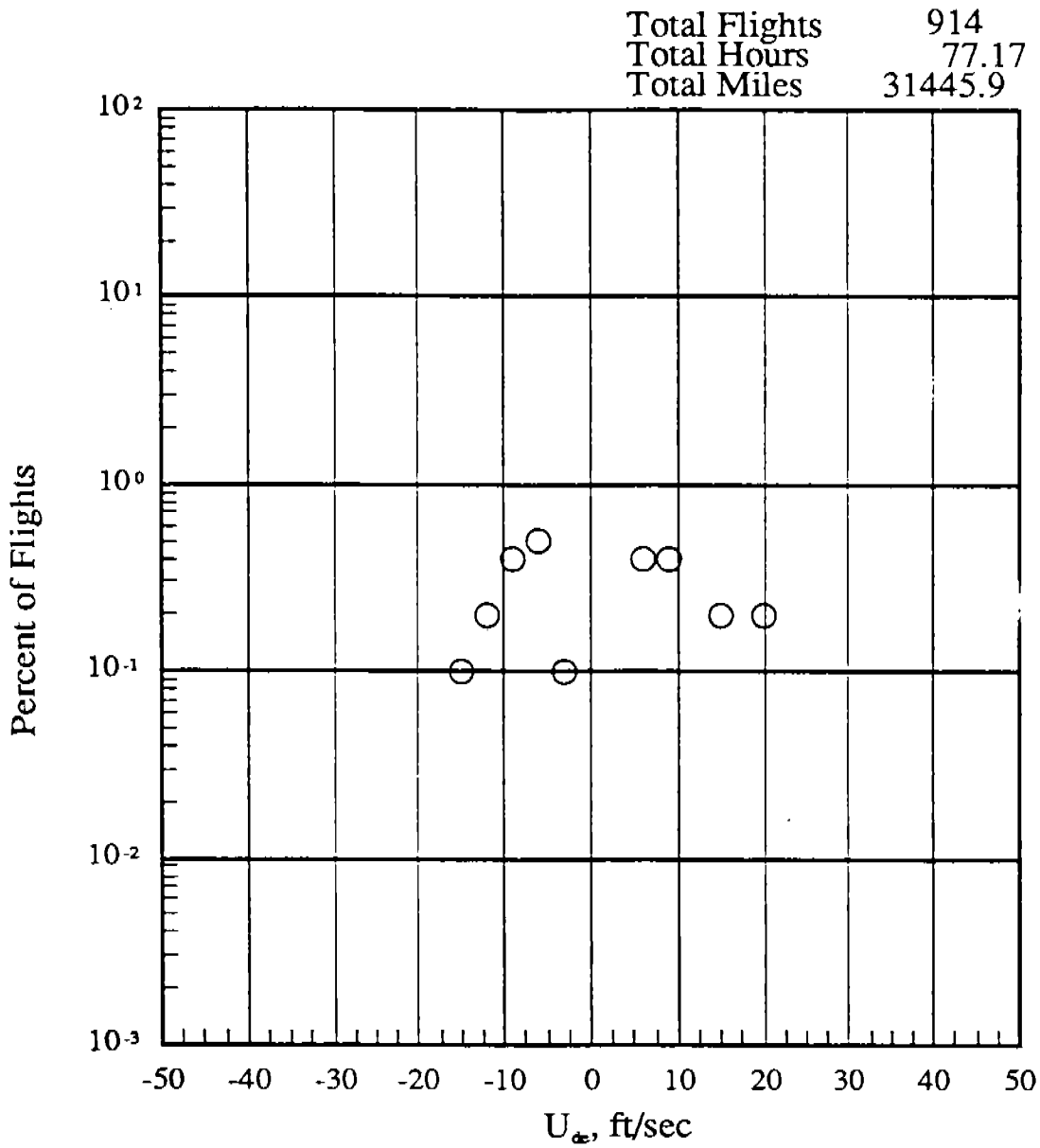
(c) 4500 to 9500 feet altitude

Figure 19.- Continued.



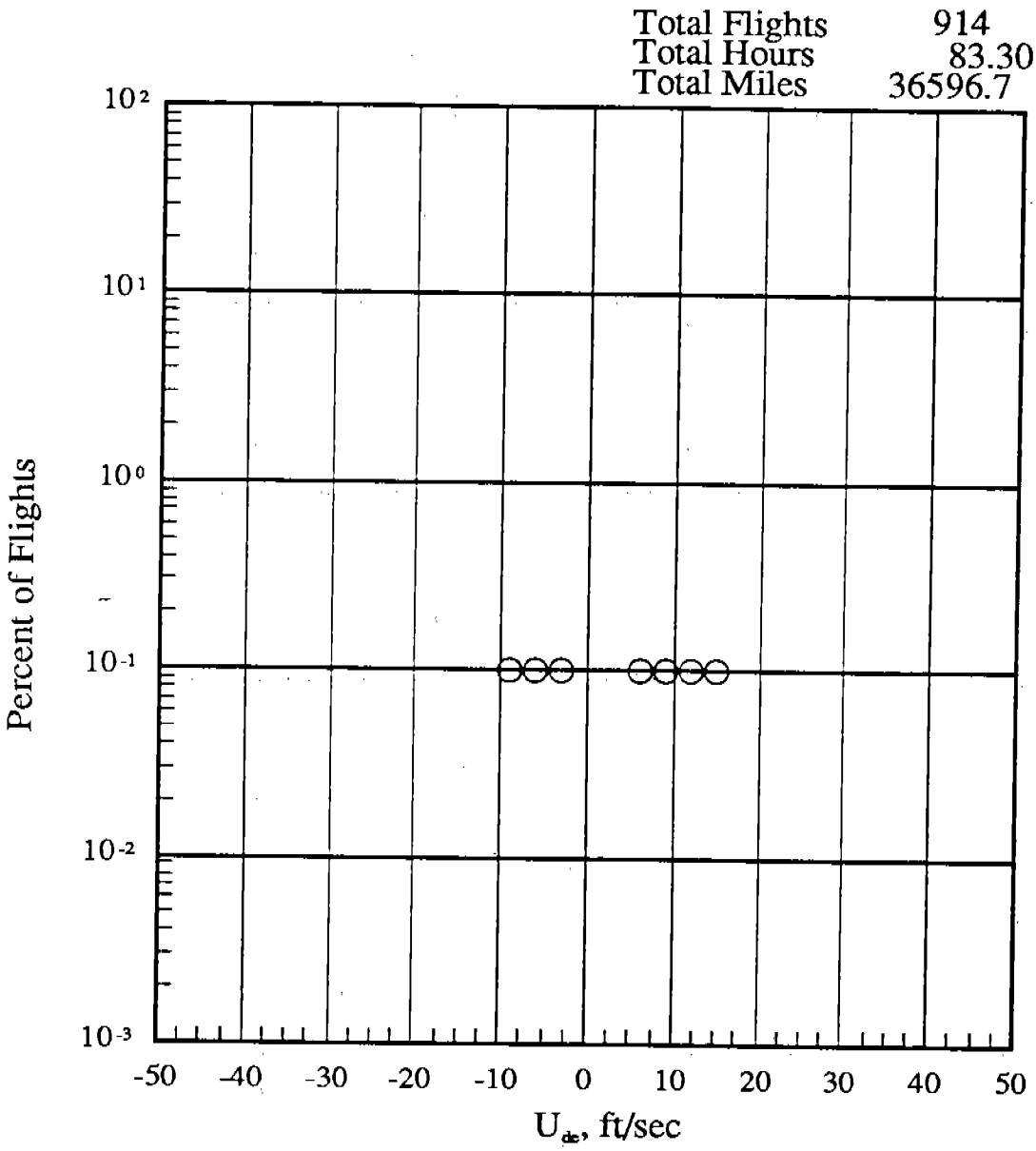
(d) 9500 to 14500 feet altitude

Figure 19.- Continued.



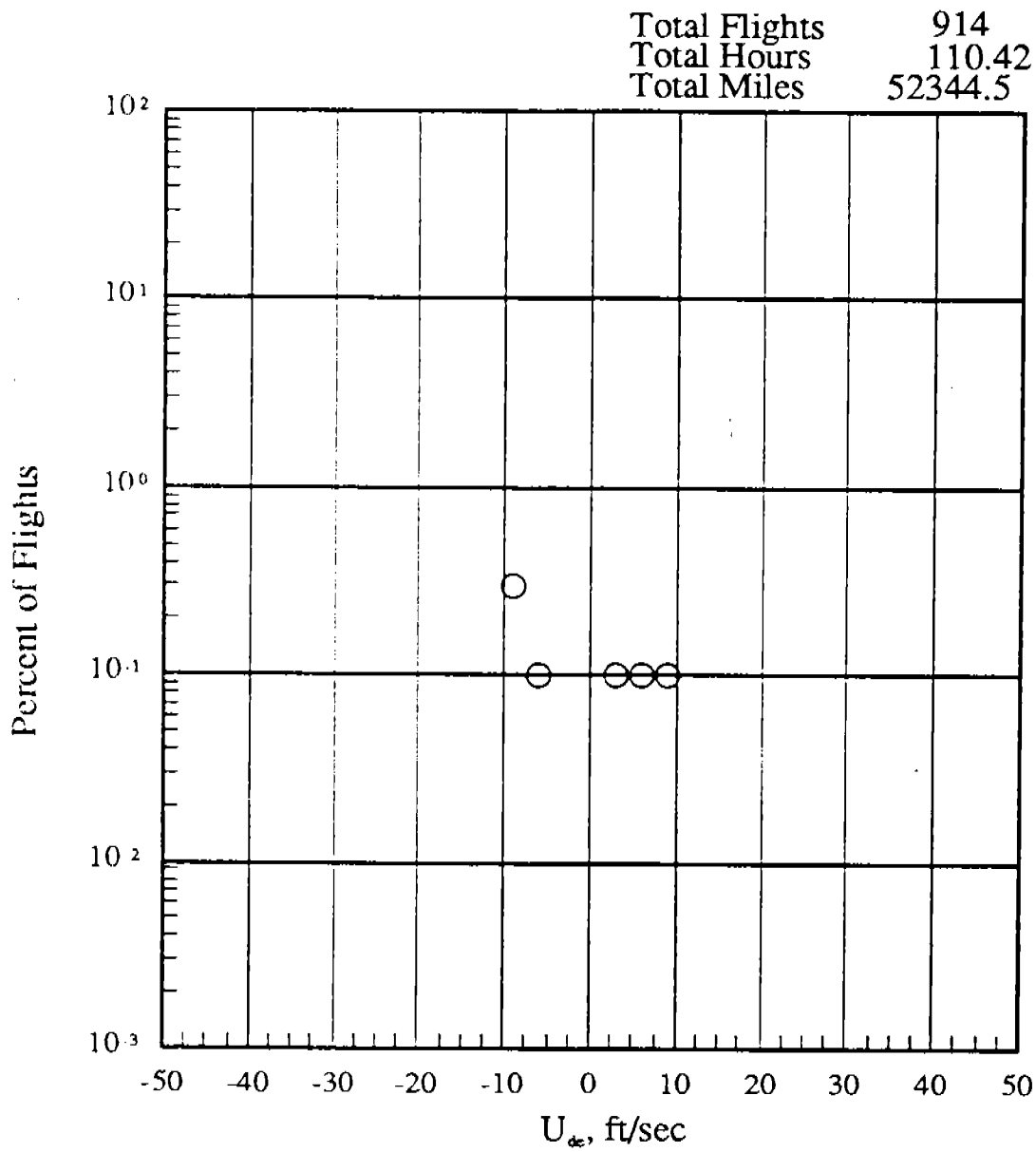
(e) 14500 to 19500 feet altitude

Figure 19.- Continued.



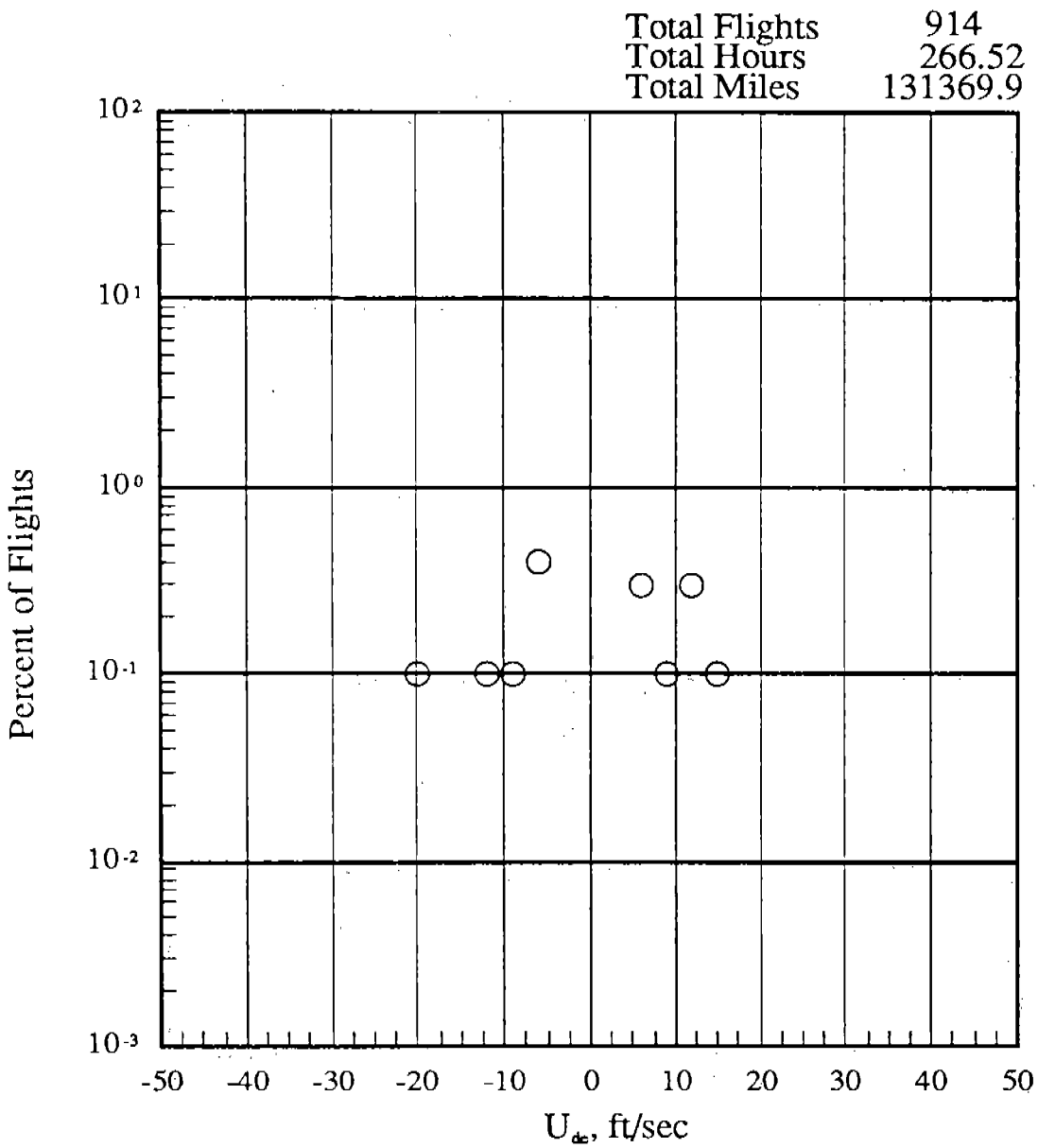
(f) 19500 to 24500 feet altitude

Figure 19.- Continued.



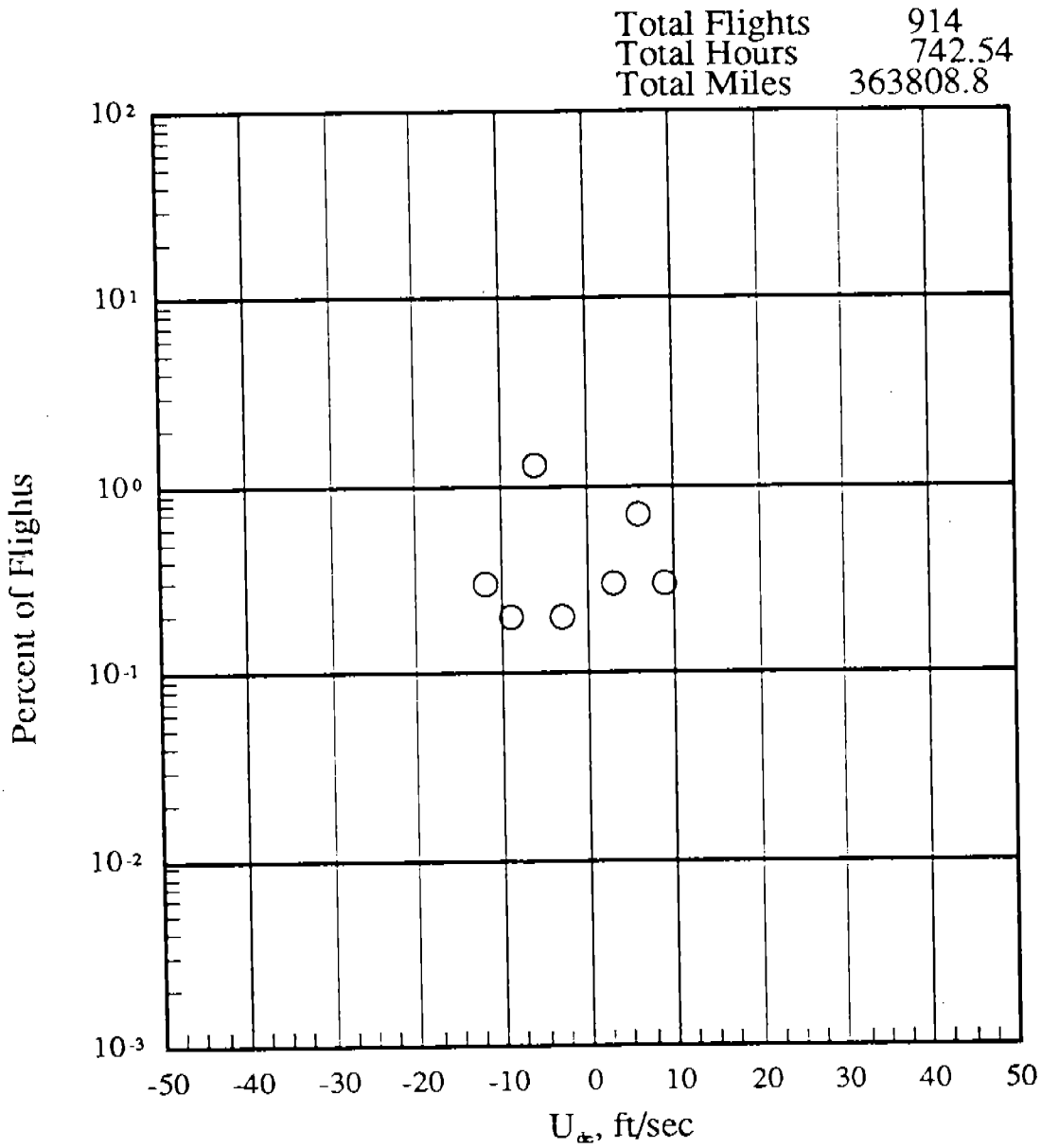
(g) 24500 to 29500 feet altitude

Figure 19.- Continued.



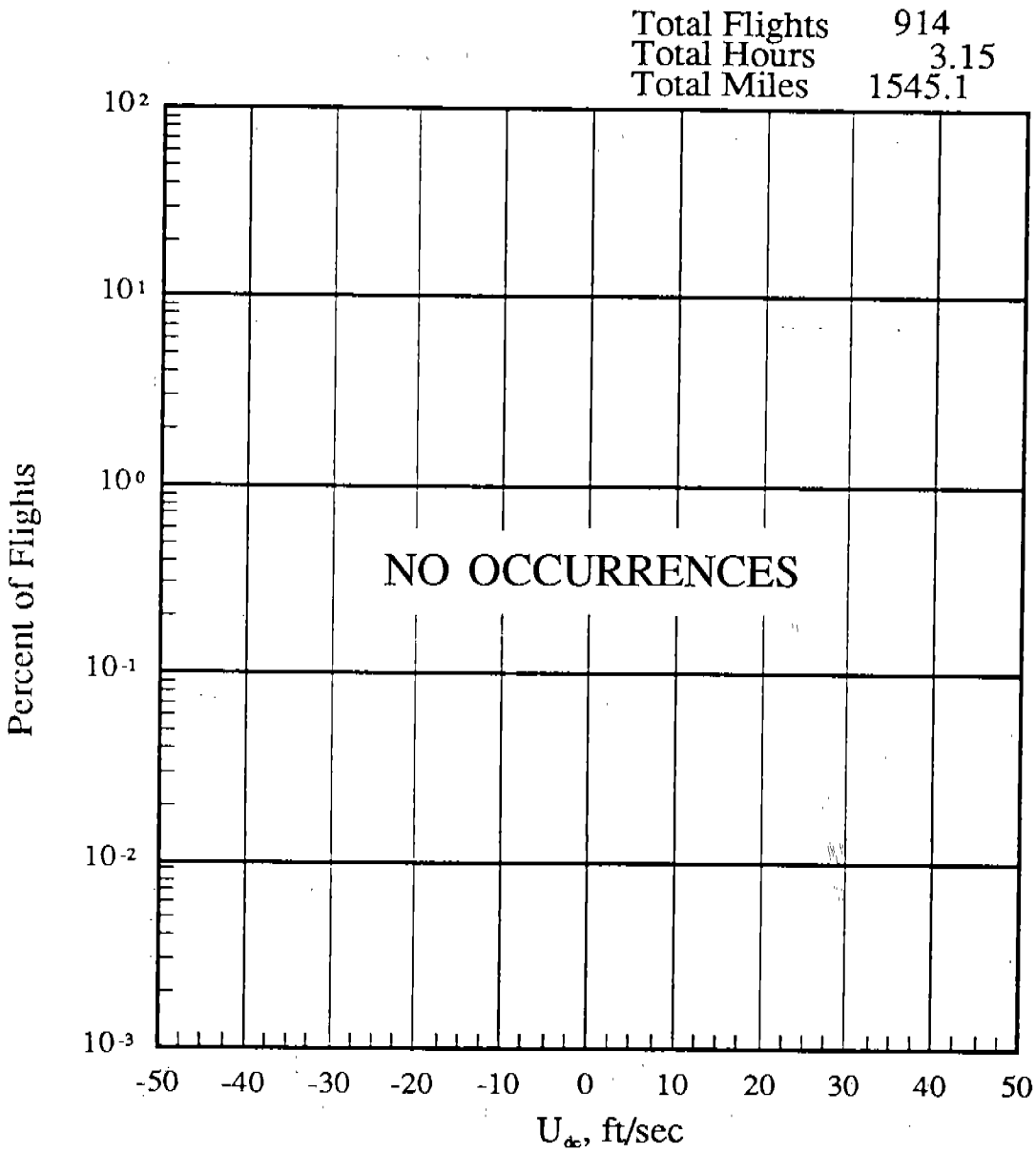
(h) 29500 to 34500 feet altitude

Figure 19.- Continued.



