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

**Volume IV - B 747 Data 1978-1980: 1689 HOURS**

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## FOREWORD

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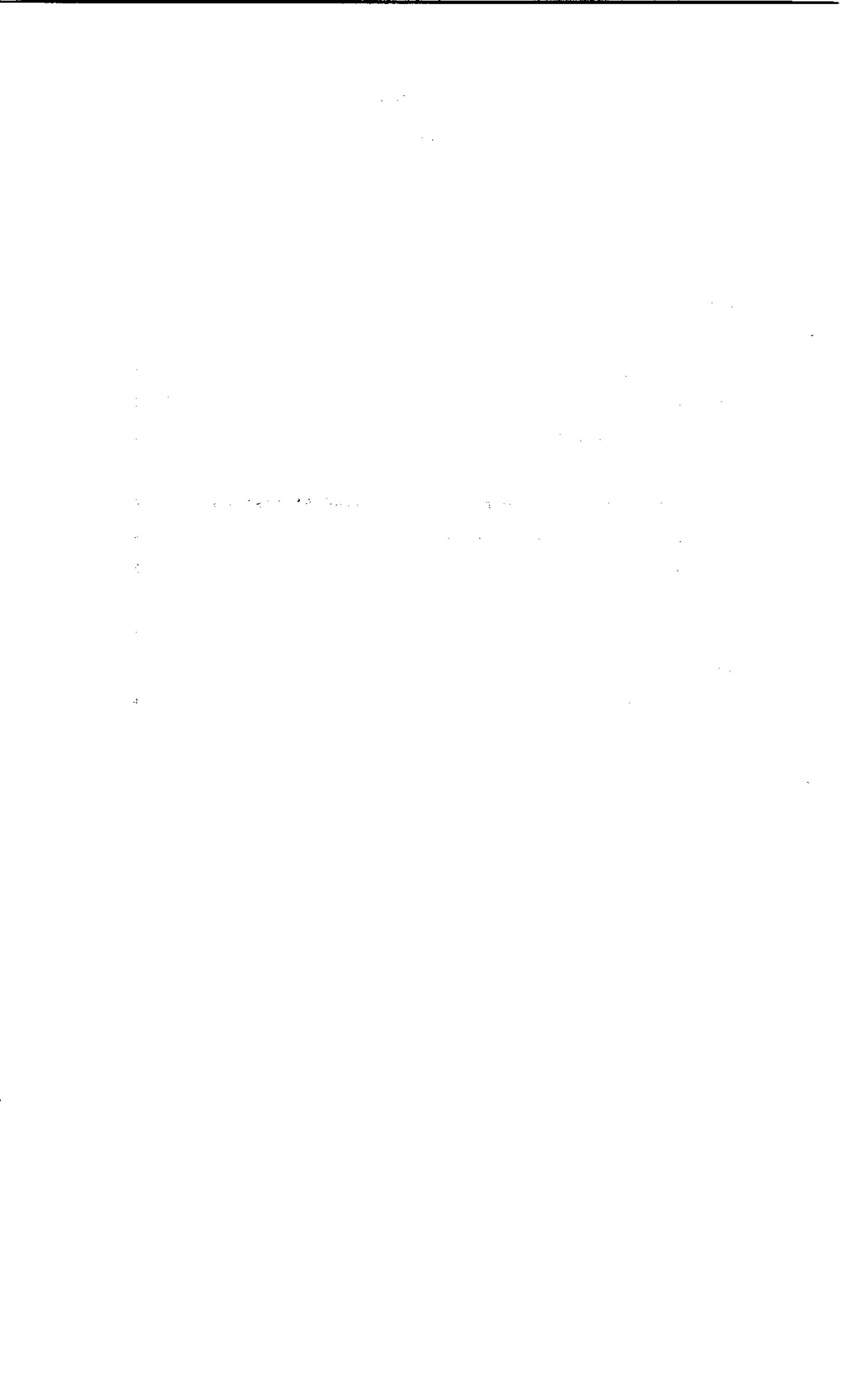
The Eagle Engineering, Inc. effort was performed by Norman L. Crabill and administered under the direction of Joseph W. Stickle (NASA Langley Research Center) and Thomas DeFiore (FAA Technical Center).



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Volume IV: B 747 Data 1978-1980: 1689 HOURS

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SUMMARY

Data obtained from the Digital Flight Data Recorder system of Boeing 747 aircraft in 442 flights and 1689 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. No discussion of the data is presented.