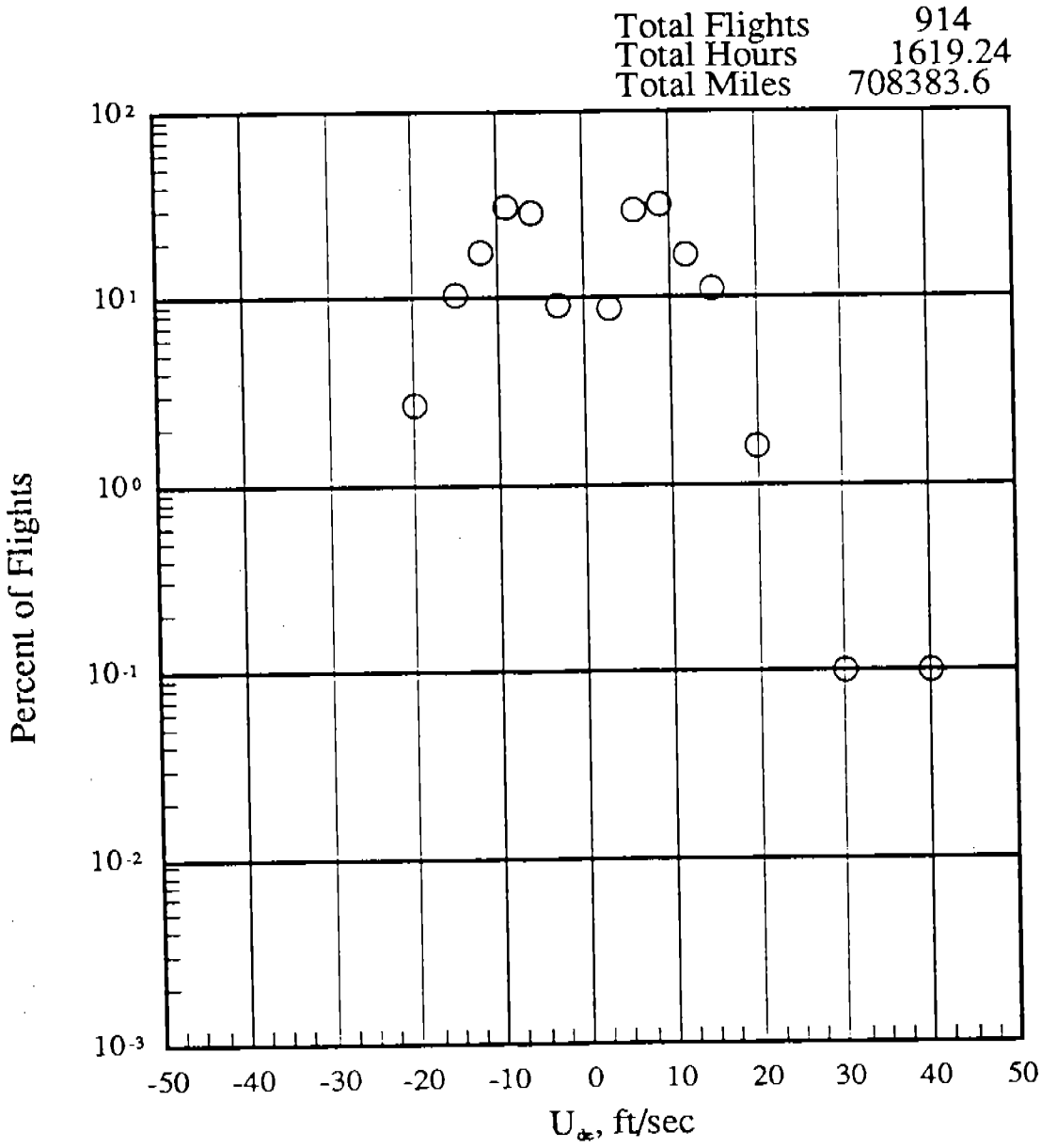
(i) 34500 to 39500 feet altitude

Figure 19.- Continued.



(j) 39500 to 44500 feet altitude

Figure 19.- Continued.



(k) -500 to 44500 feet altitude

Figure 19.- Concluded.

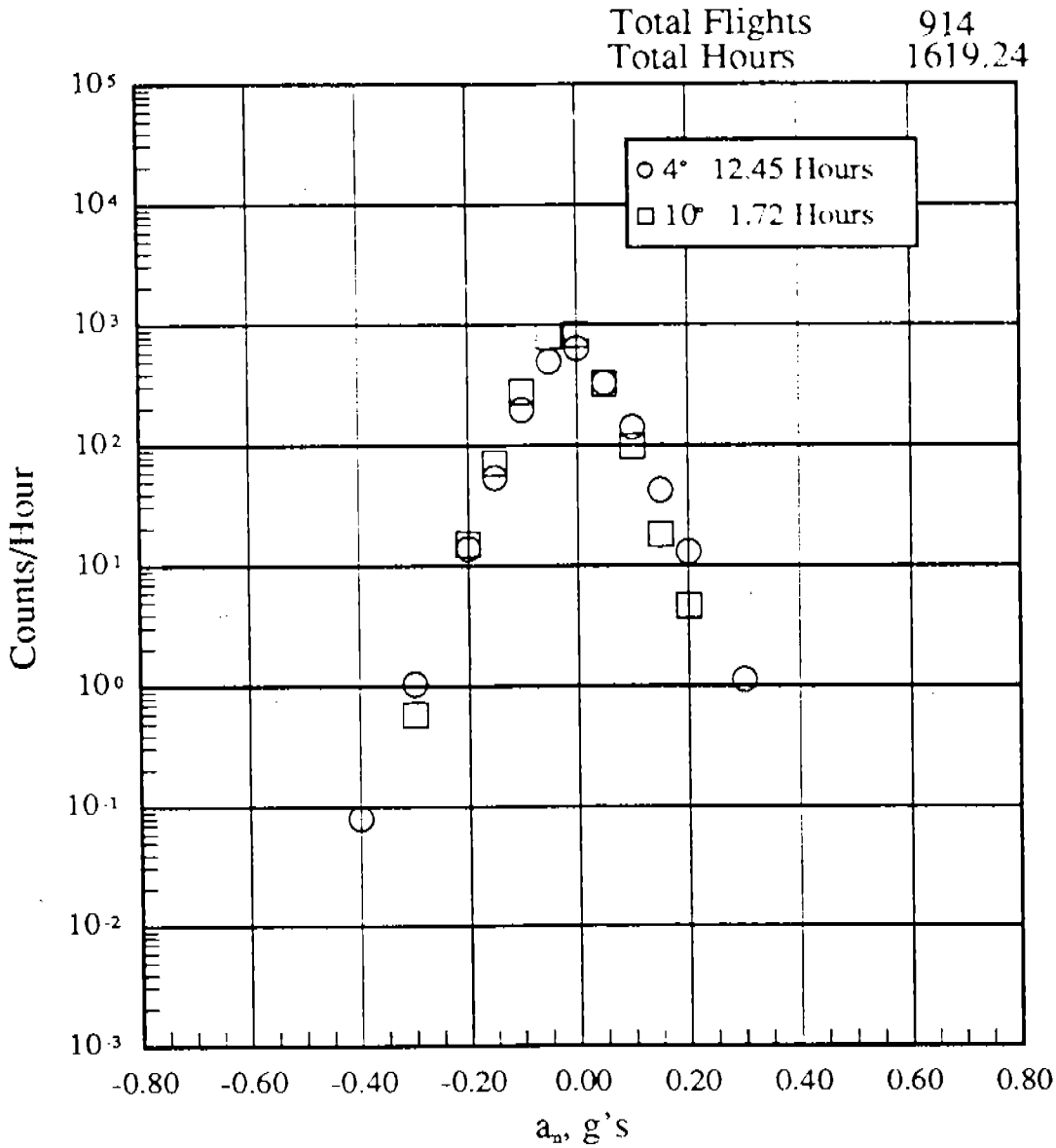
FLAP DETENT

a_n LEVEL g's	4	10	18	22	27	33	42
1.60	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0
.30	1.124	0	0	0	0	0	0
.20	13.007	4.650	0	0	0	0	0
.15	41.993	18.020	0	0	0	0	0
.10	140.754	97.077	0	128.571	0	0	0
.05	327.275	320.878	240.00	128.571	0	0	0
0	634.877	826.029	1080.00	900.000	0	0	0
-.05	493.321	801.033	720.00	642.857	0	0	0
-.10	196.638	279.025	480.00	257.143	0	0	0
-.15	53.555	70.919	0	128.571	0	0	0
-.20	13.891	15.114	0	0	0	0	0
-.30	1.044	0.581	0	0	0	0	0
-.40	0.080	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0
FLIGHT HOURS IN DETENT	12.454	1.720	0.008	0.008	0	0	0

TOTAL HOURS	14.19
TOTAL FLIGHTS	914
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	1619.24
TOTAL FLIGHT MILES FLASPS UP AND DOWN	708383.60

(a) Take off

Figure 20.- a_n Exceedances with flaps deflected.



(b) Take off

Figure 20.- Continued.

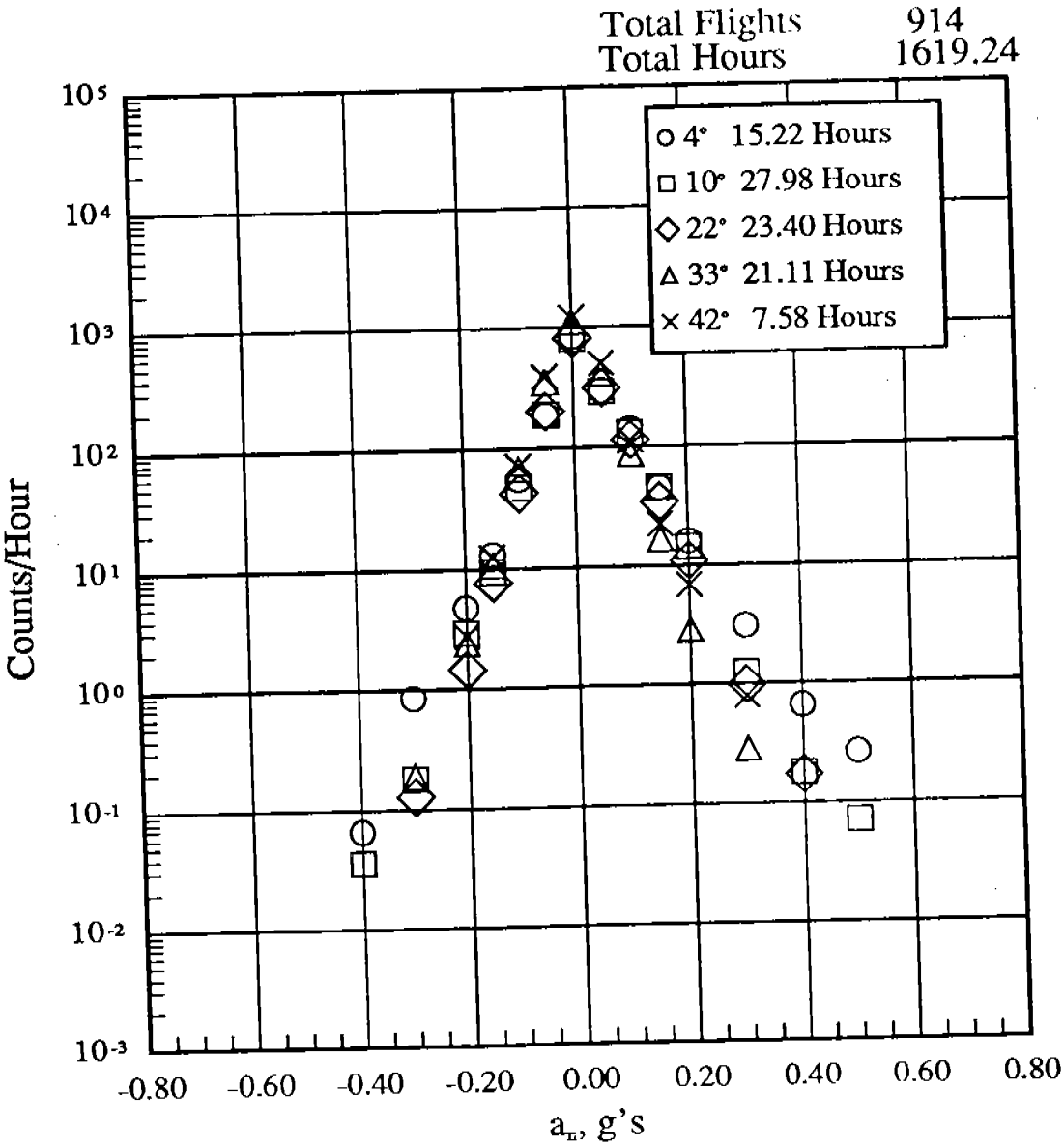
FLAP DETENT

a'_n LEVEL g's	4	10	18	22	27	33	42
1.60	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0
.50	0.263	0.071	0	0	0	0	0
.40	0.657	0.179	0	0.171	0	0	0
.30	3.089	1.251	2.048	0.983	0	0.284	0.791
.20	16.034	14.332	15.971	11.028	9.943	2.889	6.856
.15	45.081	45.318	54.055	34.621	37.964	16.768	22.414
.10	140.039	130.522	167.899	113.695	137.393	86.918	112.466
.05	293.418	286.633	395.177	308.942	390.484	403.185	495.483
0	832.478	793.388	731.384	806.848	687.866	1109.944	1197.836
-.05	185.711	188.349	199.431	201.488	361.559	351.508	389.214
-.10	55.858	47.427	49.141	42.700	105.756	66.882	71.593
-.15	13.209	9.507	10.238	7.736	23.501	10.752	12.657
-.20	4.797	2.931	3.276	1.453	2.712	2.416	2.769
-.30	0.854	0.179	0.410	0.128	0	0.189	0
-.40	0.066	0.036	0	0	0	0	0
-.50	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0
FLIGHT HOURS IN DETENT	15.217	27.980	2.442	23.396	1.106	21.112	7.585

TOTAL HOURS	98.84
TOTAL FLIGHTS	914
TOTAL FLIGHT HOURS FLAPS UP A	1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN	708383.60

(c) Landing

Figure 20.- Continued.



(d) Landing.

Figure 20.- Concluded.

MAXIMUM an LEVEL FOR EACH FLIGHT		EAS, KTS																			
g's FROM	TO	120 TO 130 KTS	130 TO 140 KTS	140 TO 150 KTS	150 TO 160 KTS	160 TO 170 KTS	170 TO 180 KTS	180 TO 190 KTS	190 TO 200 KTS	200 TO 210 KTS	210 TO 220 KTS	220 TO 230 KTS	230 TO 240 KTS	240 TO 250 KTS	250 TO 260 KTS	260 TO 270 KTS	270 TO 280 KTS	280 TO 290 KTS	290 TO 300 KTS	300 TO 310 KTS	310 TO 320 KTS
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	1	2	3	2	1	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	0	2	4	4	3	2	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	0	1	4	6	8	8	2	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	0	2	4	6	8	6	1	0	0	0	0	0	0	0	0	1
-.05	-0.10	0	0	0	0	0	2	5	7	5	1	1	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	0	0	1	4	13	14	8	1	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	0	0	2	6	7	4	1	0	0	0	0	0	0	0	0	0	1
-.20	-0.30	0	0	0	0	0	1	4	3	3	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAKS @ EAS		0	0	0	1	19	111	358	451	381	227	62	8	4	0	0	0	0	0	1	29
FLIGHT HOURS @ EAS		0	0	0	0	0	0.9	2.7	3.7	3	1.4	0.4	0.1	0	0	0	0	0	0	0	0.2
FLIGHT MILES @ EAS		0	0	0	3	23	164	513	755	644	310	85	18	3	0	0	0	0	1	4	38

TOTAL FLIGHTS INCLUDED	913
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS, ANY FLAP	1619.24
TOTAL FLIGHT MILES, ANY FLAP	708383.64

(a) Take off; flaps 4 degree detent

Figure 21.- Percent of flights with peak positive and negative a_n per flight vs. EAS bands.

MAXIMUM an LEVEL FOR EACH FLIGHT		EAS 120 TO 130 KTS	130 TO 140 KTS	140 TO 150 KTS	150 TO 160 KTS	160 TO 170 KTS	170 TO 180 KTS	180 TO 190 KTS	190 TO 200 KTS	200 TO 210 KTS	210 TO 220 KTS	220 TO 230 KTS	230 TO 240 KTS	240 TO 250 KTS	250 TO 260 KTS	260 TO 270 KTS	270 TO 280 KTS	280 TO 290 KTS	290 TO 300 KTS	300 TO 310 KTS	310 TO 320 KTS
G'S FROM	TO																				
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	1	4	5	1	0	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	1	9	9	3	0	0	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	0	0	0	2	18	20	3	1	0	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	0	0	2	11	9	2	0	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	0	1	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAKS @ EAS		0	0	0	7	68	360	364	82	12	5	4	0	0	0	0	0	0	2	1	4
FLIGHT HOURS @ EAS		0	0	0	0	0.2	0.7	0.7	0.2	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT MILES @ EAS		0	0	0	3	27	121	124	31	6	2	3	0	0	0	0	0	0	1	0	1

TOTAL FLIGHTS INCLUDED	755.00
TOTAL FLIGHTS ANALYZED	914.00
TOTAL FLIGHT HOURS, ANY FLAP	1619.24
TOTAL FLIGHT MILES, ANY FLAP	708383.64

(b) Take off; flap 10 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL
FOR EACH FLIGHT

g's FROM	TO	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250	250–260	260–270	270–280	280–290	290–300	300–310	310–320
		EAS, KTS																		
1.60	1.80		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	0	0	0	0	20	20	0	0	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK @ EAS		0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ EAS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT MILES @ EAS		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL FLIGHTS INCLUDED 5
TOTAL FLIGHTS ANALYZED 914
TOTAL FLIGHT HOURS ,ANY FLAP 16[illegible]24
TOTAL FLIGHT MILES ,ANY FLAP 7083

(c) Take off; flap 18 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL

FOR EACH FLIGHT

G'S FRO	TO	120 130	130 140	140 150	150 160	160 170	170 180	180 190	190 200	200 210	210 220	220 230	230 240	240 250	250 260	260 270	270 280	280 290	290 300	300 310	310 320
		EAS, KTS																			
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAKS @ EAS		0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ EAS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT MILES @ EAS		0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL FLIGHTS INCLUDED	2,50
TOTAL FLIGHTS ANALYZED	4
TOTAL FLIGHT HOURS ,ANY FLAP	1,24
TOTAL FLIGHT MILES ,ANY FLAP	708383,64

(d) Take off; flap 22 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL

FOR EACH FLIGHT

g's FROM	TO	120 130	130 140	140 150	150 160	160 170	170 180	180 190	190 200	200 210	210 220	220 230	230 240	240 250	250 260	260 270	270 280	280 290	290 300	300 310	310 320
		EAS, KTS																			
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	0	1	2	2	2	1	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	0	1	1	2	3	3	4	2	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	0	1	1	1	3	6	5	5	3	1	0	0	0	0	0	0
.05	0.10	0	0	0	0	0	0	1	1	4	5	8	7	3	1	0	0	0	0	0	0
-.05	-0.10	0	0	0	0	0	1	1	2	4	7	7	7	4	1	0	0	0	0	0	0
-.10	-0.15	0	0	0	0	0	1	1	1	3	3	4	4	3	1	0	0	0	0	0	1
-.15	-0.20	0	0	0	0	0	0	0	0	1	1	1	1	2	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK @ EAS		0	0	0	0	3	28	50	63	173	251	278	285	179	38	0	0	0	0	0	26
FLIGHT HOURS @ EAS		0	0	0	0	0.1	0.9	1.8	1.1	2.3	2.7	2.1	2.2	1.6	0.2	0	0	0	0	0	0.2
FLIGHT MILES @ EAS		0	0	0	0	12	166	357	233	518	621	500	565	426	60	1	0	0	0	2	526

TOTAL FLIGHTS INCLUDED	898
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS ,ANY FLAP	1619.24
TOTAL FLIGHT MILES ,ANY FLAP	708383.64

(e) Landing; flaps 4 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL
FOR EACH FLIGHT

g's FROM	TO	120 130	130 140	140 150	150 160	160 170	170 180	180 190	190 200	200 210	210 220	220 230	230 240	240 250	250 260	260 270	270 280	280 290	290 300	300 310	310 320
		RAS,KTS																			
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	3	2	2	3	2	2	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	1	2	3	4	4	3	2	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	3	4	4	4	5	5	2	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	1	1	3	4	5	4	4	1	0	0	0	0	0	0	0	1
-.05	-0.10	0	0	0	0	3	5	6	6	6	6	4	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	0	0	2	5	4	3	5	5	2	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	0	1	2	1	2	2	1	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAKS @ RAS		0	0	0	18	104	203	223	233	296	256	167	21	1	0	0	1	4	1	3	17
FLIGHT HOURS @ RAS		0	0	0	4.0	3.1	5.7	5.0	3.4	4.1	4.0	1.8	0.2	0	0	0	0	0	0	0.1	0.1
FLIGHT MILES @ RAS		0	0	0	60	551	1069	965	701	902	932	425	42	2	0	0	1	6	7	11	31

TOTAL FLIGHTS INCLUDED	909.50
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS ,ANY FLAP	1619.24
TOTAL FLIGHT MILES ,ANY FLAP	708383.64

(f) Landing; flaps 10 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL
FOR EACH FLIGHT

g's FROM	TO	120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250	250–260	260–270	270–280	280–290	290–300	300–310	310–320
		EAS, KTS																			
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	1	3	4	3	4	3	1	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	2	6	9	7	8	7	1	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	0	0	1	3	3	2	2	4	2	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK @ EAS		0	0	0	37	118	180	133	160	159	34	0	0	0	0	0	2	1	7	2	3
FLIGHT HOURS @ EAS		0	0	0	0.1	0.4	0.6	0.3	0.4	0.4	0.1	0	0	0	0	0	0	0	0	0	0
FLIGHT MILES @ EAS		0	0	2	20	77	102	65	78	89	17	2	0	0	0	1	3	5	6	1	1

TOTAL FLIGHTS INCLUDED	909
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS ,ANY FLAP	1619.24
TOTAL FLIGHT MILES ,ANY FLAP	708383.64

(g) Landing; flaps 18 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL

FOR EACH FLIGHT

g'S FROM	TO	EAS, KTS 120 130	130 140	140 150	150 160	160 170	170 180	180 190	190 200	200 210	210 220	220 230	230 240	240 250	250 260	260 270	270 280	280 290	290 300	300 310	310 320
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	1	3	2	3	1	1	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	2	5	4	4	2	0	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	3	11	6	4	3	1	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	1	5	11	7	4	1	1	0	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	0	1	8	15	9	3	3	2	0	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	1	6	12	6	3	2	1	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	2	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK @ EAS		0	0	33	246	568	342	204	119	51	4	0	0	0	5	6	7	4	2	3	2
FLIGHT HOURS @ EAS		0	0	0.3	4.2	8.2	4.9	3.0	1.8	0.5	0	0	0	0	0	0.1	0.1	0.1	0	0	0
FLIGHT MILES @ EAS		0	2	51	683	1399	891	592	383	115	5	0	0	0	6	14	14	10	6	9	6

TOTAL FLIGHTS INCLUDED	913
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS ,ANY FLAP	1619.24
TOTAL FLIGHT MILES ,ANY FLAP	708383.64

(h) Landing; flaps 22 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL

FOR EACH FLIGHT

g's FROM	TO	RAS, KTS 120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250	250–260	260–270	270–280	280–290	290–300	300–310	310–320
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	3	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	2	12	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	0	1	10	11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	0	0	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK @ RAS		0	1	33	282	329	43	7	1	0	0	0	0	1	4	2	4	0	0	0	0
FLIGHT HOURS @ RAS		0	0	0	0.4	0.5	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT MILES @ RAS		0	0	6	57	85	24	8	2	0	0	0	0	0	1	1	0	0	0	0	0

TOTAL FLIGHTS INCLUDED	907
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS ,ANY FLAP	1619.24
TOTAL FLIGHT MILES ,ANY FLAP	708383.64

(i) Landing; flaps 27 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL

FOR EACH FLIGHT

g's FROM	TO	EAS, KTS 120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250	250–260	260–270	270–280	280–290	290–300	300–310	310–320
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	1	7	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	2	13	12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	2	13	14	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.05	-0.10	0	3	16	15	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.10	-0.15	0	3	12	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	1	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK @ EAS		2	116	625	645	141	0	0	1	0	0	0	1	10	7	3	1	0	0	0	0
FLIGHT HOURS @ EAS		0.1	2	10	7.8	0.9	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0
FLIGHT MILES @ EAS		18	284	1486	1217	150	0	0	0	0	0	0	4	13	15	2	0	0	0	0	0

TOTAL FLIGHTS INCLUDED	914
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS ,ANY FLAP	1619.24
TOTAL FLIGHT MILES ,ANY FLAP	708383.64

(j) Landing; flaps 33 degree detent

Figure 21.- Continued.

MAXIMUM a_n LEVEL
FOR EACH FLIGHT

g's FROM	TO	EAS, KTS 120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250	250–260	260–270	270–280	280–290	290–300	300–310	310–320
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	1	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	2	8	5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
.10	0.15	0	6	25	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	6	16	6	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
-.05	-0.10	1	9	22	9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
-.10	-0.15	0	7	17	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.15	-0.20	0	1	7	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	-0.30	1	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK @ EAS		6	101	315	132	12	0	0	0	0	0	0	7	7	2	1	1	0	0	0	0
FLIGHT HOURS @ EAS		0.1	1.8	4	1.5	0.1	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0
FLIGHT MILES @ EAS		7	245	590	239	14	0	0	0	0	0	3	8	10	4	1	0	0	0	0	0

TOTAL FLIGHTS INCLUDED	309
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT HOURS ,ANY FLAP	1619.24
TOTAL FLIGHT MILES ,ANY FLAP	708383.64

(k) Landing; flaps 42 degree detent

Figure 21.- Concluded.

PRESSURE ALTITUDE BANDS

a_n LEVEL g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0.11	0	0	0	0	0	0	0	0	0.04
.40	0.77	0	0.45	0.52	0	0	0	0	0	0.38
.30	2.21	1.92	1.79	1.03	2.50	0	0	0	0	1.48
.20	22.76	9.59	11.16	2.58	9.99	0	4.73	0	0	11.89
.15	57.00	20.56	27.23	5.16	27.48	0	9.45	1.38	0	29.27
.10	159.96	74.29	84.38	25.27	51.21	13.42	33.09	15.85	0	87.69
.05	335.94	130.22	226.36	95.92	146.15	148.56	115.01	101.68	12.42	205.29
0.00	752.41	1248.16	888.03	1006.10	954.34	1095.53	951.60	1489.98	696.26	976.33
-.05	272.09	111.85	144.66	81.48	178.63	98.72	143.37	117.19	14.49	170.87
-.10	88.93	33.72	45.09	17.02	27.48	5.75	17.33	14.13	0	48.17
-.15	25.08	8.50	12.50	2.58	2.50	0	3.15	1.72	0	12.65
-.20	6.63	3.56	5.36	1.55	1.25	0	1.58	0.34	0	3.84
-.30	0.33	0.27	1.34	0.52	0	0	1.58	0	0	0.38
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26

TOTAL FLIGHTS	56
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	23.71
TOTAL FLIGHT MILES FLAPS UP AND DOWN	7616.26

(a) a_n Level crossing counts per hour within pressure altitude bands

Figure 22.- Normal acceleration exceedances: Non-revenue flights.

PRESSURE ALTITUDE BANDS

a_{nM} LEVEL g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.30	0.22	0	0	0	1.25	0	0	0	0	0.13
.20	2.32	0.55	0.89	0	2.50	0	0	0	0	1.14
.15	8.62	2.47	3.57	0	5.00	0	0	0	0	4.18
.10	26.84	15.63	12.50	3.61	11.24	0	0	1.03	0	14.64
.05	58.88	35.91	41.52	21.14	23.73	18.21	23.63	7.58	4.14	37.08
0.00	171.01	149.68	134.39	124.80	123.66	145.69	135.49	199.90	208.40	162.64
-.05	36.79	22.48	25.90	21.66	28.73	11.50	15.75	8.27	1.38	24.72
-.10	6.85	4.66	5.80	2.58	3.75	0	0	0.34	0	4.26
-.15	0.99	0.82	0.89	0.52	0	0	0	0	0	0.63
-.20	0.11	0.55	0	0	0	0	0	0	0	0.13
-.30	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26

TOTAL FLIGHTS	56
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	23.71
TOTAL FLIGHT MILES FLAPS UP AND DOWN	7616.26

(b) a_{nM} Level crossing counts per hour wihtin pressure altitude bands

Figure 22.- Continued.

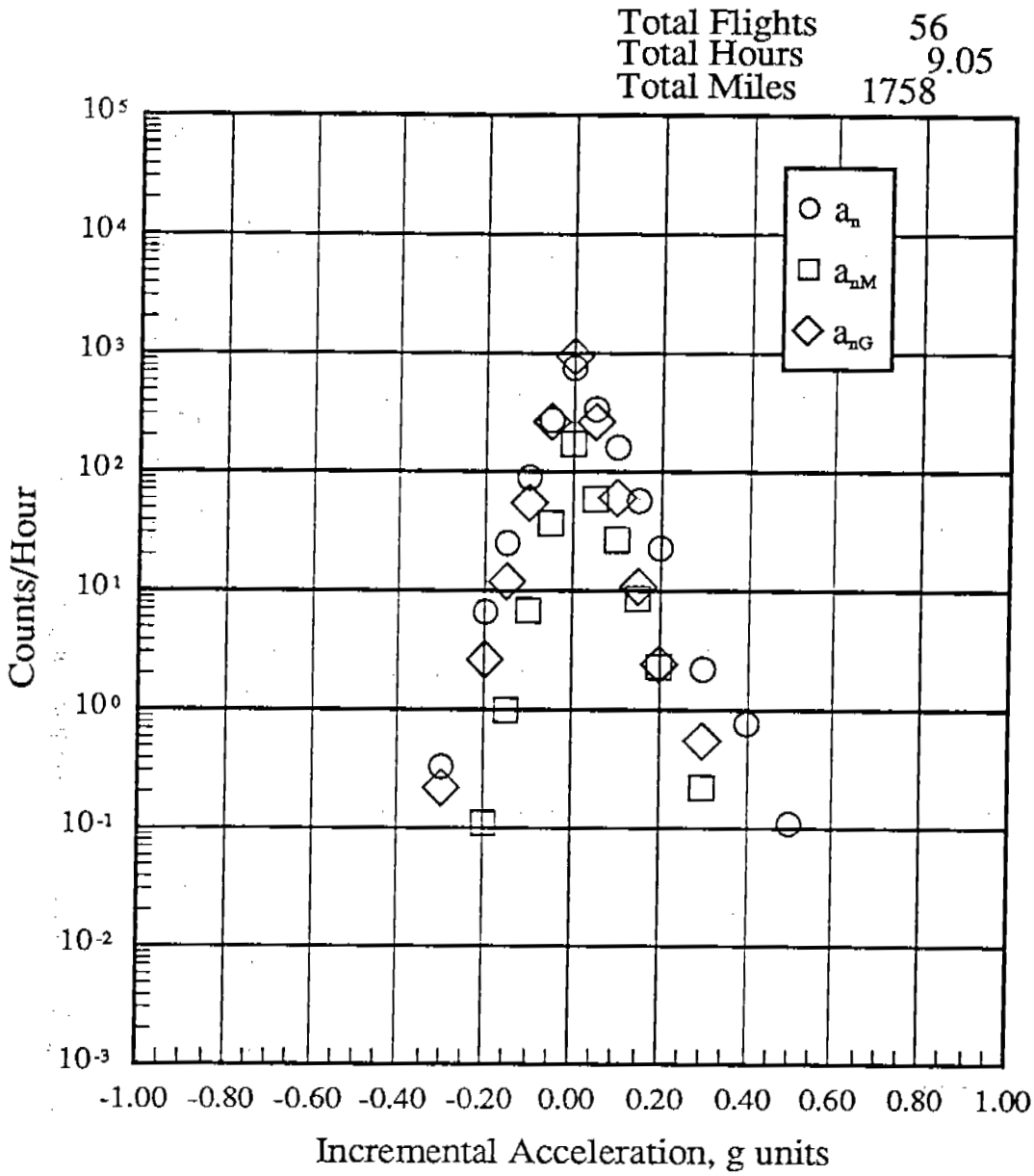
PRESSURE ALTITUDE BANDS

a_{nG} LEVEL g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0.45	0	0	0	0	0	0	0.04
.30	0.55	0	0.89	0.52	0	0	0	0	0	0.34
.20	2.43	3.02	3.13	0.52	0	0	3.15	0	0	1.81
.15	10.83	4.11	7.59	1.03	1.25	0	4.73	1.03	0	5.86
.10	60.32	13.16	18.75	5.16	9.99	2.88	14.18	4.48	0	28.64
.05	262.92	69.91	99.56	29.39	68.70	23.00	40.96	55.84	0	134.22
0.00	938.44	1256.66	1288.96	1466.61	1366.55	1478.91	1350.20	1416.56	1419.44	1200.90
-.05	263.47	67.44	100.01	28.36	81.19	24.92	39.39	53.77	0.69	134.26
-.10	54.57	13.98	28.13	3.61	8.74	2.88	9.45	5.17	0	27.25
-.15	11.93	6.03	8.93	1.03	1.25	0	4.73	0.34	0	6.62
-.20	2.65	1.10	2.68	0.52	0	0	0	0	0	1.48
-.30	0.22	0	0.89	0.52	0	0	0	0	0	0.21
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26

TOTAL FLIGHTS	56
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	23.71
TOTAL FLIGHT MILES FLAPS UP AND DOWN	7616.26

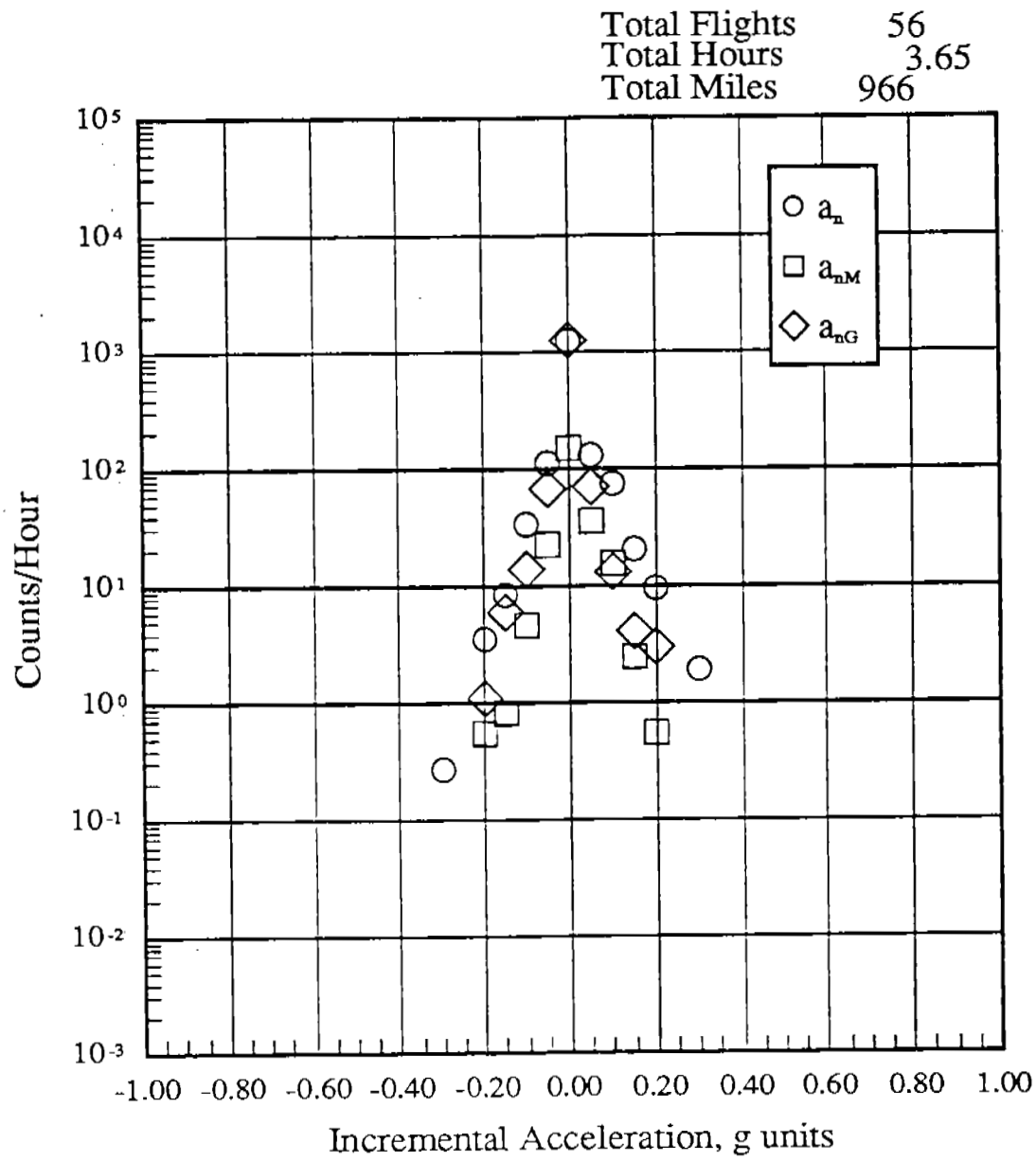
(c) a_{nG} Level crossing counts per hour wihtin pressure altitude bands

Figure 22.- Continued.



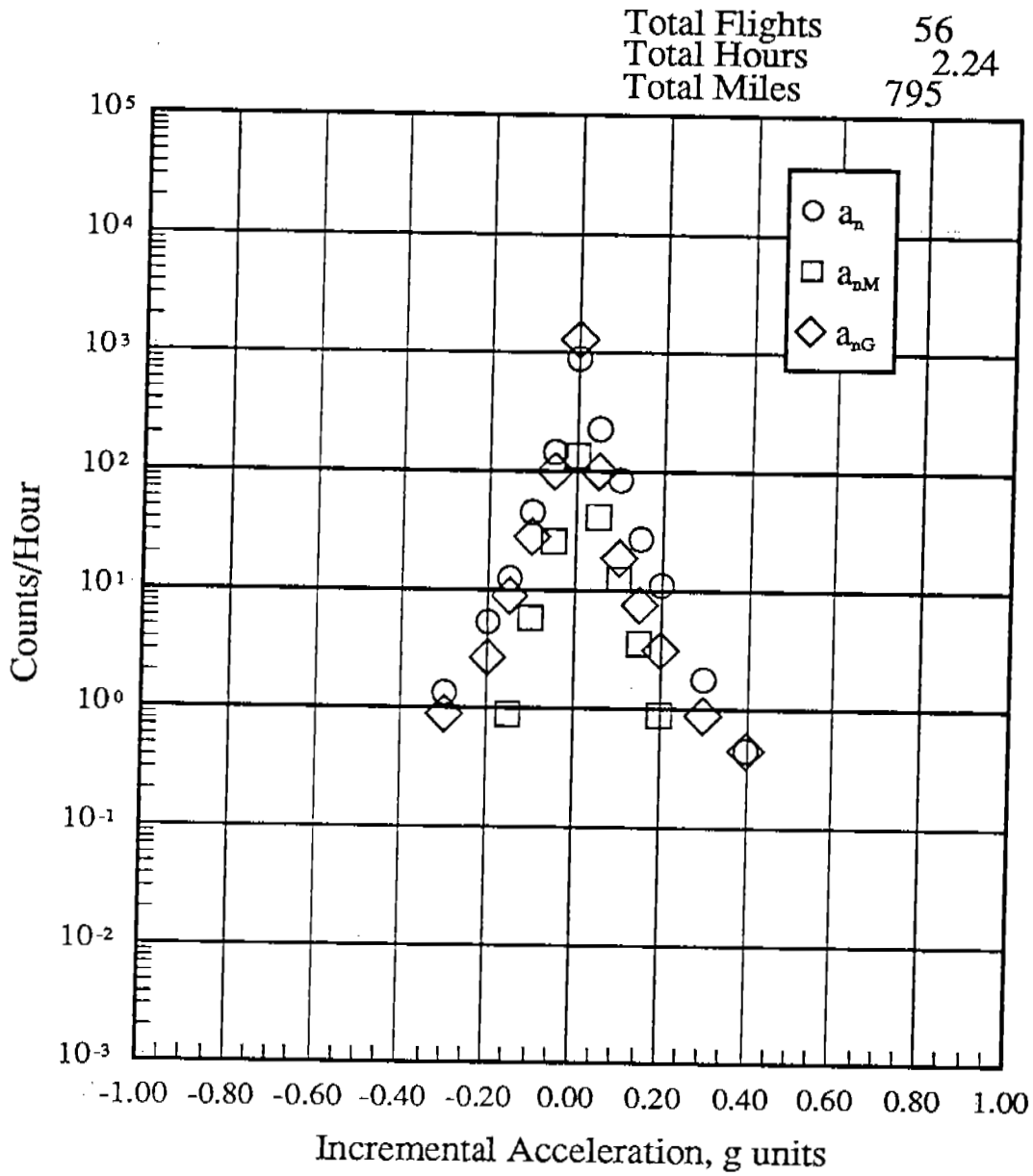
(d) a_n, a_{nM}, a_{nG}, -500 to 4500 feet altitude

Figure 22.- Continued.



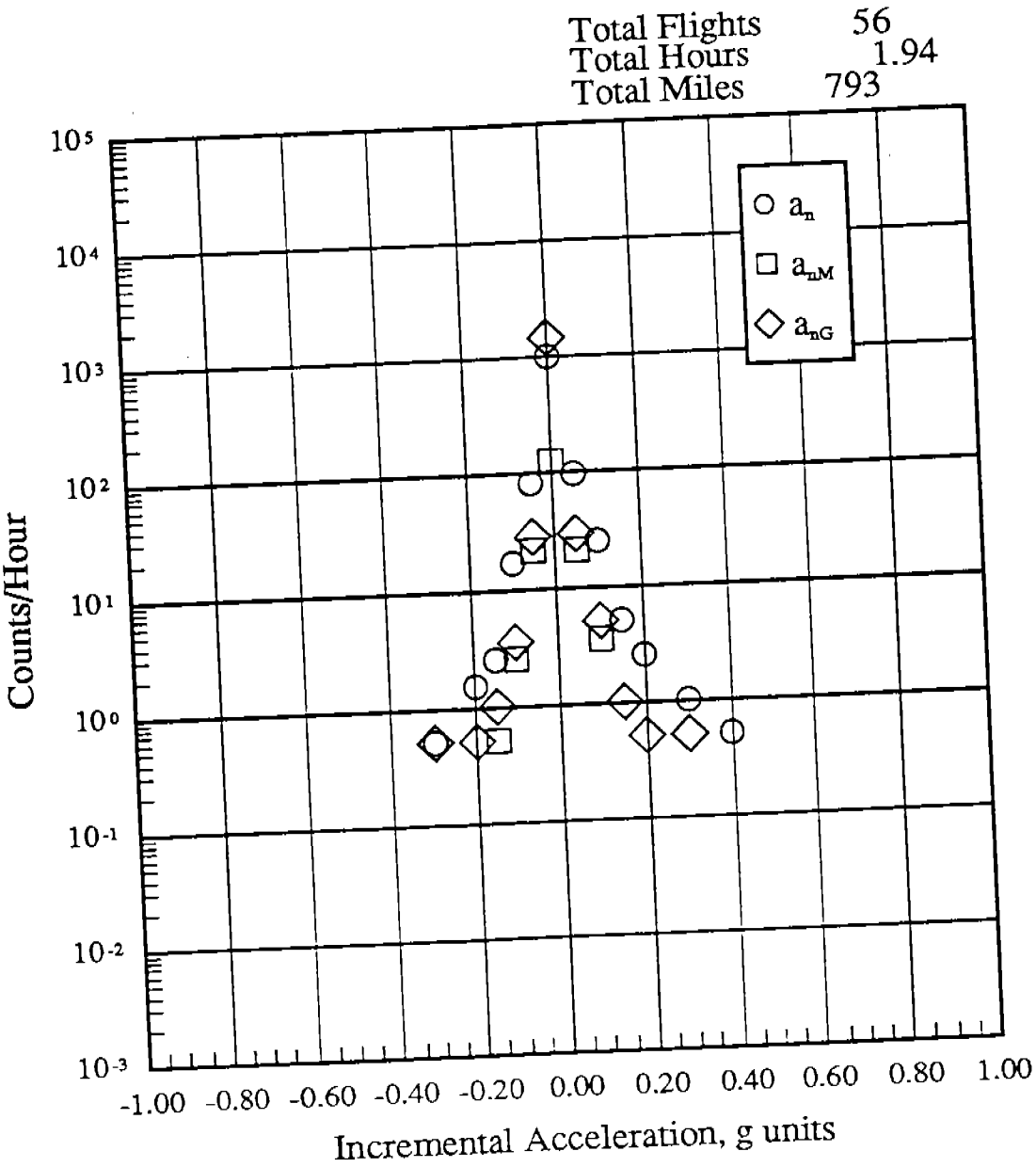
(e) a_n, a_{nM}, a_{nG}, 4500 to 9500 feet altitude

Figure 22.- Continued.