INTRODUCTION

This document presents the results of the NASA DVGH Program obtained during 1978-1980 operations of Boeing B 747 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 type was the Boeing B 747-100 with four Pratt and Whitney JT9D-3A and -7 turbofan engines. Characteristics of the aircraft used in the data reduction process are given in Table I. The configuration is shown in figure 1.

### Instrumentation

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

<u>Parameter</u>	<u>Range and Units</u>	<u>Samples per Second</u>
$a_n + 1$	-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
Cabin Pressure	0 to 15 psia	1
Autopilot Status	Off or On	Discrete

Note that Spoiler data are not reported here, although they were in Volume I. The cabin pressure data type is the same as reported in Volume II.

#### SCOPE OF DATA

Data were collected from five aircraft operating in regular airline service over the area shown in figure 2 during 1978 through 1980: Almost all of the data (442 flights and 1689 hours) were obtained during passenger-carrying revenue service; a small amount (73 flights and 23 hours) was obtained during nonrevenue service (ferry flights mainly, although some training and maintenance flights may have been included). Due to operational difficulties, it was not practical to obtain continuous data from one aircraft as in Volumes I and II; it was therefore decided to obtain the data from any of five 747-100 aircraft being operated by the airline over the service route during the 30 months of the test.

#### 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 similar to that described in Volume I except that the high limit of the band pass was set at 0.75 Hz based on an inspection of representative spectra. 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 though 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 at flap retraction after lift off, and the conditions existing at flap deflection before landing are given.

Acceleration Derived Statistics are also presented as in Volume I, except that with Flaps Deflected, the maximum  $a_n$  per flight and the Equivalent Airspeed occurring 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 flights. All other results are for revenue flights. These 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 and Effects

Autopilot status was monitored as off or on without regard to the exact on-mode. The autopilot was on about 92 percent of the time; 7.5 percent of the time that it was on, the low-amplitude

limit cycle in normal acceleration appeared as discussed in Volume I. Its characteristics are summarized in figure 25. This phenomenon is believed to be due to off-nominal autopilot operation in the altitude-hold mode, and it is more fully discussed in Volumes I and II.

#### Cabin Pressure

Absolute cabin pressure was measured and used to compute the quantity "Maximum Differential Cabin Pressure per Flight" by using the measured absolute cabin pressure and the standard atmosphere based on the indicated pressure altitude. The distribution of this quantity as a function of the percent of flights is shown in figure 26.

#### CONCLUDING REMARKS

Data obtained from the Digital Flight Data Recorder system of Boeing 747-100 aircraft in 442 flights and 1689 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 use are given. In addition, acceleration statistics are presented from 23 hours of nonrevenue flights. No general discussion of the data is presented.

TABLE I  
BOEING B 747-100 CHARACTERISTICS USED IN THE ANALYSIS

o Geometrical Characteristics

- o Wing Area = 5500 ft<sup>2</sup>
- o Wing Mean Chord = 27.32 ft

o Lift Curve Slope  $C_{l\alpha}$  per degree

o Flaps up

<u>M</u>	<u>HP = 0</u>	<u>20 kft</u>	<u>40kft</u>
.2	.0860	.0885	.0902
.4	.0820	.0875	.0910
.5	.0790	.0870	.0922
.6	.0790	.0885	.0970
.7	.0750	.0865	.0970
.8	.0675	.0830	.0960
.85	-	.0860	.1005
.90	-	.0940	.1095

o Flaps down

<u>FLP, deg</u>	<u>HP ≈ 0</u>
0	.0860
2	.1000
10	.1050
20	.1050
30	.1018

- o 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	27-36
10	Flap Deflection Times	37-39
11	Equivalent Airspeeds and Detents	40
12	Flap Use above 10,000 ft	41

TABLE II (continued)

## ACCELERATION DERIVED STATISTICS

## o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
<b>13 Normal Acceleration Exceedances</b>		
(a)	$a_n$ matrix	42
(b)	$a_{nM}$ matrix	43
(c)	$a_{nG}$ matrix	44
(d)-(m)	$a_n$ , $a_{nM}$ , $a_{nG}$ plots	45-54
<b>14 Lateral Acceleration Exceedances</b>		
(a)	$a_y$ matrix	55
(b)-(k)	$a_y$ plots	56-65
<b>15 <math>U_{de}</math> Exceedances</b>		
(a)	$U_{de}$ matrix	66
(b)-(k)	$U_{de}$ plots	67-76
<b>16 Peak Positive and Negative <math>a_n</math> vs. Altitude</b>		
(a)	$a_n$ matrix	77
(b)-(k)	$a_n$ plots	78-87
<b>17 Peak Positive and Negative <math>a_{nM}</math> vs. Altitude</b>		
(a)	$a_{nM}$ matrix	88
(b)-(k)	$a_{nM}$ plots	89-98
<b>18 Peak Positive and Negative <math>a_{nG}</math> vs. Altitude</b>		
(a)	$a_{nG}$ matrix	99
(b)-(k)	$a_{nG}$ plots	100-109