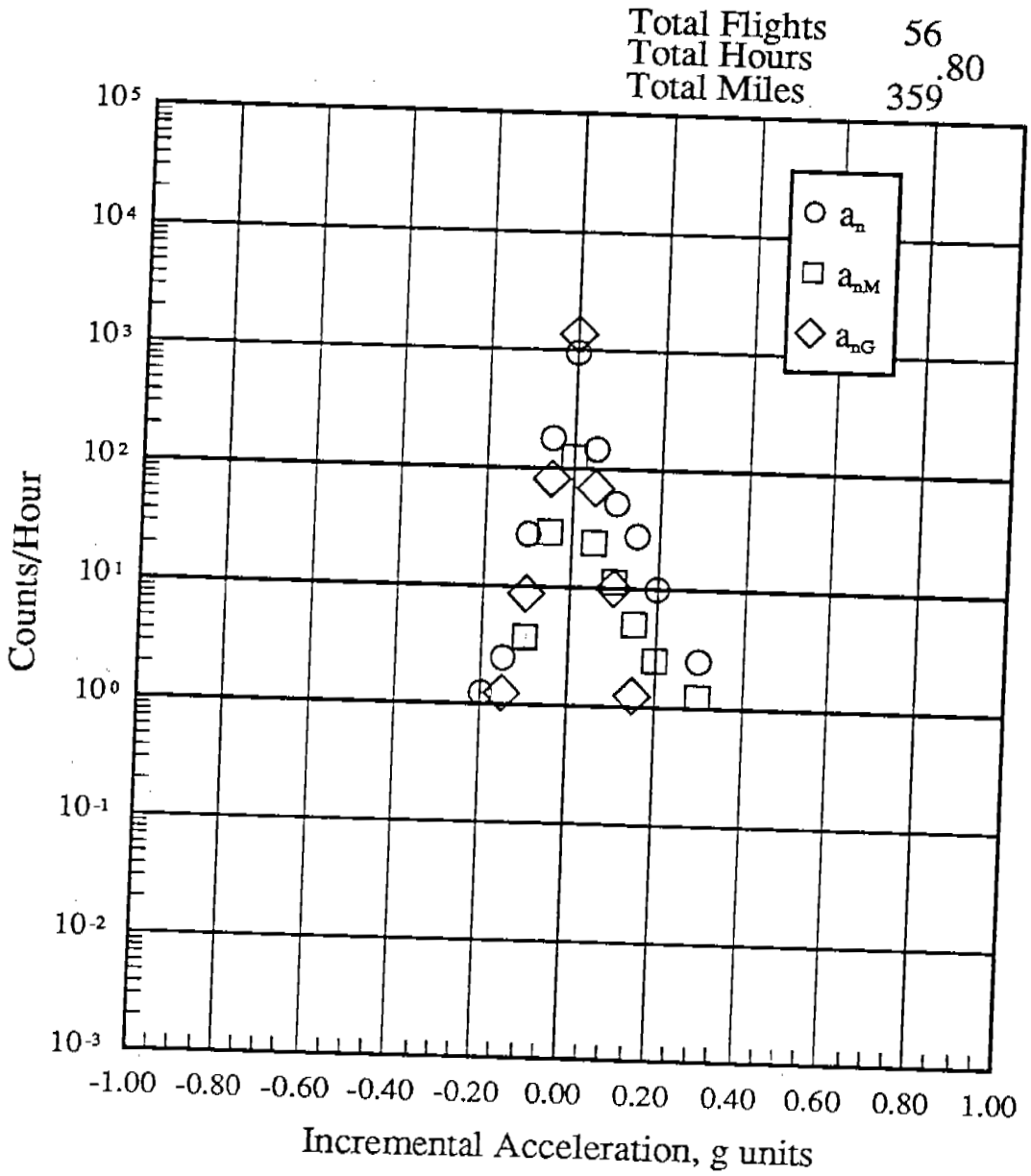
(f) a_n, a_{nM}, a_{nG}, 9500 to 14500 feet altitude

Figure 22.- Continued.



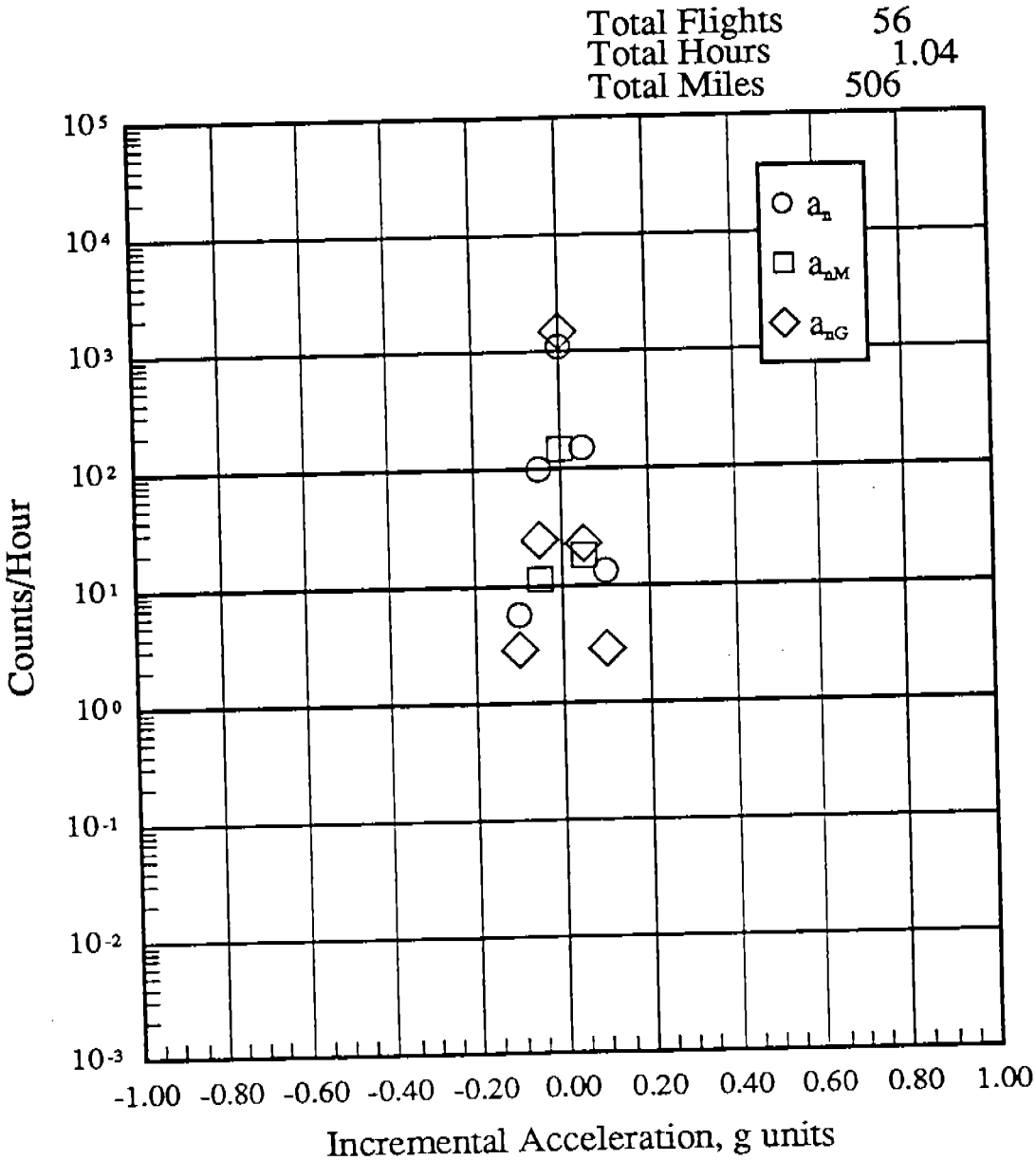
(g) a_n, a_{nM}, a_{nG}, 14500 to 19500 feet altitude

Figure 22.- Continued.



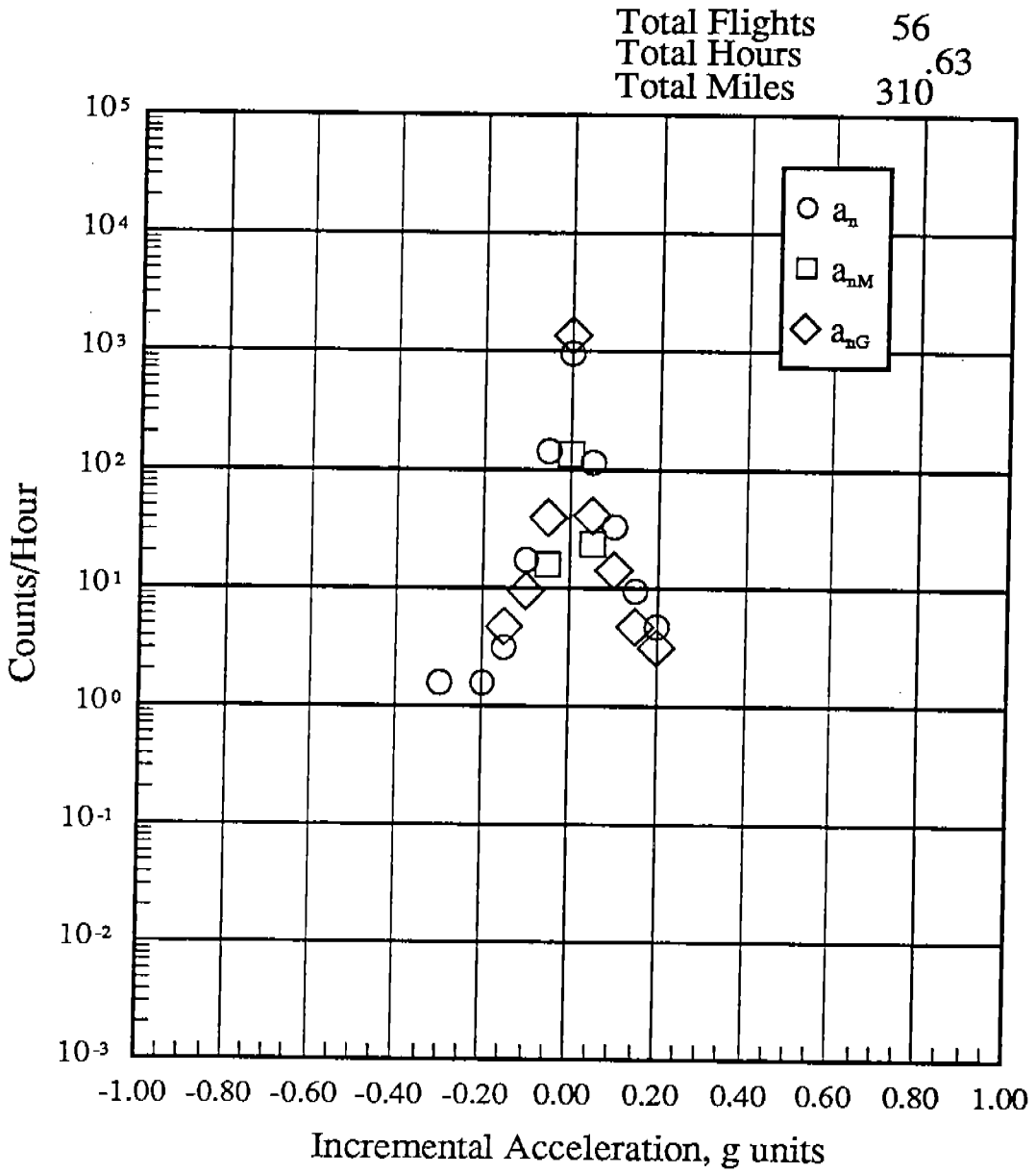
(h) a_n, a_{nM}, a_{nG}, 19500 to 24500 feet altitude

Figure 22.- Continued.



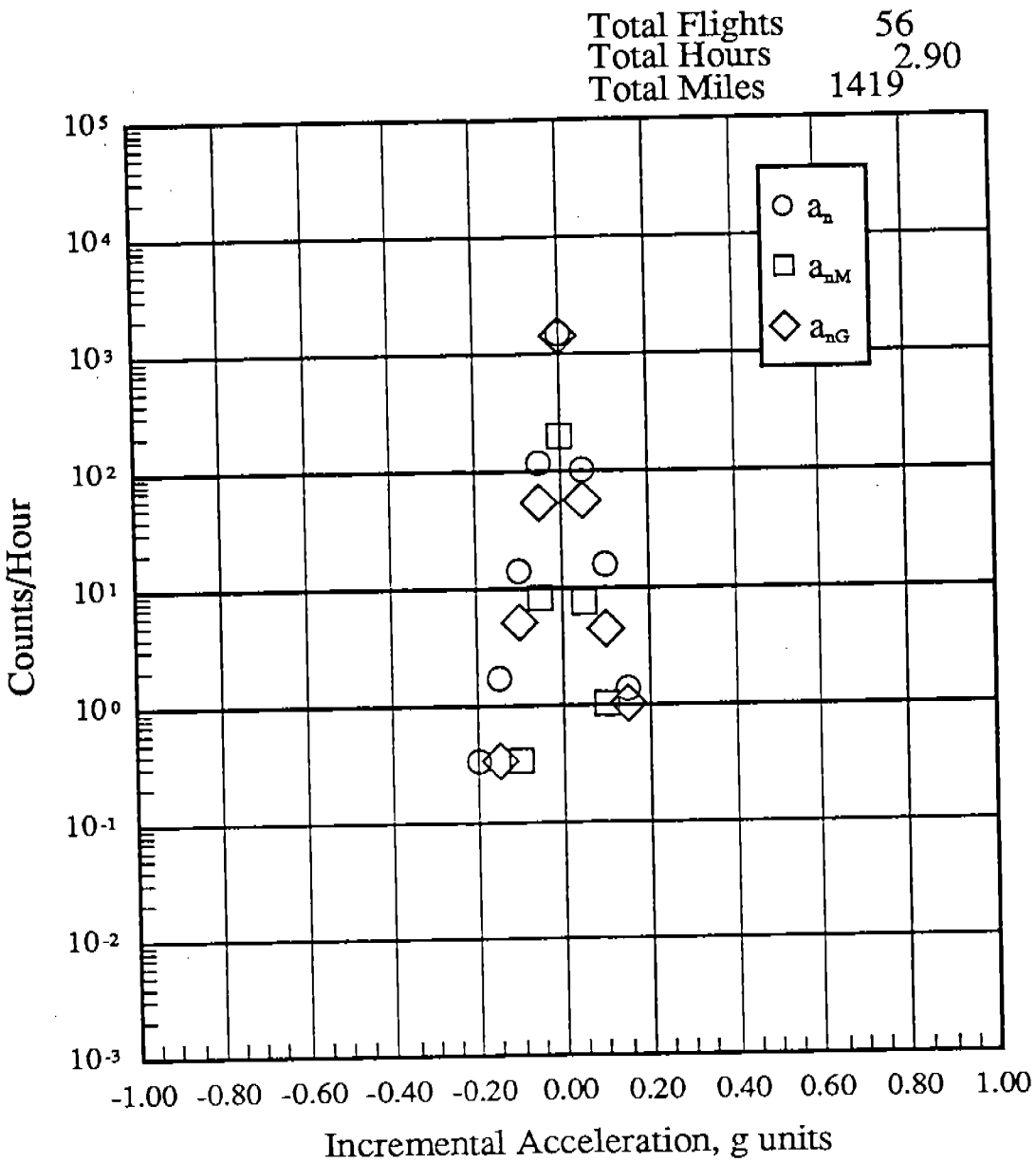
(i) a_n, a_{nM}, a_{nG}, 24500 to 29500 feet altitude

Figure 22.- Continued.



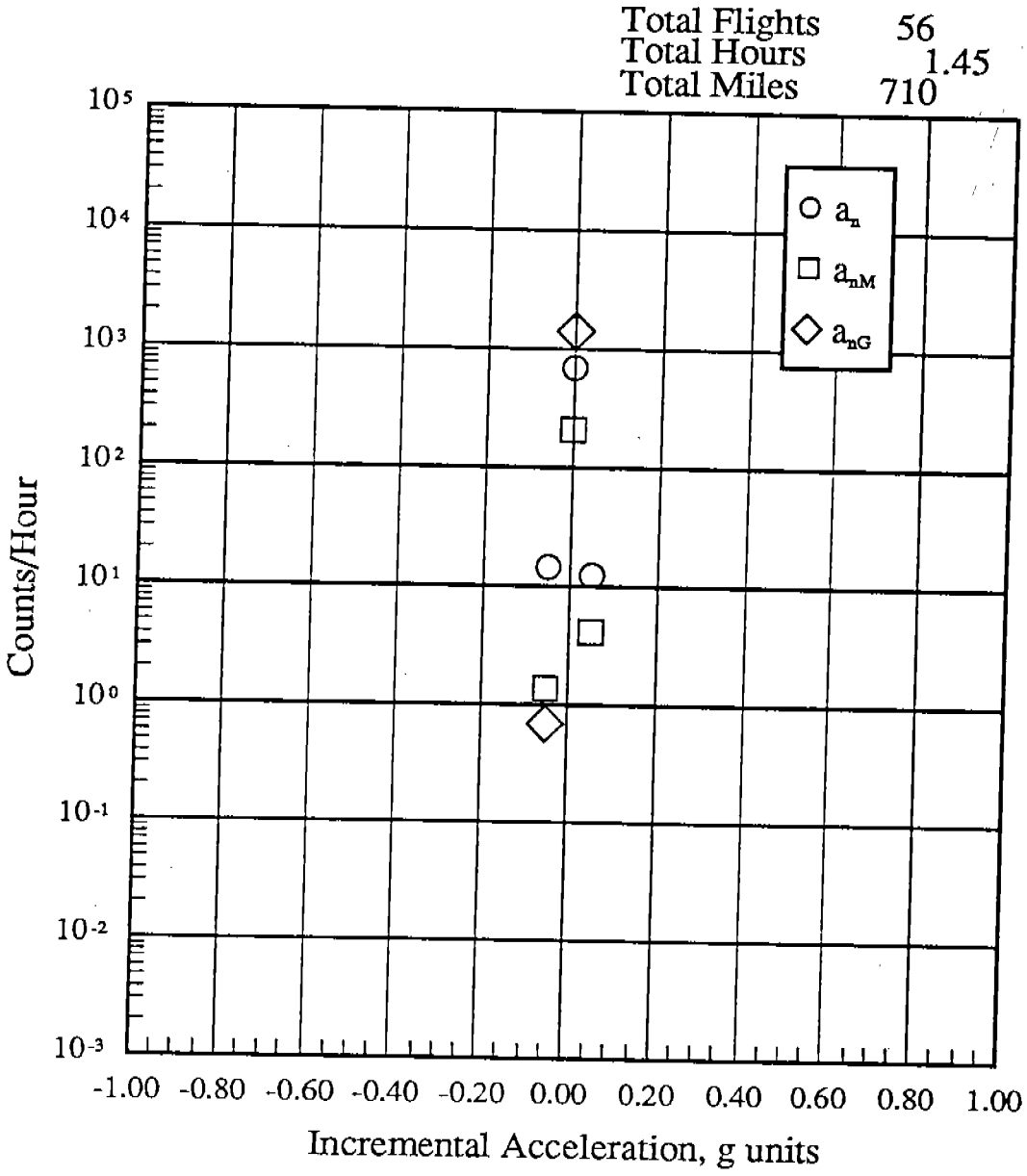
(j) a_n, a_{nM}, a_{nG}, 29500 to 34500 feet altitude

Figure 22.- Continued.



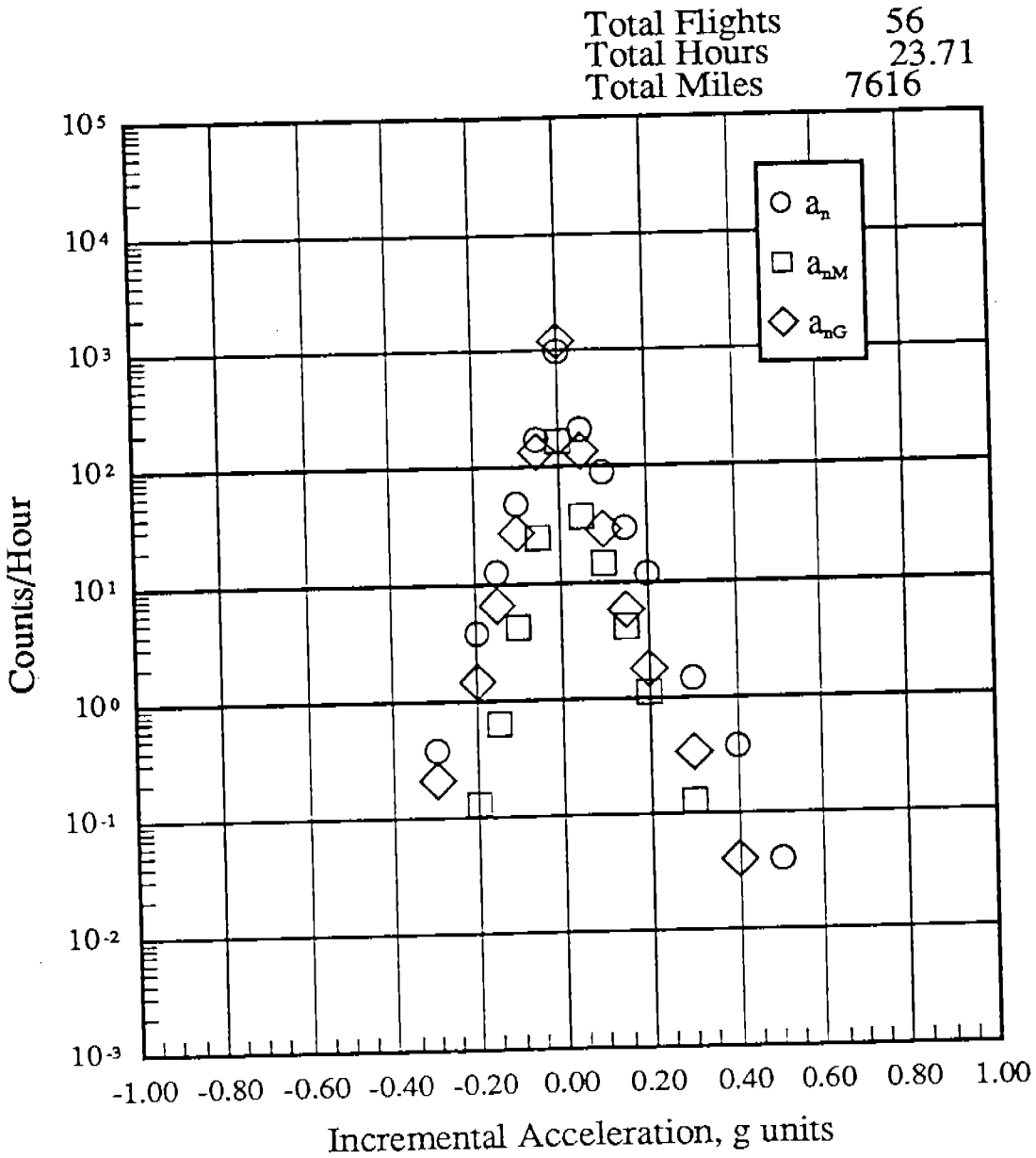
(k) a_n, a_{nM}, a_{nG}, 34500 to 39500 feet altitude

Figure 22.- Continued.



(l) a_n, a_{nM}, a_{nG}, 39500 to 44500 feet altitude

Figure 22.- Continued.



(m) a_n, a_{nM}, a_{nG}, -500 to 44500 feet altitude

Figure 22.- Concluded.

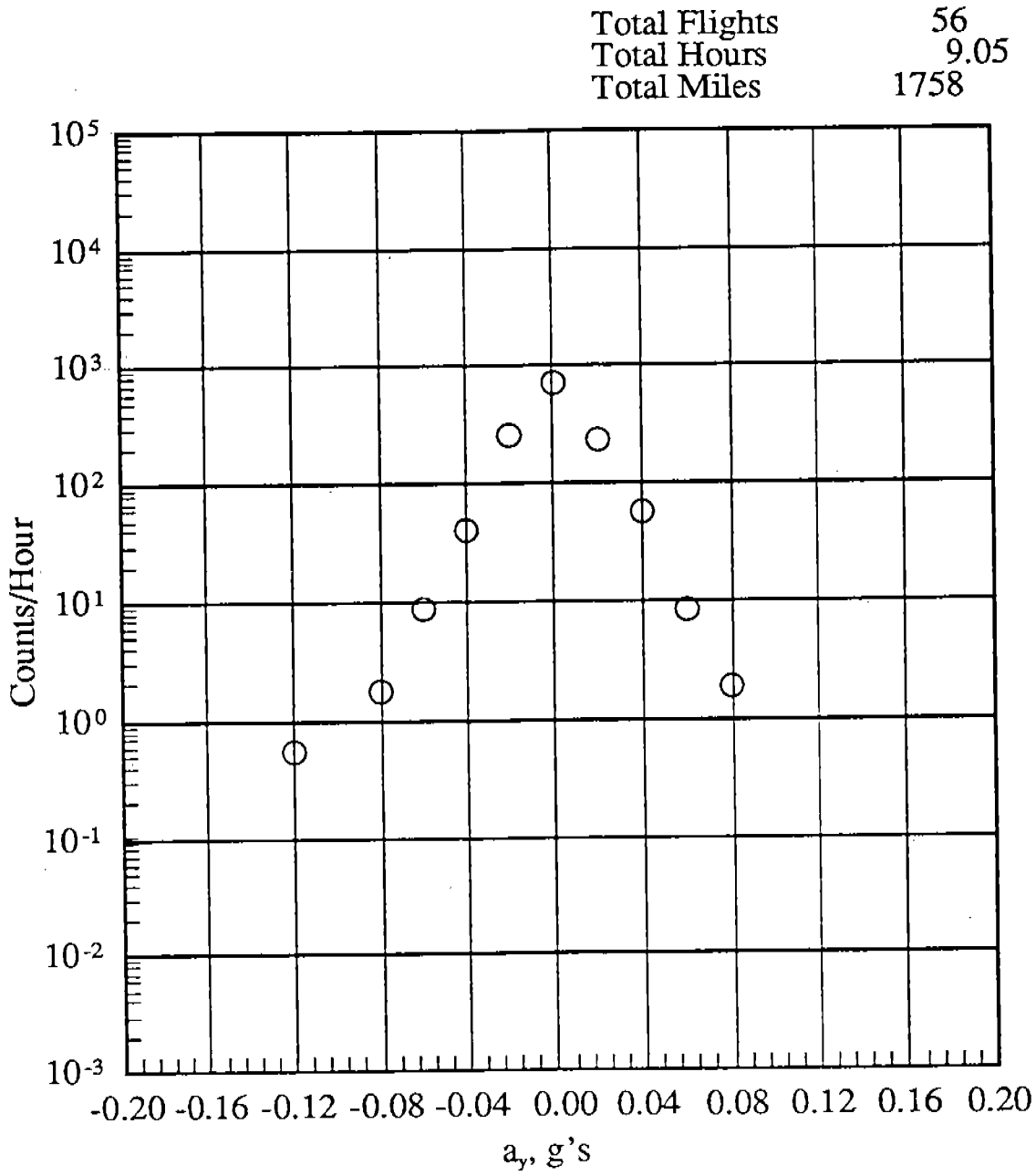
PRESSURE ALTITUDE BAND

a_y LEVEL g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
.48	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0
.16	0	0	0	0	0	0	0	0	0	0
.12	0	0	0	1.03	0	0	0	0	0	0.08
.08	1.88	1.10	0.45	3.61	0	0	0	0	0	1.22
.06	8.40	2.47	3.13	1.55	1.25	0	0	0	0	4.05
.04	57.33	13.98	22.32	2.58	16.24	0	3.15	2.76	0	27.33
.02	236.07	82.79	92.87	70.65	156.14	110.22	40.96	39.64	0	133.50
0	723.69	710.30	792.04	885.95	783.21	923.00	819.26	1419.66	1126.16	864.47
-.02	260.27	100.61	163.41	47.96	78.70	46.01	39.39	40.67	0	144.93
-.04	40.65	18.09	12.95	1.55	6.25	0.96	9.45	2.41	0	20.46
-.06	8.73	2.47	2.68	1.03	0	0	1.58	0	0	4.09
-.08	1.77	0.27	0.45	0	0	0	0	0	0	0.76
-.12	0.55	0	0	0	0	0	0	0	0	0.21
-.16	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26

TOTAL FLIGHTS	56
TOTAL FLIGHT HOURS FLAPS UP AND DOWN	23.71
TOTAL FLIGHT MILES FLAPS UP AND DOWN	7616.26

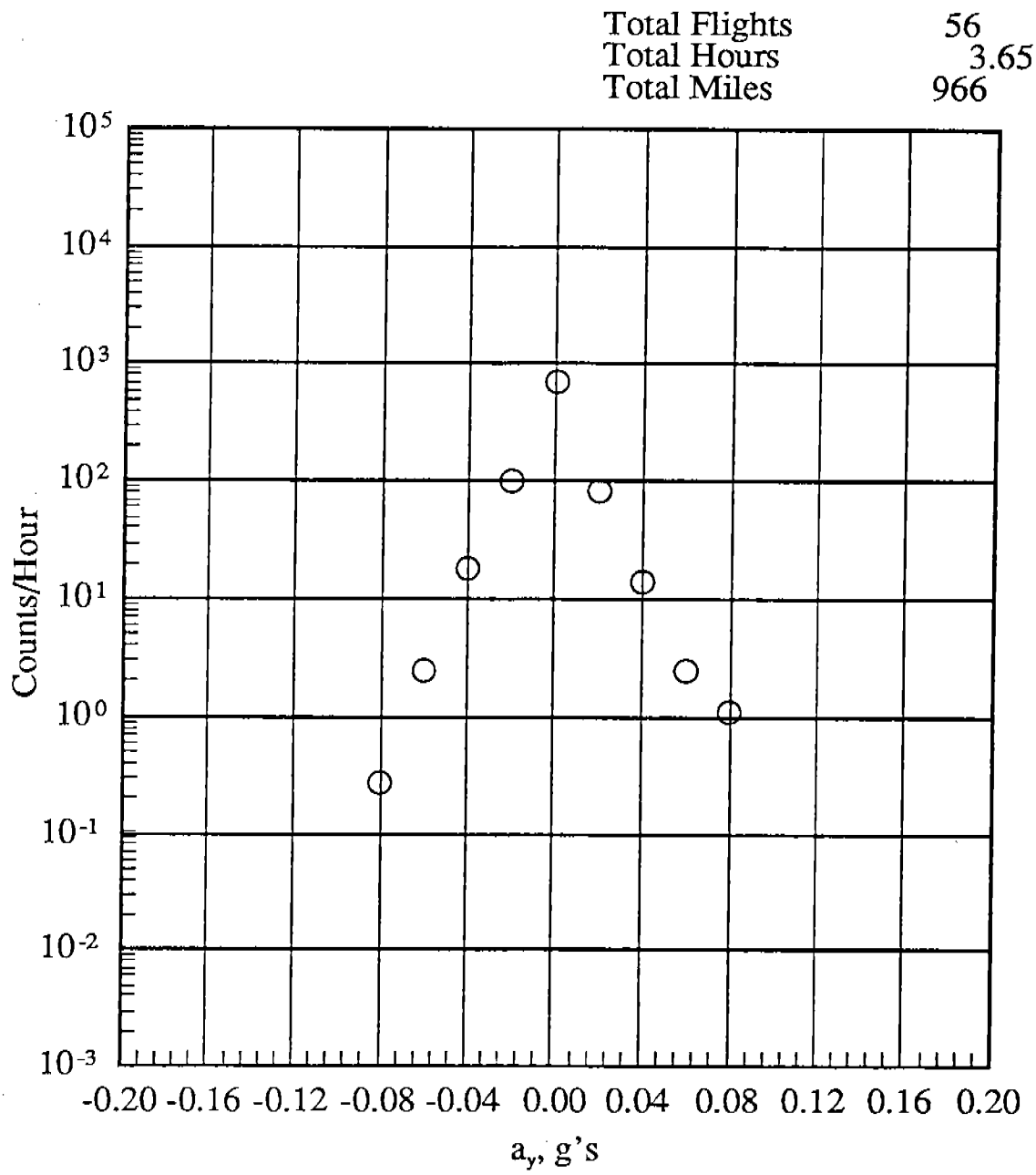
(a) a_y Level crossing counts per hour within pressure altitude bands

Figure 23.- Lateral acceleration exceedances: Nonrevenue flights.



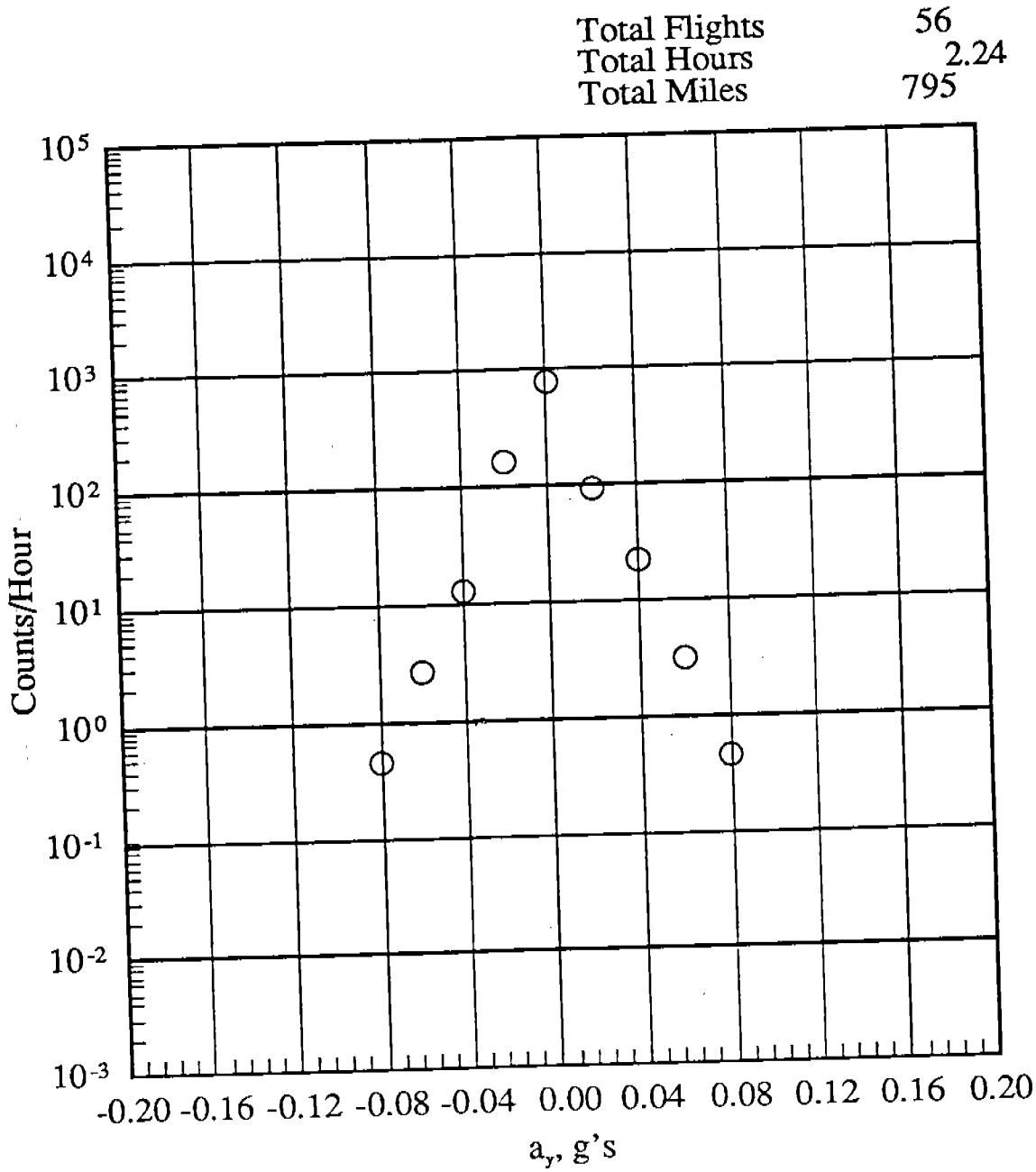
(b) -500 to 4500 feet altitude

Figure 23.- Continued.



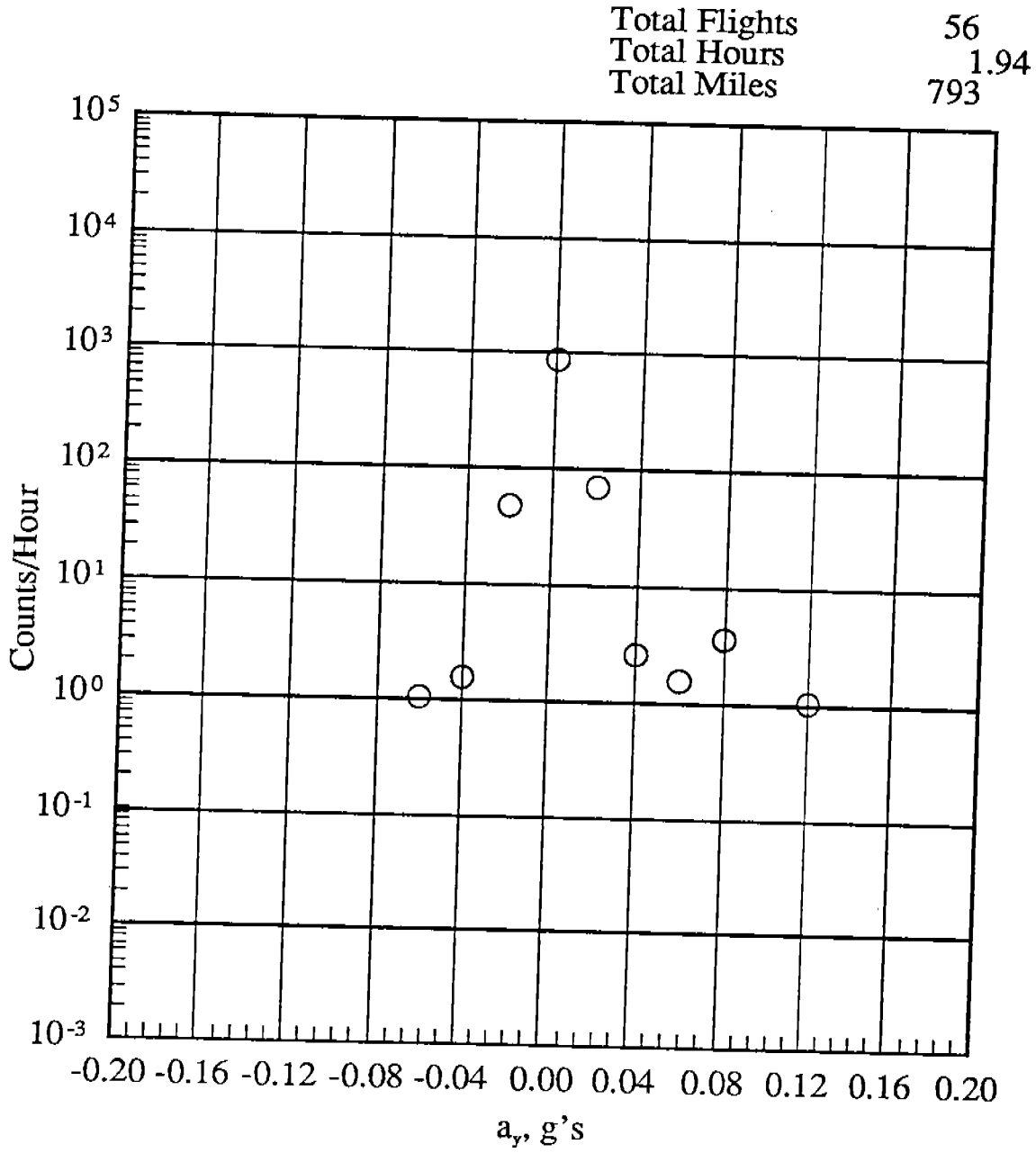
(c) 4500 to 9500 feet altitude

Figure 23.- Continued.



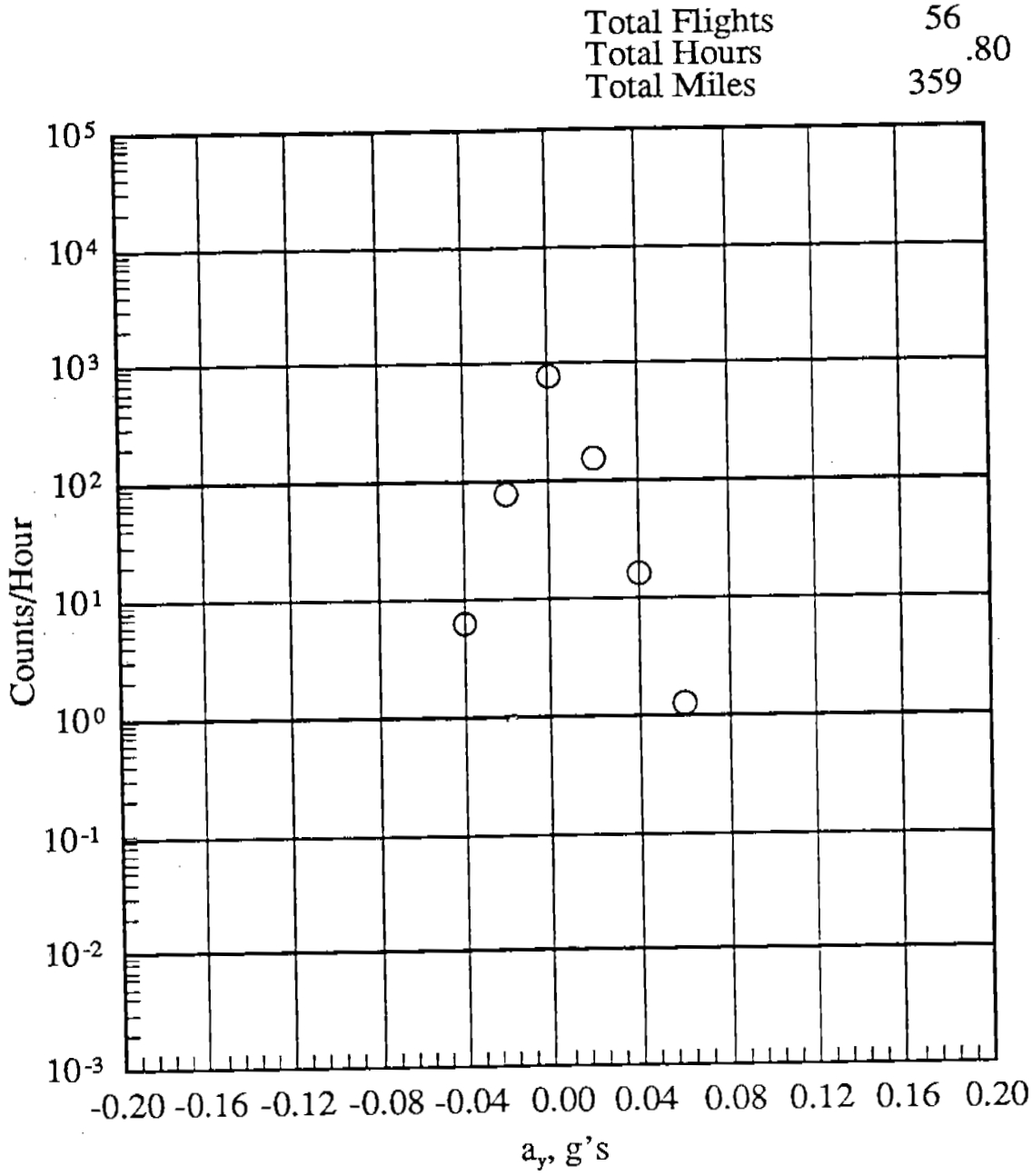
(d) 9500 to 14500 altitude

Figure 23.- Continued.