**TABLE II (Concluded)**

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

(a)	$U_{de}$ matrix	110
(b)-(k)	$U_{de}$ plots	111-120

**o FLAPS DEFLECTED**

Figure Number	Subject	Page Numbers
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**20  $a_n$  Exceedances with Flaps Deflected**

(a)	Take Off Detents matrix	121
(b)	Take Off Detents plot	122
(c)	Landing Detents matrix	123
(d)	Landing Detents plot	124

**21 Peak Positive and Negative  $a_n$  per flight and EAS bands**

(a)-(c)	Take Off Detents	125-127
(d)-(i)	Landing Detents	128-133

**o NON-REVENUE FLIGHTS**

Figure Number	Subject	Page Numbers
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**22 Normal Acceleration Exceedances**

(a)	$a_n$ matrix	134
(b)	$a_{nW}$ matrix	135
(c)	$a_{nG}$ matrix	136
(d)-(m)	$a_n$ , $a_{nW}$ , $a_{nG}$ 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

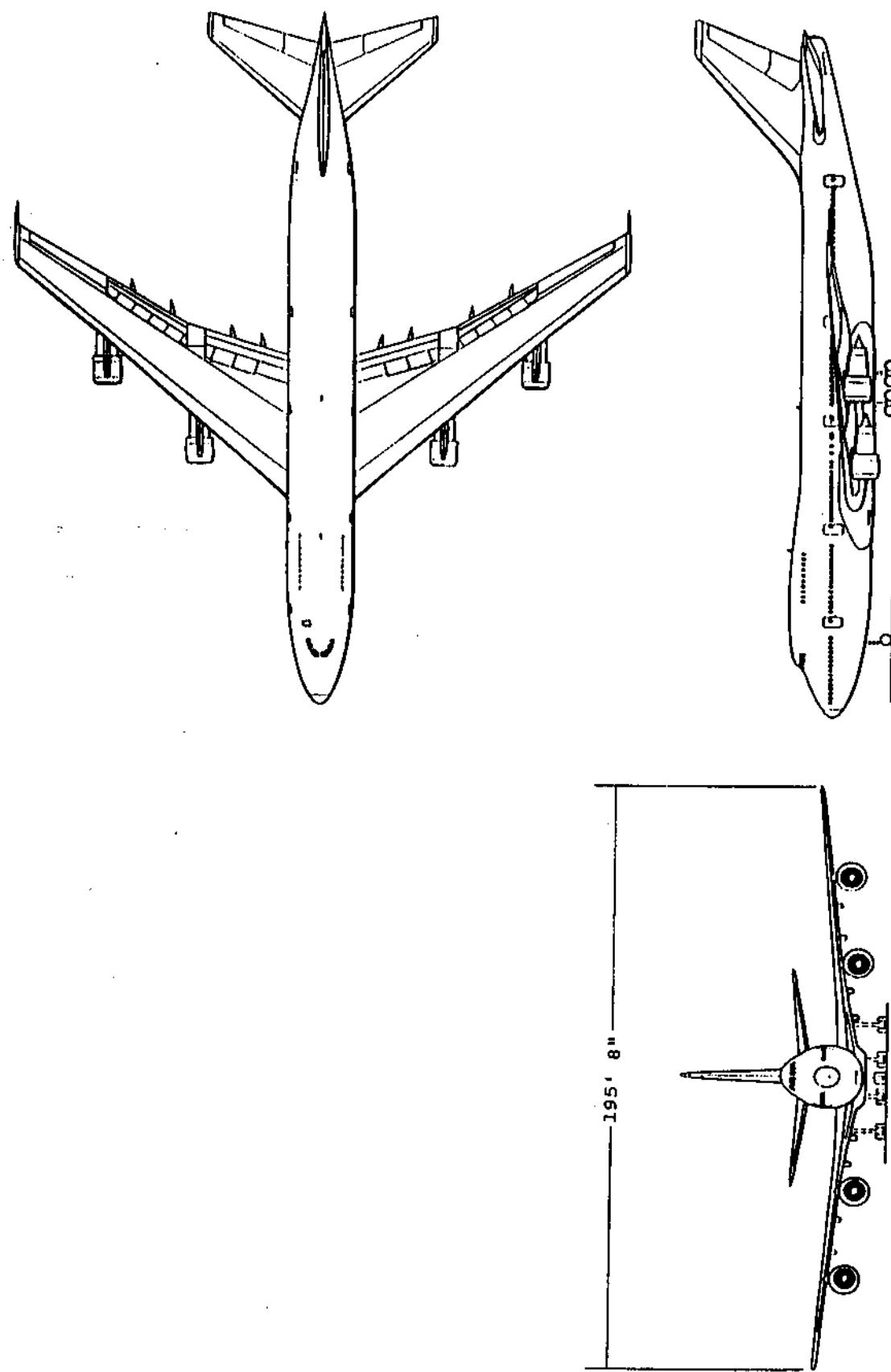


FIGURE 1.- Aircraft three view.

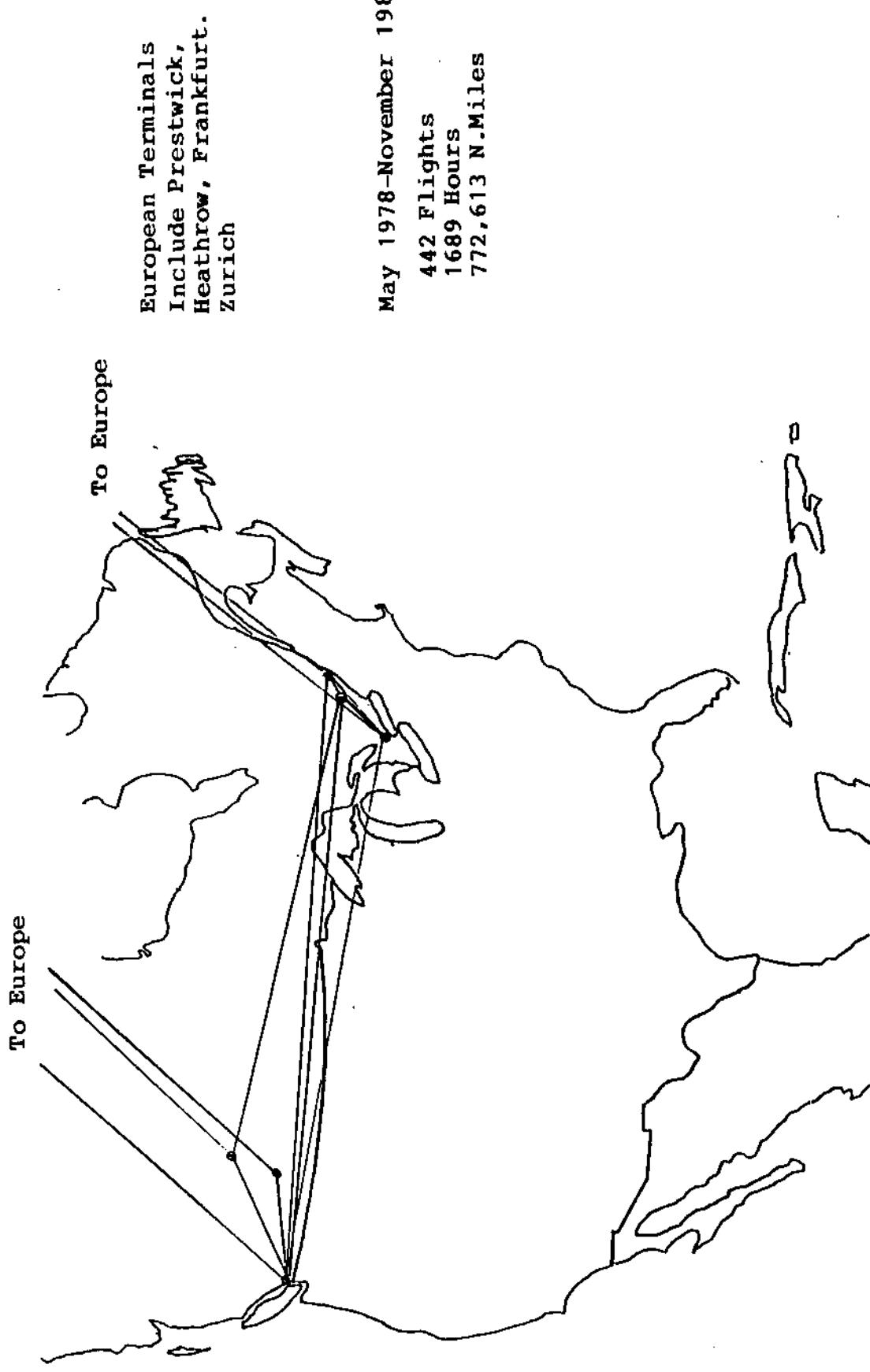


Figure 1. - Location of service area and scope of data.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	330 TO 370 KIAMS	370 TO 410 KIAMS	410 TO 450 KIAMS	450 TO 490 KIAMS	490 TO 530 KIAMS	530 TO 570 KIAMS	570 TO 610 KIAMS	610 TO 650 KIAMS	650 TO 690 KIAMS
6.5-9.0	0	0	0	0	0	0	0	0	0.2
8.0-8.5	0	0	0	0	0	0	0	0.5	0.7
7.5-8.0	0	0	0	0	0	0	0	0.2	2.5
7.0-7.5	0	0	0	0	0	0	1.4	0.2	1.1
6.5-7.0	0	0	0	0	0	0	1.1	3.2	0.7
6.0-6.5	0	0	0	0	0	0	0.9	1.1	0.5
5.5-6.0	0	0	0	0	0	0	0.2	1.6	0
5.0-5.5	0	0	0	0	0	0	0	0.5	0.5
4.5-5.0	0	0	0	0	0	0	0.2	0.5	0
4.0-4.5	0	0	0	0	0	0	0.7	1.6	2.3
3.5-4.0	0	0	0	0	0	0.2	0.7	3.8	0.2
3.0-3.5	0	0	0	0	0.5	0.5	1.8	5.0	0.2
2.5-3.0	0	0	0	0	0.5	0.9	1.4	0	0.2
2.0-2.5	0	0	0	0	0	0.2	4.6	6.3	0.2
1.5-2.0	0	0	0	0	0	0	0	0	0
1.0-1.5	0	0	0	2.5	0	0	0.2	0	0
.5-1.0	0	0	2.7	8.6	6.6	1.6	0	0	0
.0-.5	0	0	0	0	0.7	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0	2.7	11.5	14.5	12.9	20.8	14.0	9.3	11.1
									3.2

(a) Gross weight at take off

Figure 3.- Percent of flights; weight vs flight durations.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	330 TO 370 KILO 370 KILO	370 TO 410 KILO 410 KILO	410 TO 450 KILO 450 KILO	450 TO 490 KILO 490 KILO	490 TO 530 KILO 530 KILO	530 TO 570 KILO 570 KILO	570 TO 610 KILO 610 KILO	610 TO 650 KILO 650 KILO	650 TO 690 KILO 690 KILO	690 TO 730 KILO 730 KILO