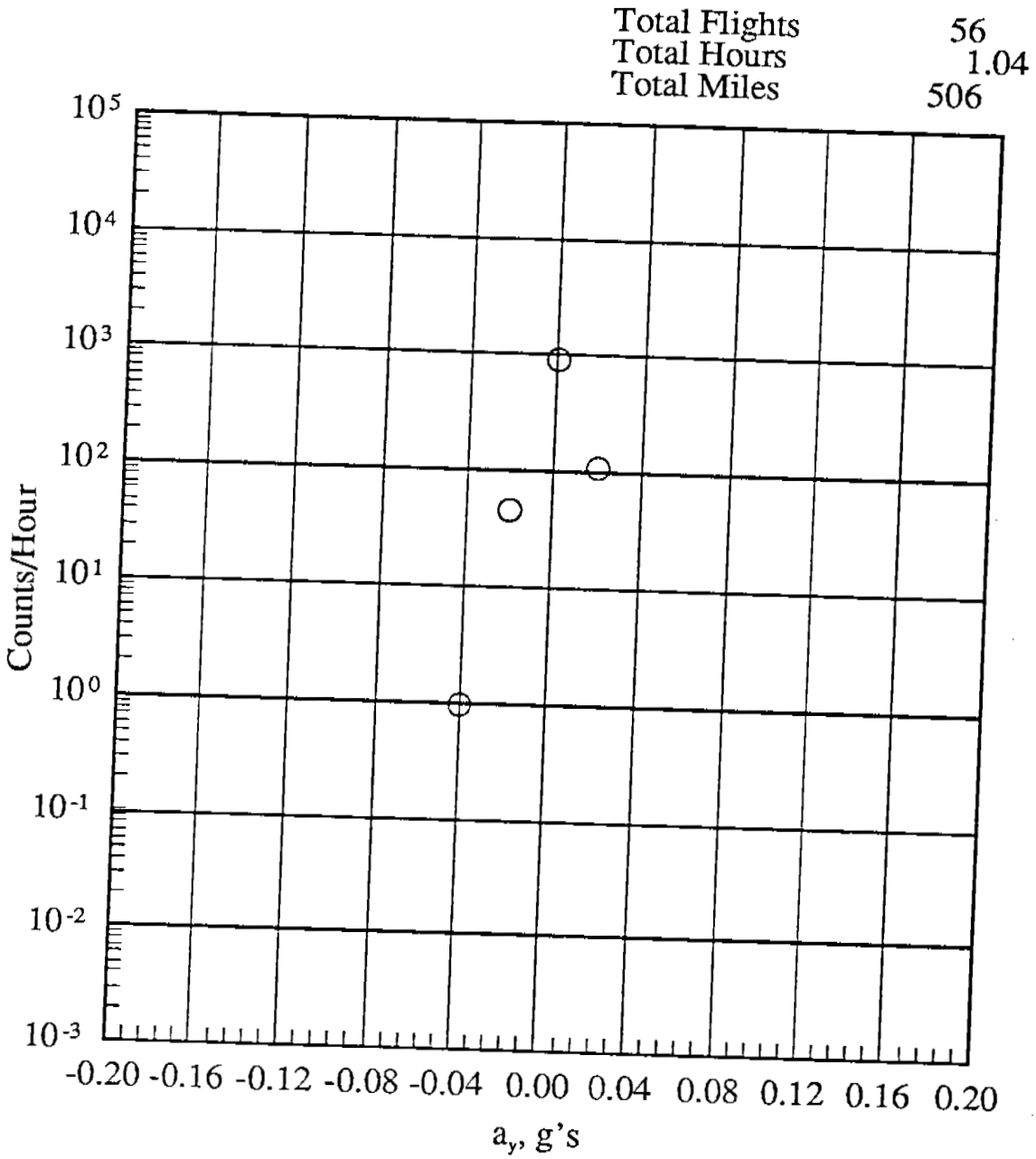
(e) 14500 to 19500 feet altitude

Figure 23.- Continued.



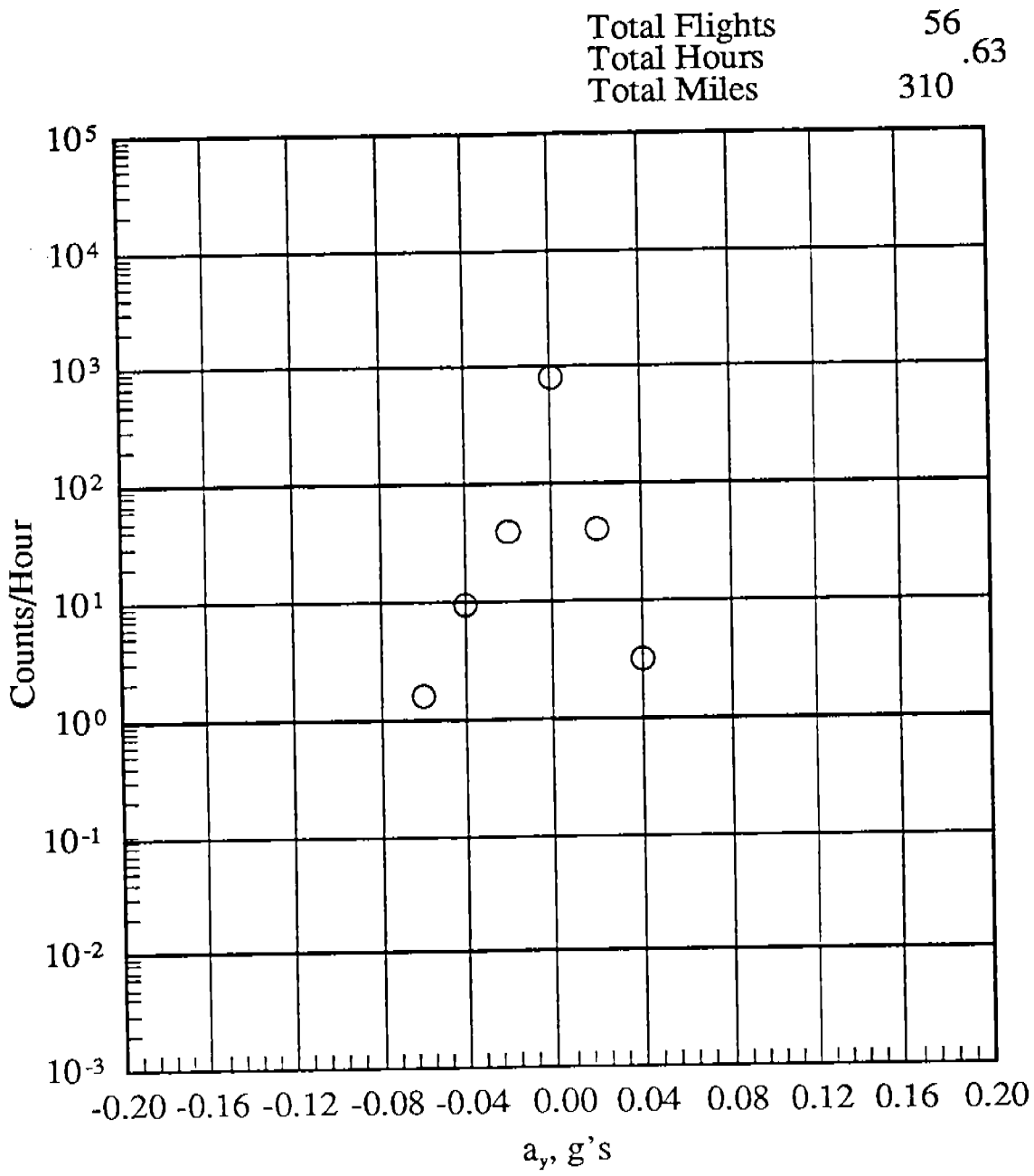
(f) 19500 to 24500 feet altitude

Figure 23.- Continued.



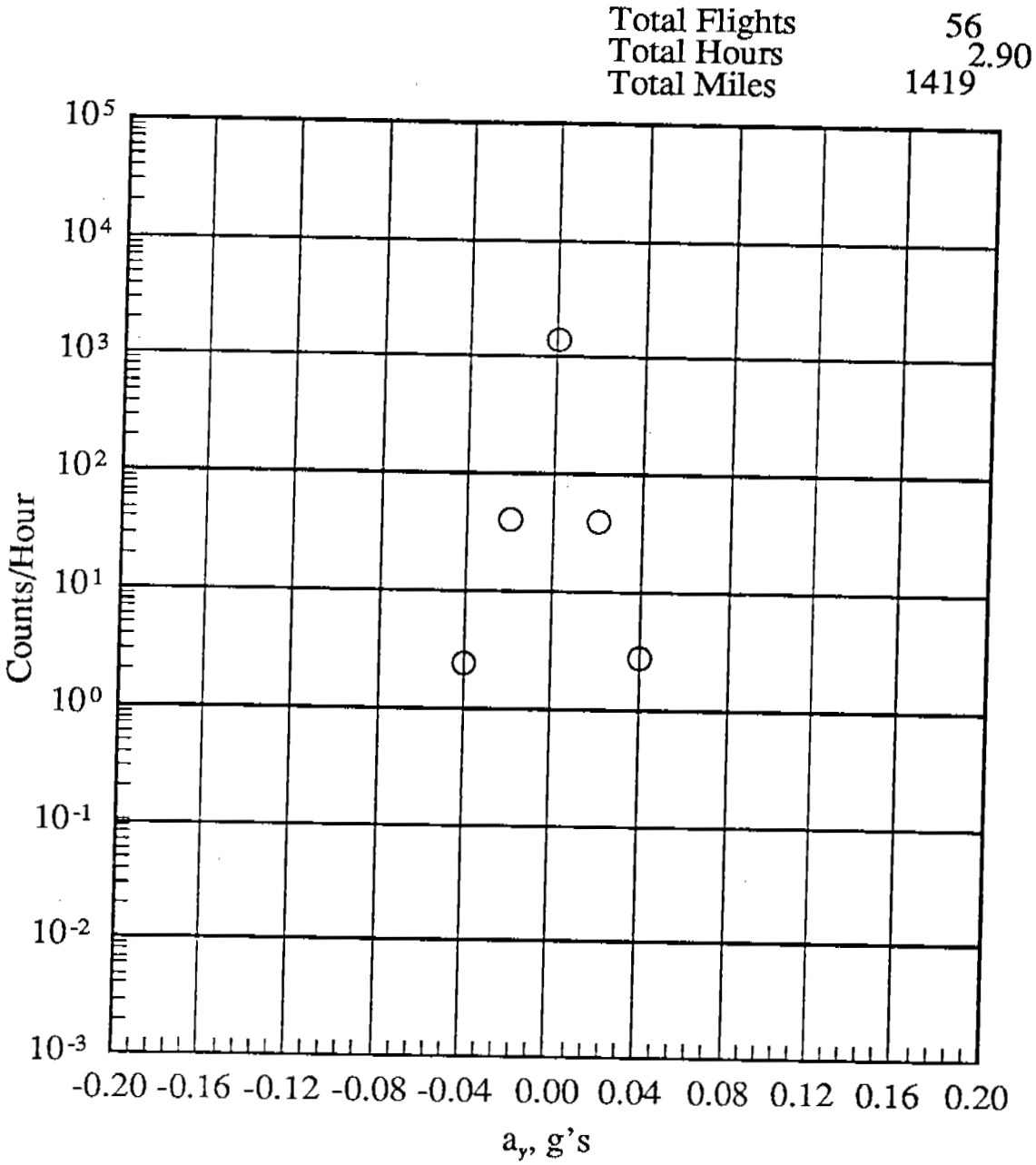
(g) 24500 to 29500 feet altitude

Figure 23.- Continued.



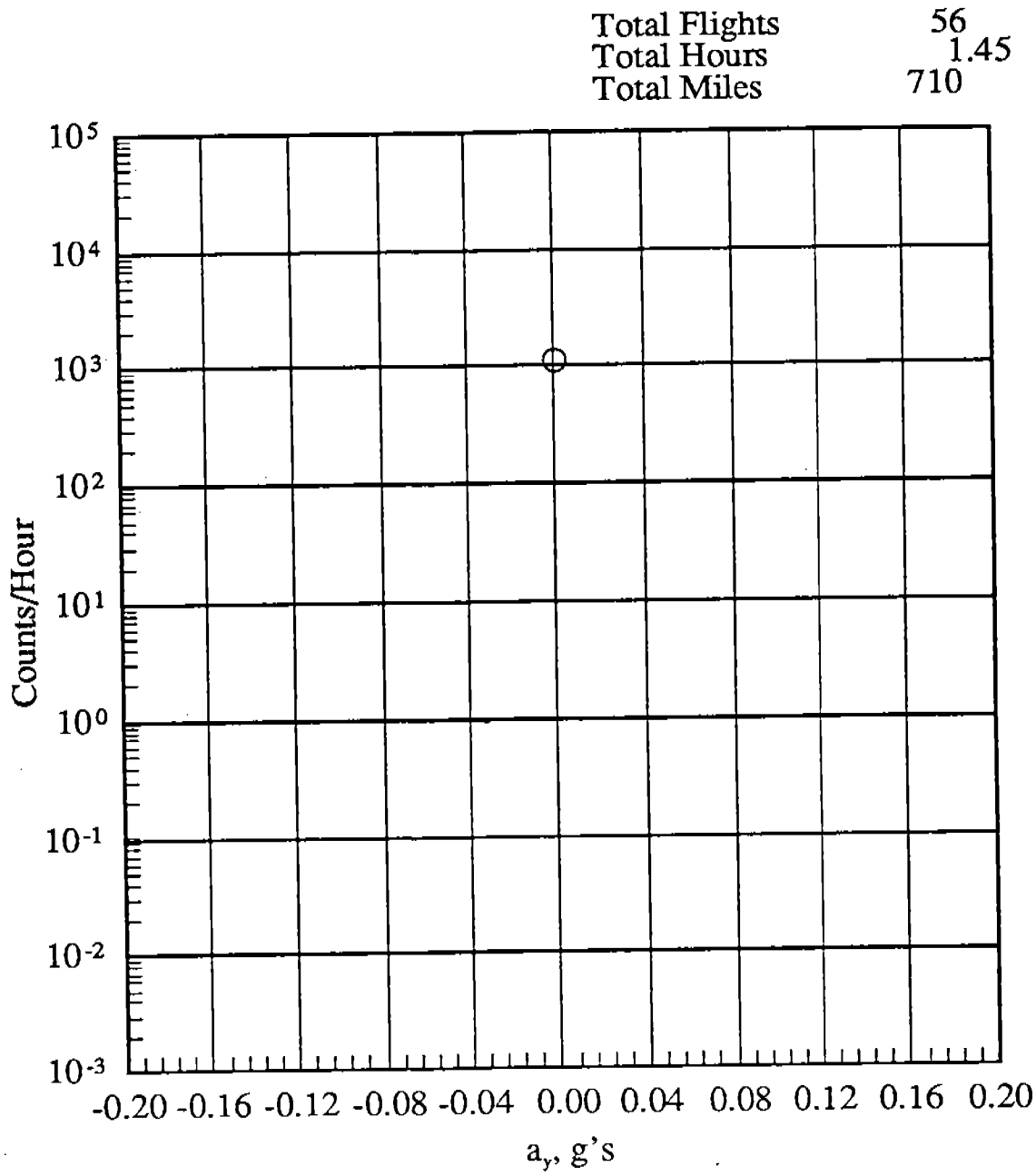
(h) 29500 to 34500 feet altitude

Figure 23.- Continued.



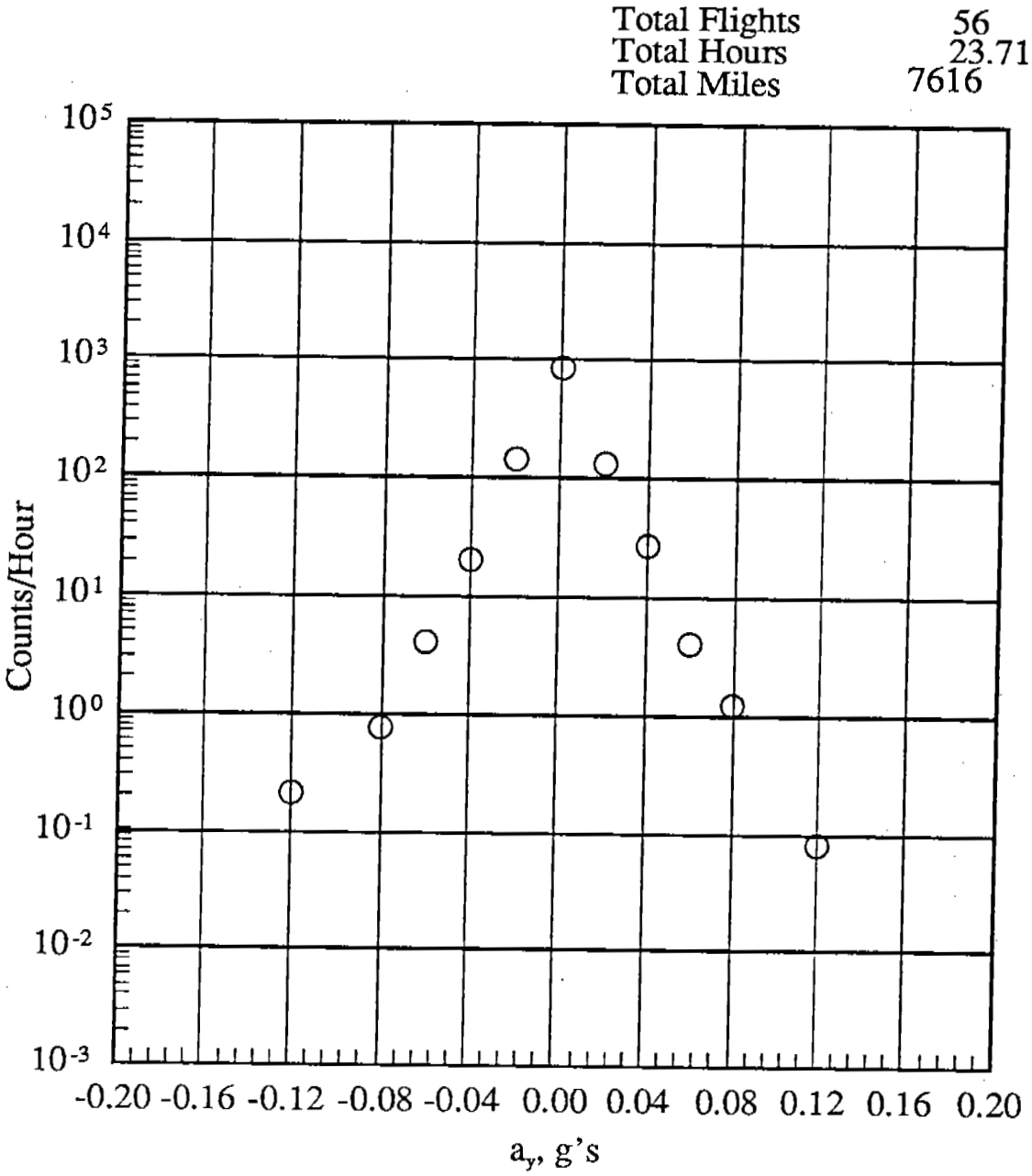
(i) 34500 to 39500 feet altitude

Figure 23.- Continued.



(j) 39500 to 44500 feet altitude

Figure 23.- Continued.



(k) -500 to 44500 feet altitude

Figure 23.- Concluded

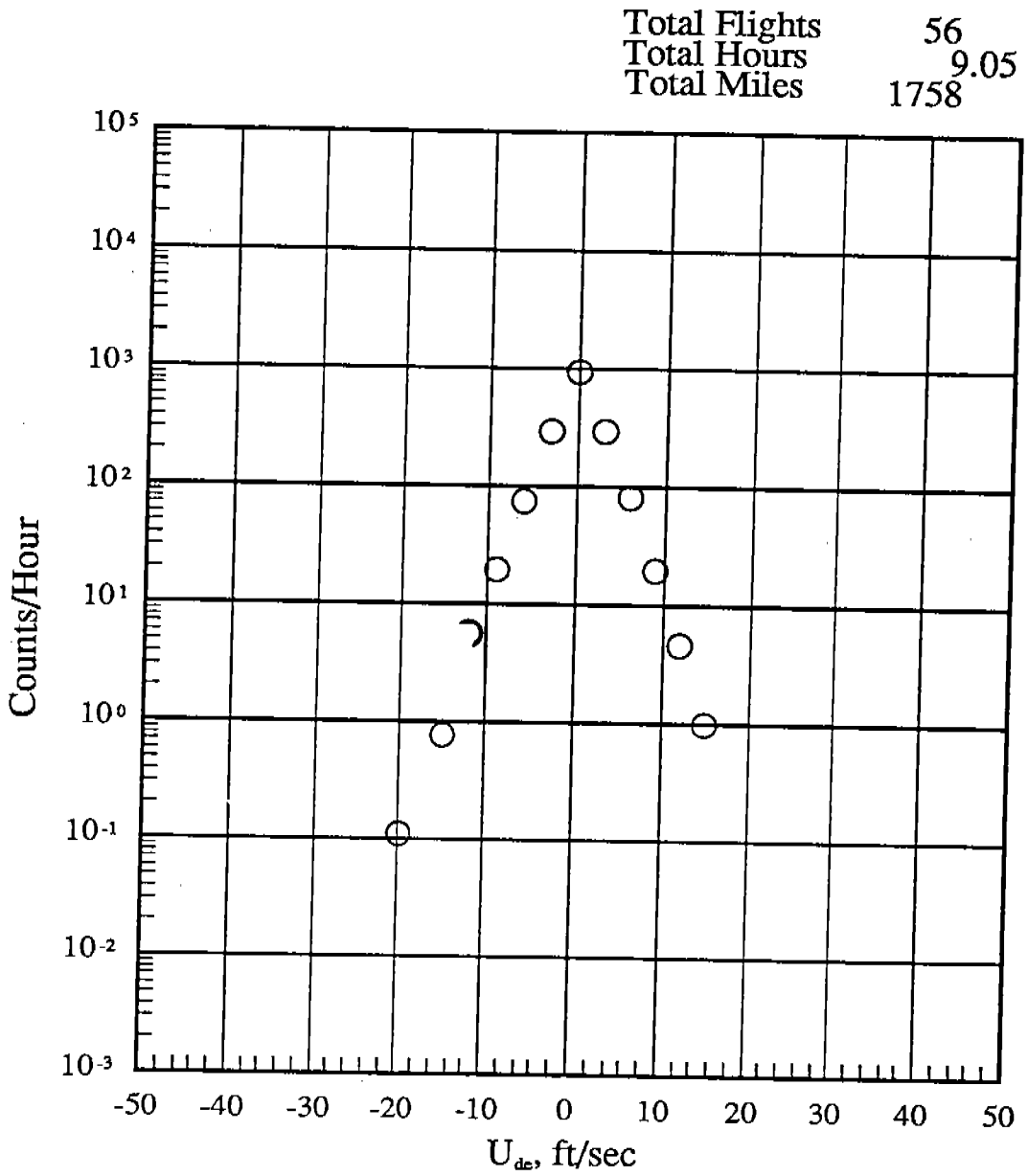
PRESSURE ALTITUDE BAND

U_{de} DERIVED GUST VELOCITY LEVEL FT/SEC	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
100	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
15	0.99	0	0.89	0	0	0	0	0	0	0.46
12	4.64	0.27	0.89	0	0	0	0	0	0	1.90
9	19.55	3.02	2.68	0.52	0	0	0	0	0	8.23
6	80.75	7.40	7.59	1.03	0	0	3.15	1.03	0	32.98
3	293.08	41.94	40.63	7.74	12.49	4.79	15.75	6.55	0	124.68
0	938.44	1256.66	1288.96	1466.61	1366.55	1478.91	1350.20	1416.56	1419.44	1200.90
-3	292.75	41.40	42.86	4.64	13.74	1.92	11.03	6.89	0	124.26
-6	74.35	8.22	10.72	0.52	0	0	0	0.34	0	30.75
-9	19.55	1.92	2.23	0.52	0	0	0	0	0	8.01
-12	5.63	0.27	1.34	0	0	0	0	0	0	2.32
-15	0.77	0	0.45	0	0	0	0	0	0	0.34
-20	0.11	0	0	0	0	0	0	0	0	0.04
-30	0	0	0	0	0	0	0	0	0	0
-40	0	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26