8.5-9.0	0	0	0	0	0	0	0	0	0	0
8.0-8.5	0	0	0	0	0	0	0	0	0	0
7.5-8.0	0	0	0	0	0	0	0	0	0	0
7.0-7.5	0	0	0	0	0	0	0	0	0	0
6.5-7.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0	0	0	0
4.5-5.0	0	0	0	0	0	0	0	0	0	0
4.0-4.5	0	0	0.2	0.2	1.4	5.2	2.0	0	0	0
3.5-4.0	0	0	0.5	1.8	5.9	1.8	0.2	0	0	0.2
3.0-3.5	0	0	0.7	1.1	1.8	0	0	0	0	0
2.5-3.0	0	0	0.9	2.7	8.1	1.6	0	0	0	0
2.0-2.5	0	0	0	0.5	2.7	0.9	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0	0
1.0-1.5	0	0	0.9	3.2	2.3	0	0.2	0	0	0
.5-1.0	0.2	0.2	7.2	7.2	4.5	0.5	0.2	0	0	0
.0-.5	0	0	0	0.2	0.5	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0.2	10.4	25.6	48.6	14.3	0.7	0.2	0	0	0

(b) Gross weight at landing

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	0 TO 30 KIWS	30 TO 60 KIWS	60 TO 90 KIWS	90 TO 120 KIWS	120 TO 150 KIWS	150 TO 180 KIWS	180 TO 210 KIWS	210 TO 240 KIWS	240 TO 270 KIWS
3.5-9.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
7.5-8.0	0	0	0	0	0	0	0	0	0
7.0-7.5	0	0	0	0	0	0	0	0	0
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	0
4.5-5.0	0	0	0	0	0	0	0	0	0
4.0-4.5	0	0	0	0	0	0	0	0	0
3.5-4.0	0	0	0	0	0	0	0	0	0
3.0-3.5	0	0	0	0	0	0	0	0	0
2.5-3.0	0	0	0	0	0	0	0	0	0
2.0-2.5	0	0	0	0	0	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0
1.0-1.5	0	0	0	0	0	0	0	0	0
.5-1.0	0	0	0	0	0	0	0	0	0
.0-.5	0	0	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0	22.9	13.6	14.8	15.2	4.3	11.1	12.4	1.9