TOTAL FLIGHTS	56
TOTAL FLIGHT HOURS FLAPS UP A	23.71
TOTAL FLIGHT MILES FLAPS UP AND DOWN	7616.26

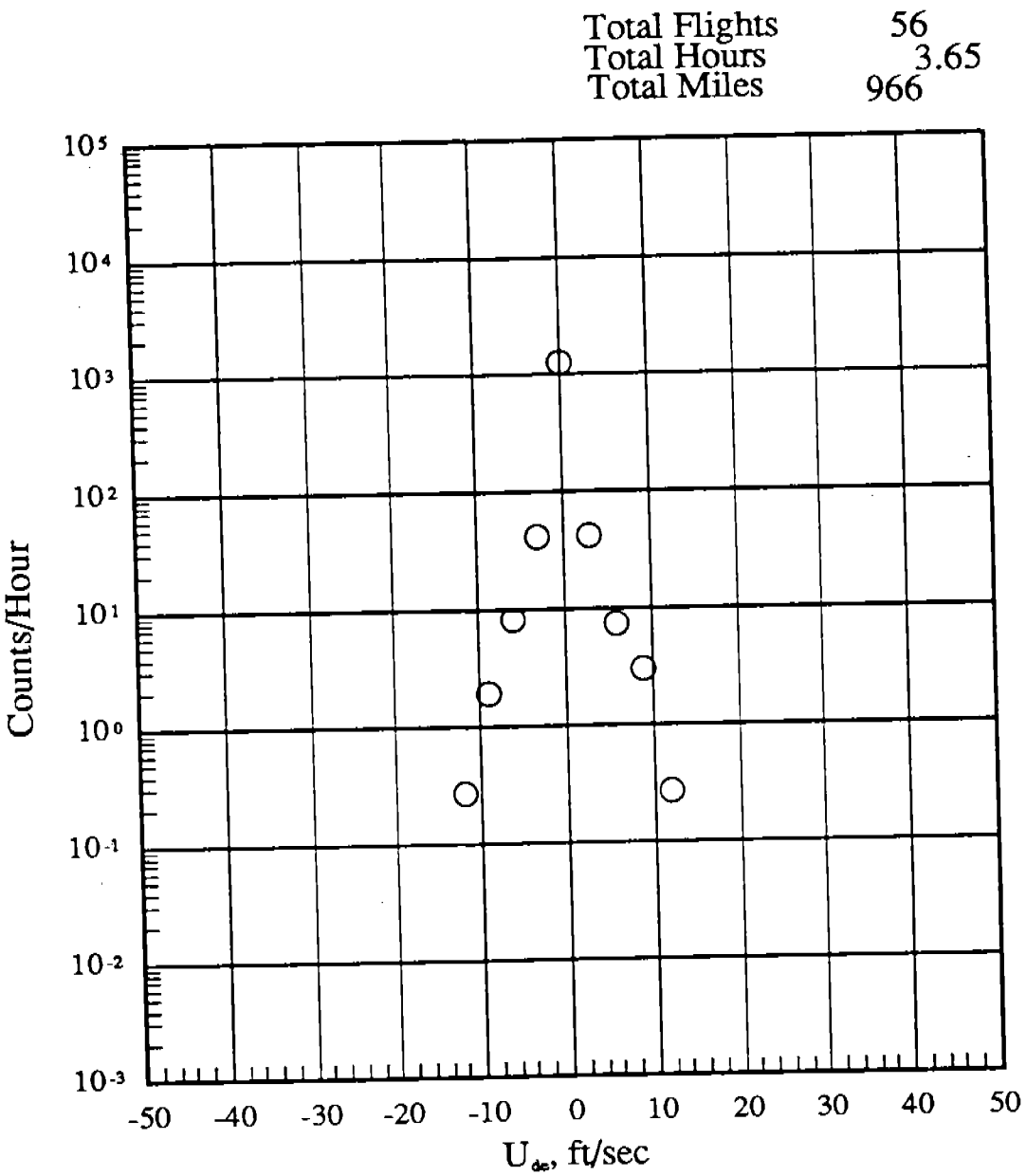
(a) U_{de} Level crossing counts per hour within pressure altitude bands

Figure 24.- U_{de} exceedances: Nonrevenue flights.



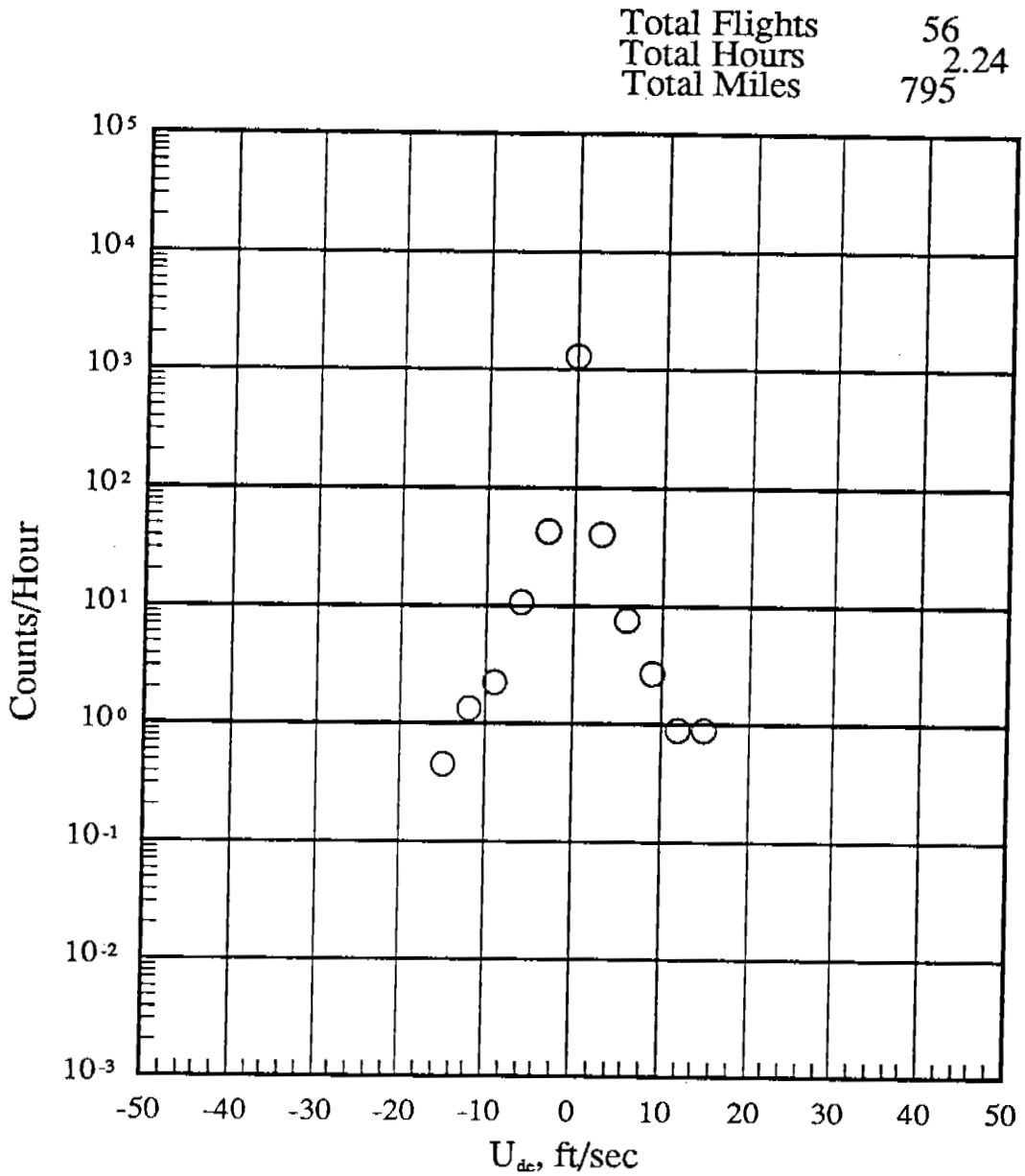
(b) -500 to 4500 feet altitude

Figure 24.- Continued.



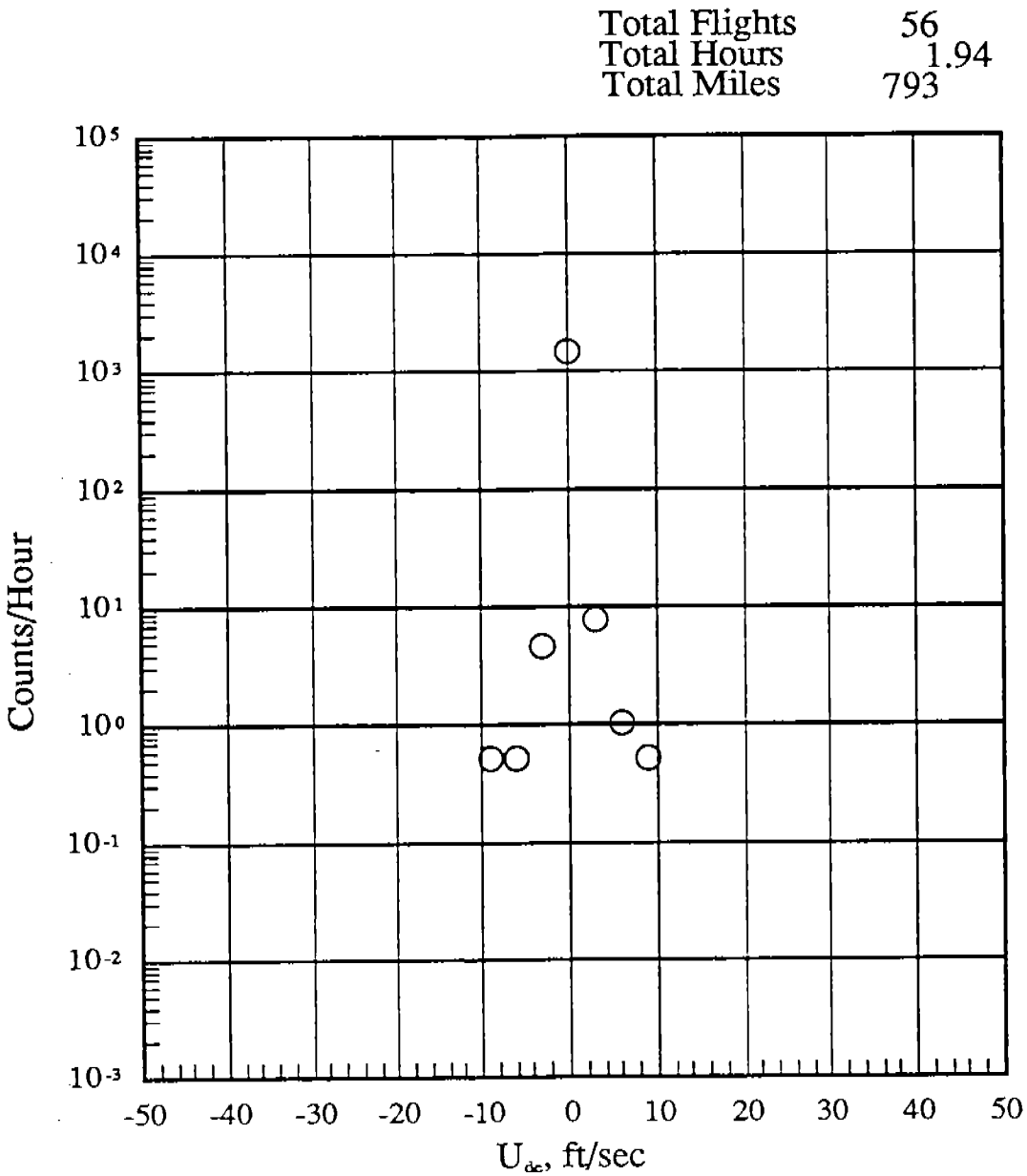
(c) 4500 to 9500 feet altitude

Figure 24.- Continued.



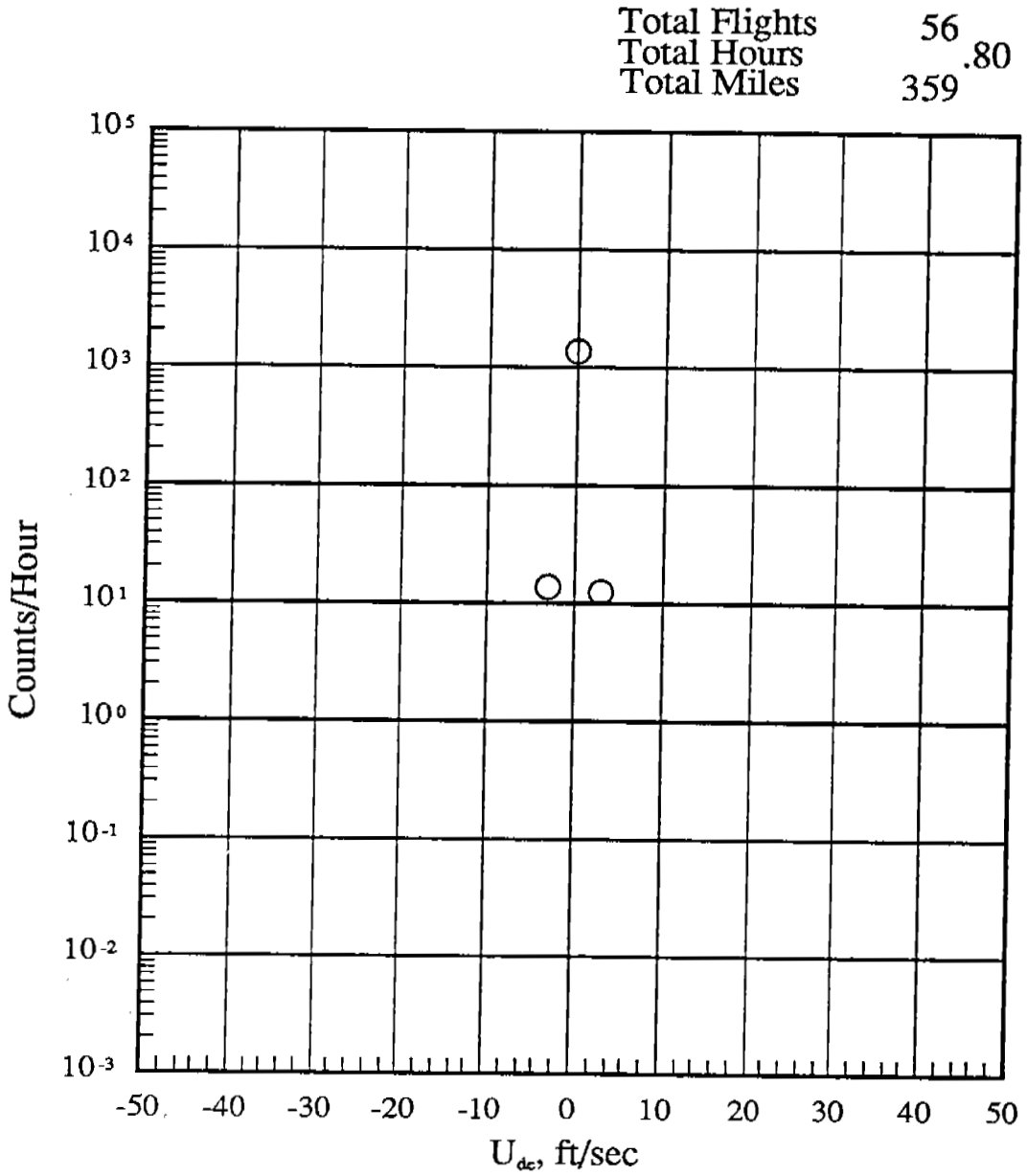
(d) 9500 to 14500 feet altitud

Figure 24.- Continued.



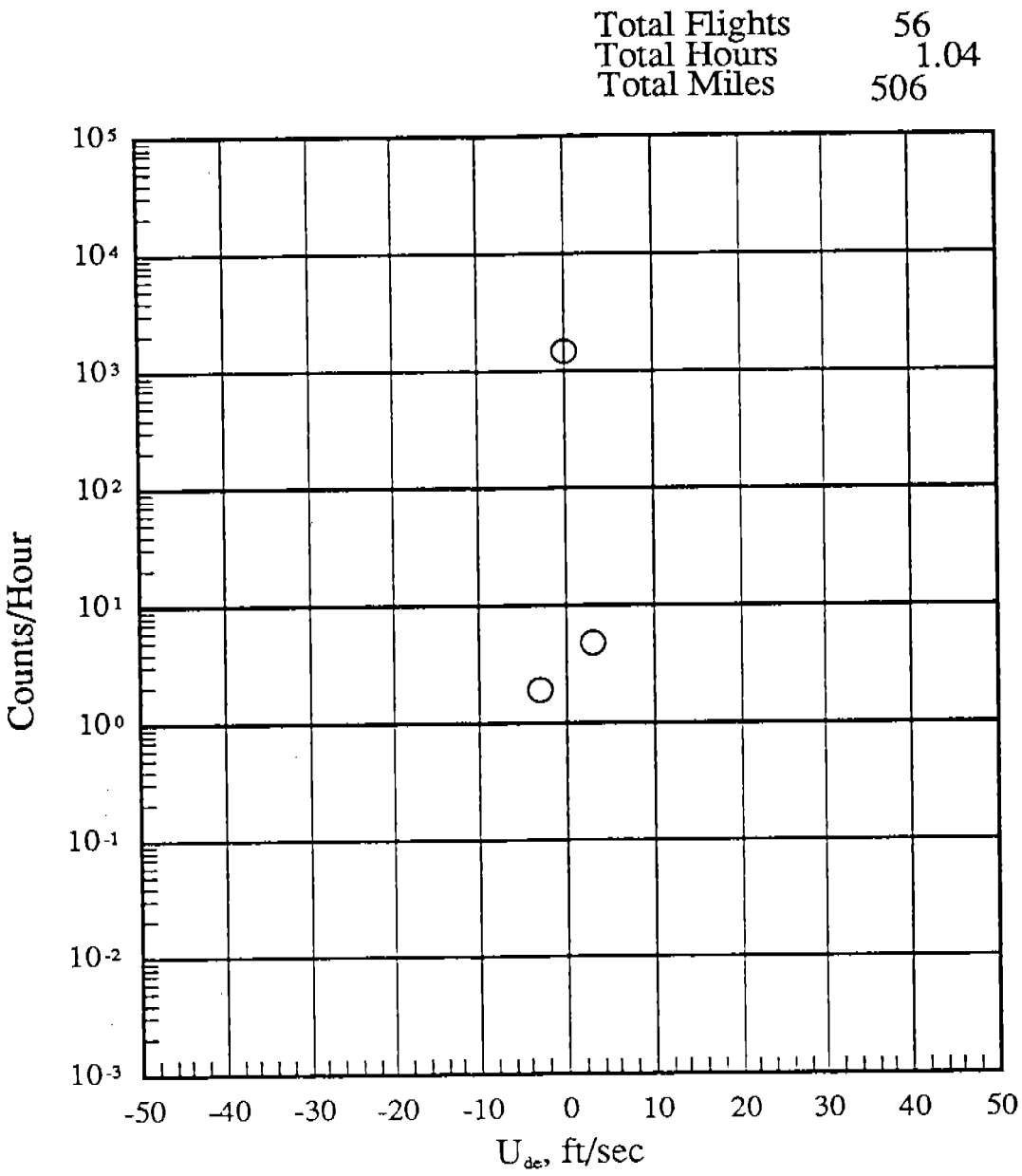
(e) 14500 to 19500 feet altitude

Figure 24.- Continued.



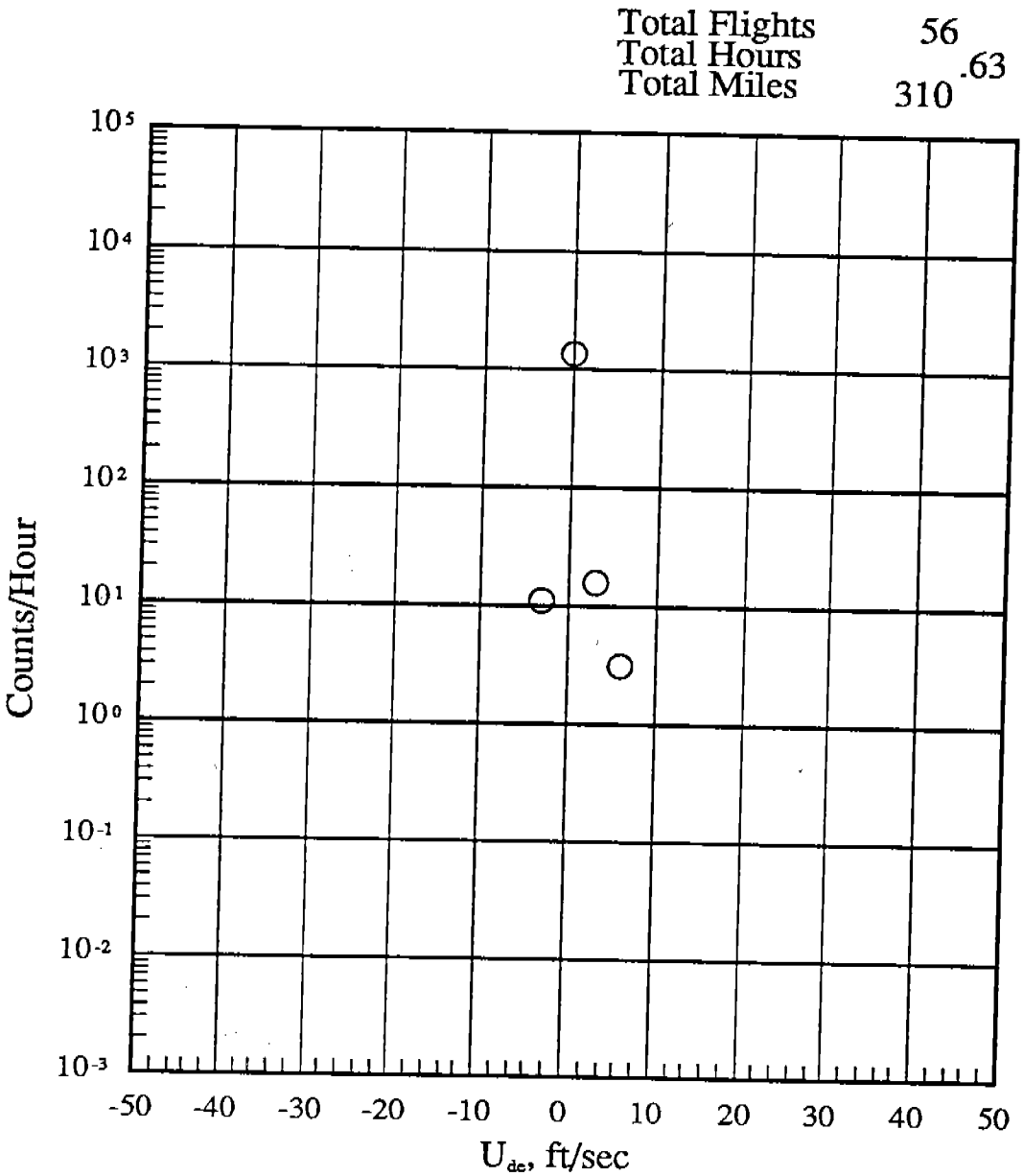
(f) 19500 to 24500 feet altitude

Figure 24.- Continued.



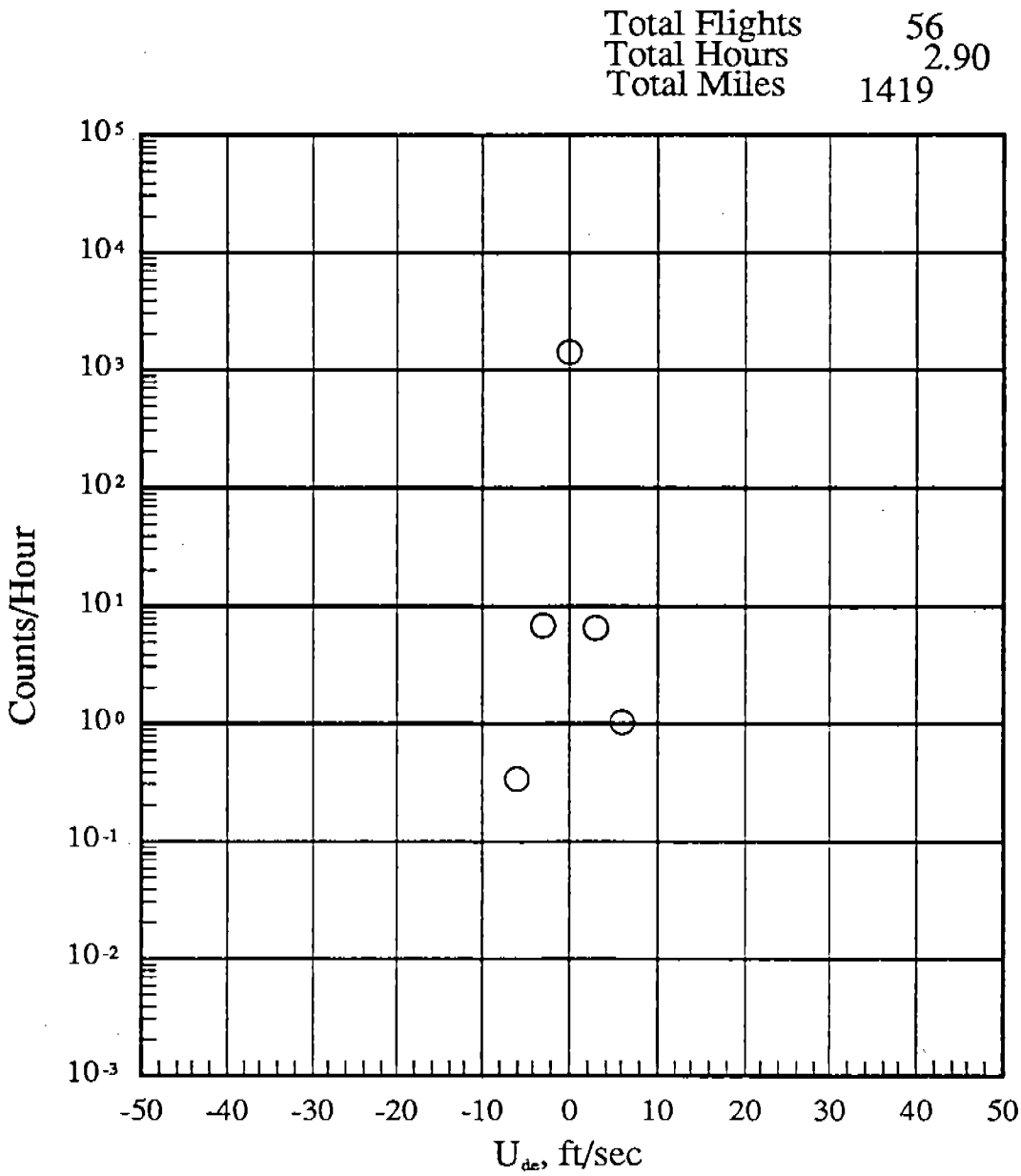
(g) 24500 to 29500 feet altitude

Figure 24.- Continued.



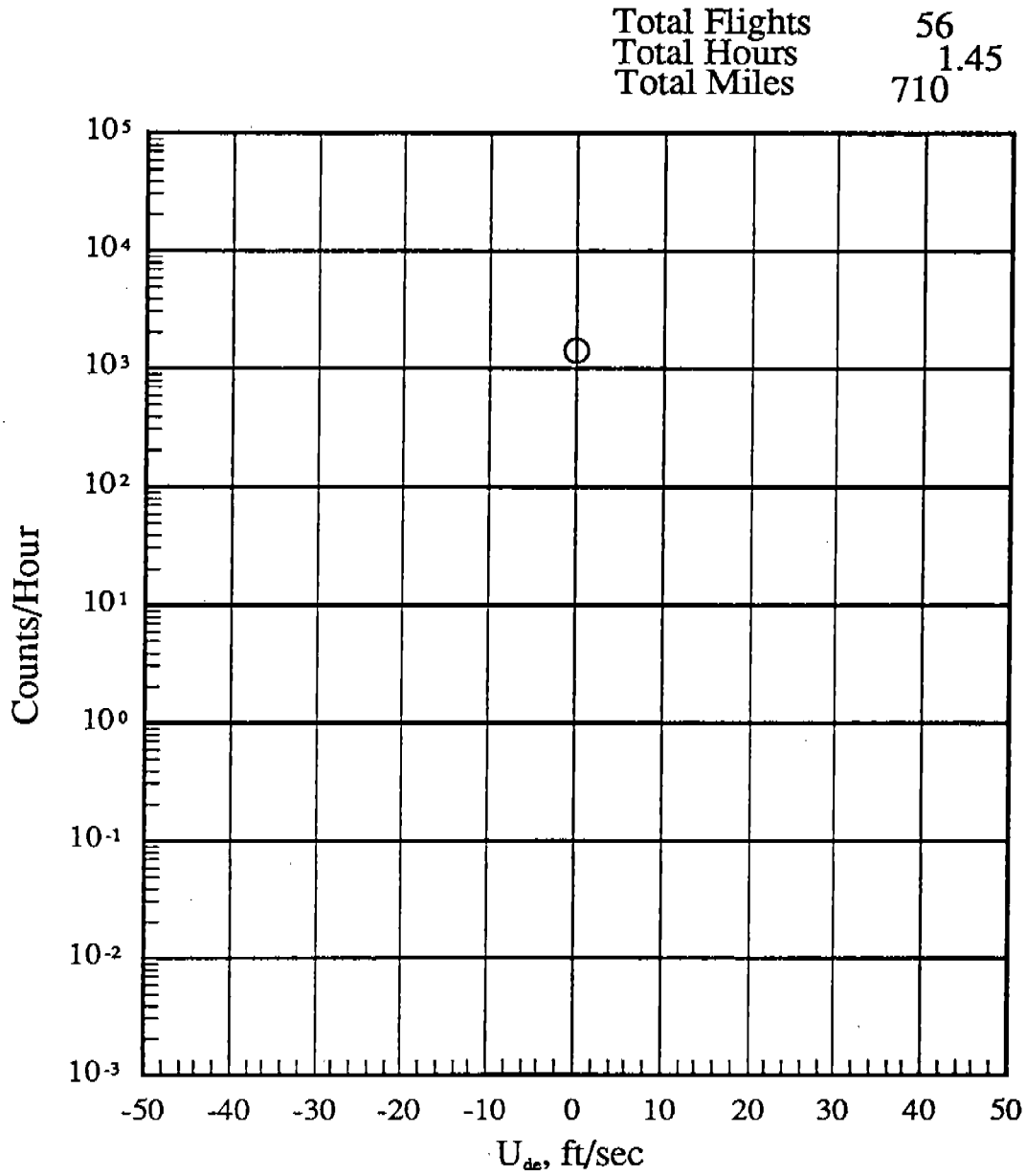
(h) 29500 to 34500 feet altitude

Figure 24.- Continued.



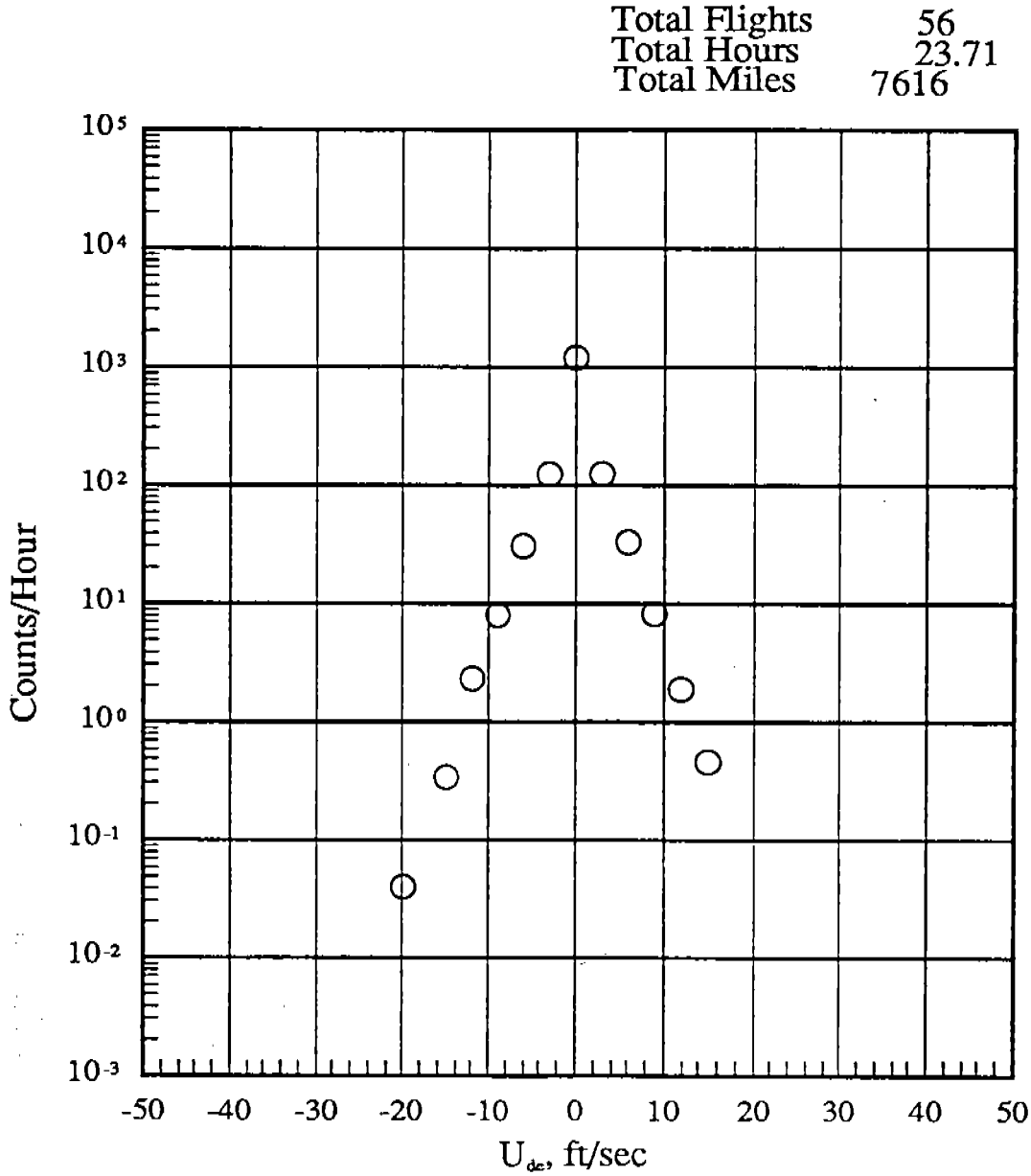
(i) 34500 to 39500 feet altitude

Figure 24.- Continued.



(j) 39500 to 44500 feet altitude

Figure 24.- Continued.

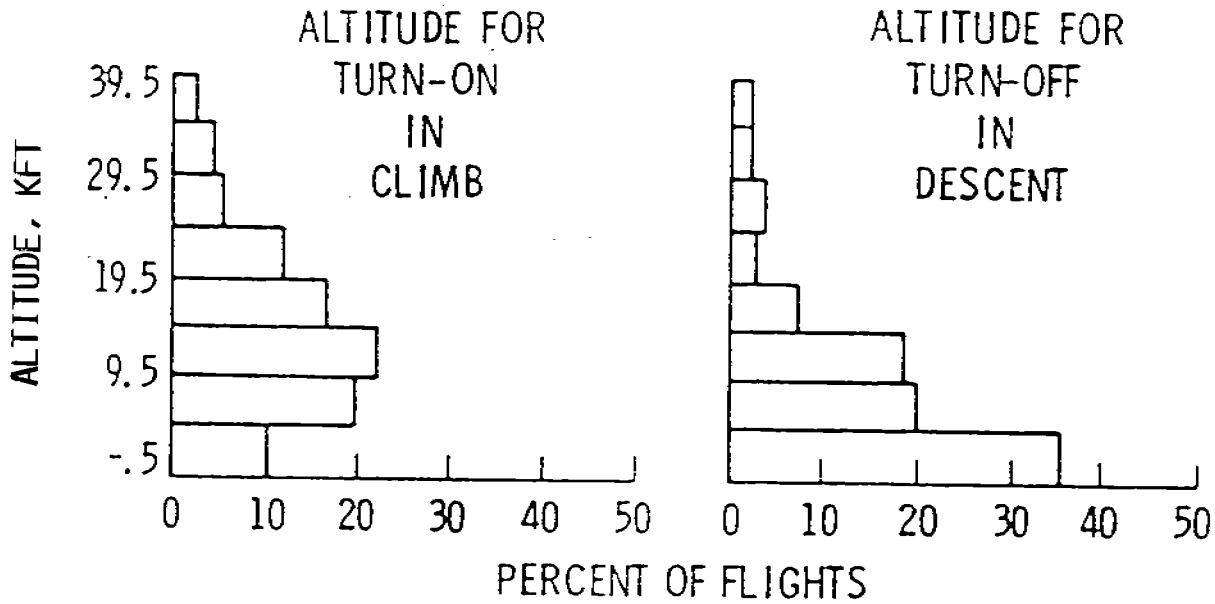


(k) -500 to 44500 feet altitude

Figure 24.- Concluded.

L-1011 FOR 373 HOURS OF REVENUE FLIGHTS

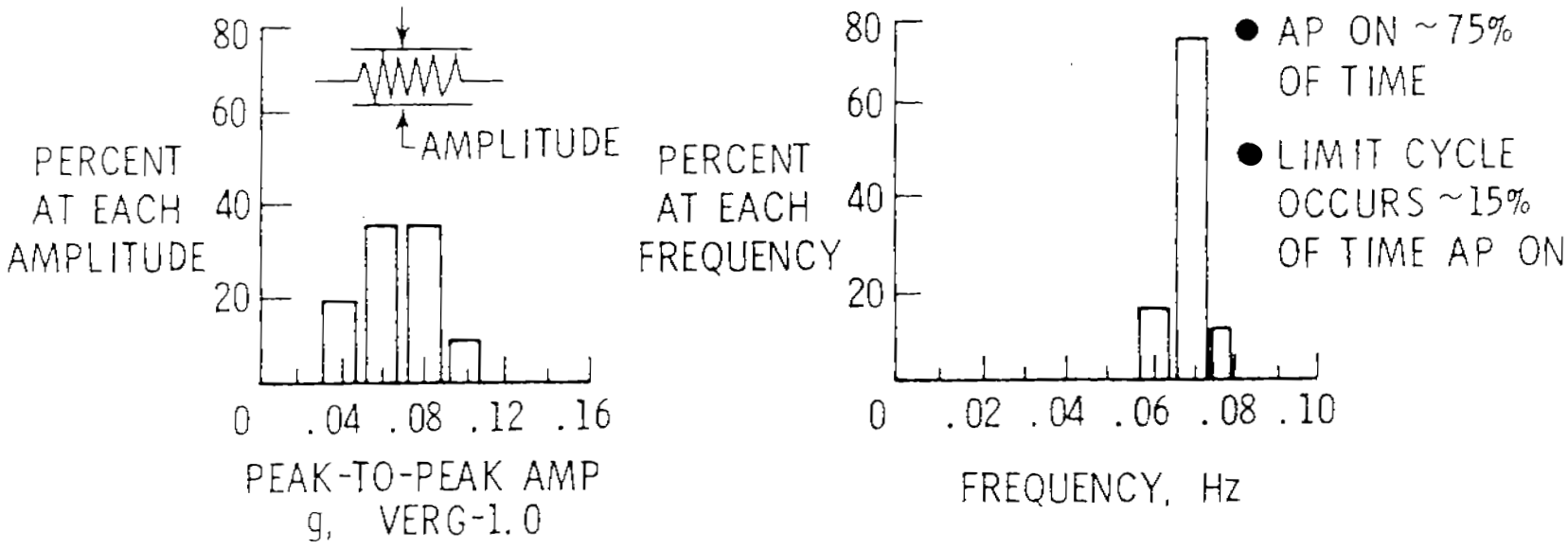
1978



SUMMARY

- AUTOPILOT WAS "ON" ABOUT 75% OF THE TIME
- AUTOPILOT WAS "ON" AT TOUCHDOWN FOR 5% OF THE FLIGHTS
- AUTOPILOT WAS NOT USED ON 8% OF THE FLIGHTS

Figure 25. - Autopilot on-off statistics.



DATA FROM 373 HOURS L-1011 1978

Figure 26.- Autopilot "limit cycle" experience.

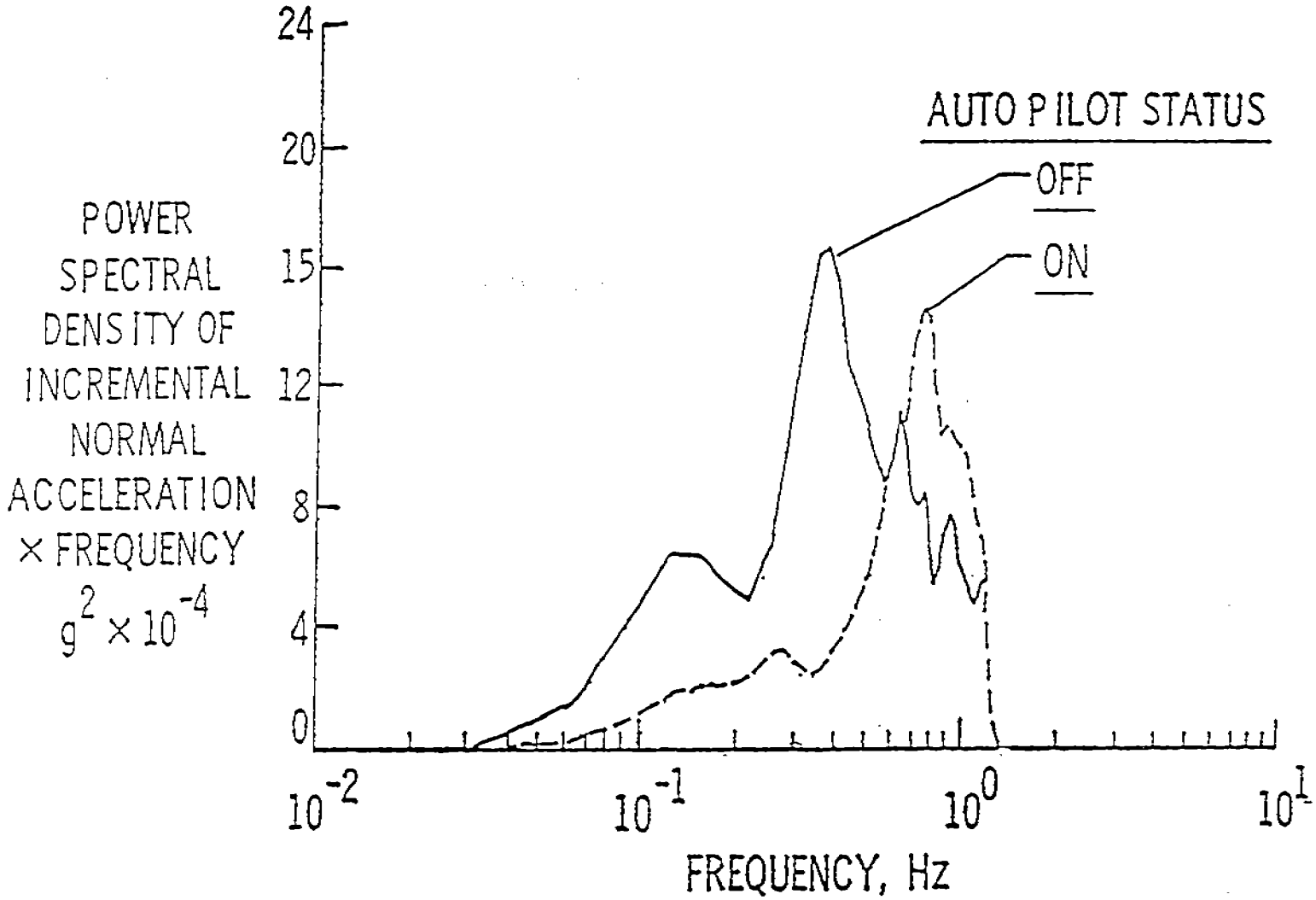


FIGURE 27.- Effect of autopilot on normal acceleration power spectra.

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15. Supplementary Notes

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FAA Technical Center COTR: Thomas DeFiore

16. Abstract

L 1011 Digital Flight Data Recorder data taken in 1978-1979 were analyzed to provide many statistical data types useful for updating airliner airworthiness design criteria.

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