(c) Fuel weight at take off

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	0 TO 30 KIAMS	30 TO 60 KIAMS	60 TO 90 KIAMS	90 TO 120 KIAMS	120 TO 150 KIAMS	150 TO 180 KIAMS	180 TO 210 KIAMS	210 TO 240 KIAMS	240 TO 270 KIAMS
8.5-9.0	1.8	0.7	0	0	0	0	0	0	0
6.0-8.5	1.4	1.4	0.2	0	0	0	0	0	0
7.5-8.0	1.4	4.3	0	0	0	0	0	0	0
7.0-7.5	1.1	2.7	0	0	0	0	0	0	0
6.5-7.0	2.0	4.5	0	0	0	0	0	0	0
6.0-6.5	1.1	2.7	0	0	0	0	0	0	0
5.5-6.0	0.7	1.1	0	0	0	0	0	0	0
5.0-5.5	0.7	0.7	0	0	0	0	0	0	0
4.5-5.0	1.6	2.5	0	0	0	0	0	0	0
4.0-4.5	4.5	4.3	0	0	0	0	0	0	0
3.5-4.0	4.8	5.0	0.5	0	0	0	0	0	0
3.0-3.5	1.1	2.3	0.2	0	0	0	0	0	0
2.5-3.0	5.9	6.1	1.4	0	0	0	0	0	0
2.0-2.5	1.6	1.8	0.7	0	0	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0
1.0-1.5	3.8	2.5	0.2	0	0	0	0	0	0
.5-1.0	12.7	7.0	0	0	0	0	0	0.2	0
.0 -.5	0.5	0.2	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	46.6	49.8	3.2	0	0.2	0.2	0	0	0

(d) Fuel weight at landing

Figure 3.-Continued.

DURATION OF FLIGHT, SECONDS	PERCENT OF FLIGHTS									
	0 TO 25 KILOS	25 TO 50 KILOS	50 TO 75 KILOS	75 TO 100 KILOS	100 TO 125 KILOS	125 TO 150 KILOS	150 TO 175 KILOS	175 TO 200 KILOS	200 TO 225 KILOS	225 TO 250 KILOS
0.5-9.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
7.5-8.0	0	0	0	0	0	0	0	0	0	0
7.0-7.5	0	0	0	0	0	0	0	0	0	0
6.5-7.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0	0	0	0
4.5-5.0	0	0	0	0	0	0	0	0	0	0
4.0-4.5	0	0	0	0	0	0	0	0	0	0
3.5-4.0	0	0	0	0	0	0	0	0	0	0
3.0-3.5	0	0	0	0	0	0	0	0	0	0
2.5-3.0	0	0	0	0	0	0	0	0	0	0
2.0-2.5	0	0	0	0	0	0	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0	0
1.0-1.5	2.0	0	0	0	0	0	0	0	0	0
-5-1.0	18.8	1.1	0	0	0	0	0	0	0	0
.0 -.5	0.7	0	0	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	21.5	6.3	20.6	16.3	8.1	2.9	11.1	8.6	4.5	0

(e) Fuel burn vs flight duration

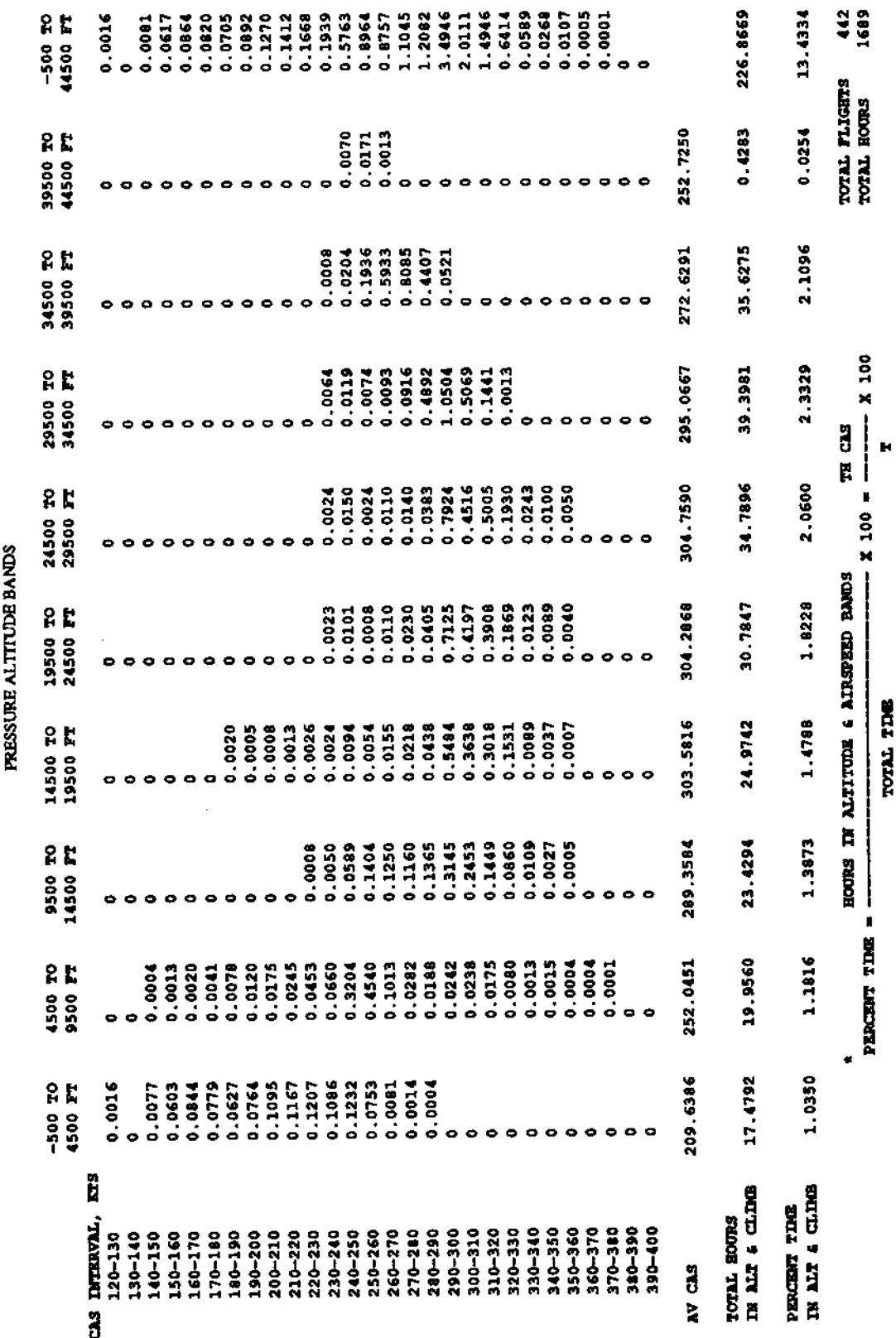
Figure 3.-Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	0 TO 20 KIWS	20 TO 40 KIWS	40 TO 60 KIWS	60 TO 80 KIWS	80 TO 100 KIWS	100 TO 120 KIWS	120 TO 140 KIWS	140 TO 160 KIWS	160 TO 180 KIWS	180 TO 200 KIWS
8.5-9.0	0	0.5	0.2	0.2	0.2	0.2	0.5	1.4	0	0
8.0-8.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0	0
7.5-8.0	0	0	0.2	1.4	1.4	1.6	1.1	1.4	0	0
7.0-7.5	0	0	0.5	0.9	0.9	0.2	1.6	0.7	0	0
6.5-7.0	0	0	0	1.4	1.4	1.6	2.5	0.9	0	0
6.0-6.5	0	0	0.2	0.2	0.2	1.4	0.2	1.1	0.7	0
5.5-6.0	0	0	0	0	0	0.9	0	0.5	0.5	0
5.0-5.5	0	0.2	0.2	0.5	0.5	0.5	0.2	0	0	0
4.5-5.0	0	0.2	0.2	0	0	2.0	1.6	0.2	0	0
4.0-4.5	0.2	0.2	1.4	1.4	2.3	3.2	1.4	0.2	0	0
3.5-4.0	0.5	0.7	2.1	3.4	2.7	1.8	0	0	0	0
3.0-3.5	0.5	1.1	0.7	1.4	0.2	0	0	0	0	0
2.5-3.0	0.9	1.8	2.0	3.2	5.2	0.2	0	0	0	0
2.0-2.5	0	0	0.9	1.8	1.8	1.4	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0	0
1.0-1.5	0.9	2.0	2.5	0.7	0.5	0	0	0	0	0
.5-1.0	5.7	6.1	3.6	2.3	2.0	0.2	0.2	0	0	0
.0 -.5	0	0	0.2	0.2	0.2	0.2	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	8.9	14.0	17.2	24.2	26.0	8.4	1.4	0	0	0

(f) Payload weight vs flight duration

Figure 3.-Concluded.

**Figure 4:** Percent time in altitude and gross weight bands.



(a) Climb

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

CAS INTERVAL, KIPS	PRESSURE ALTITUDE BANDS						TOTAL TIME X 100 = $\frac{\text{TOTAL FLIGHTS} \times \text{TH CAS}}{T}$	
	-500 TO 4500 FT		9500 TO 14500 FT		14500 TO 19500 FT			
	4500 FT	9500 FT	14500 FT	19500 FT	24500 FT	29500 FT		
120-130	0	0	0	0	0	0	0	
130-140	0.0004	0.0007	0	0	0	0	0.0011	
140-150	0.0032	0.0097	0	0	0	0	0.0128	
150-160	0.0186	0.0521	0	0	0	0	0.0237	
160-170	0.0478	0.0128	0	0	0	0	0.0606	
170-180	0.0860	0.0197	0	0	0	0	0.1057	
180-190	0.0468	0.0339	0.0022	0	0	0	0.0829	
190-200	0.0171	0.0367	0.0033	0	0	0	0.0571	
200-210	0.0116	0.0510	0.0088	0	0	0	0.0714	
210-220	0.0085	0.0427	0.0163	0	0	0	0.0574	
220-230	0.0033	0.0292	0.0122	0.0002	0.0007	0.0060	0.0583	
230-240	0.0017	0.0185	0.0195	0.0037	0	0.0039	0.0005	
240-250	0.0010	0.0226	0.0307	0.0034	0	0.0025	0.0088	
250-260	0.0007	0.0186	0.0465	0.0015	0	0.0094	0.0587	
260-270	0.0002	0.0035	0.0212	0.0009	0	0.3338	0.1554	
270-280	0	0.0022	0.0193	0.0010	0.0002	0.4389	0.1354	
280-290	0	0.0027	0.0137	0.0012	0.0010	0.2799	0.8662	
290-300	0	0.0021	0.0132	0.0024	0.0027	0.0514	9.6018	
300-310	0	0.0024	0.0106	0.0032	0.0024	0.0054	6.1344	
310-320	0	0.0023	0.0135	0.0051	0.0153	0.0158	1.9064	
320-330	0	0.0011	0.0136	0.0139	0.0091	0.2221	0.0421	
330-340	0	0.0034	0.0321	0.0161	0.0266	0.2008	0	
340-350	0	0.0006	0.0123	0.0158	0.0313	0.0988	0	
350-360	0	0.0001	0.0008	0.0057	0.0132	0.0413	0	
360-370	0	0	0	0.0017	0.0021	0.0022	0	
370-380	0	0	0	0	0	0	0	
380-390	0	0	0	0	0	0	0	
390-400	0	0	0	0	0	0	0	
AV CAS	178.8609	212.1336	272.4721	320.3210	334.9873	295.1497	301.2984	
TOTAL SCORES IN ALT & LEVEL	4.1681	5.4294	4.7956	1.2786	1.7533	28.8244	218.1544	
PERCENT TIME IN ALT & LEVEL	0.2468	0.3215	0.2840	0.0757	0.1038	1.7068	12.9175	
* HOURS IN ALTITUDE & ALTITUDE BANDS * PERCENT TIME = $\frac{\text{HOURS IN ALTITUDE & ALTITUDE BANDS}}{\text{TOTAL TIME}}$ X 100 = $\frac{\text{TH CAS}}{T}$ X 100								

(b) Level

Figure 5.-Continued.

		PRESSURE ALTITUDE BANDS							
		9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	-500 TO 44500 FT	
CAS INTERVAL, KT/S									
120-130	0.0235	0	0	0	0	0	0	0.0235	
130-140	0.2671	0.0033	0	0	0	0	0	0.2704	
140-150	0.4302	0.0217	0.0013	0	0	0	0	0.4532	
150-160	0.2980	0.0287	0.0010	0	0	0	0	0.3277	
160-170	0.3034	0.0529	0.0004	0	0	0	0	0.3567	
170-180	0.3260	0.1295	0.0037	0	0	0	0	0.4592	
180-190	0.2171	0.1530	0.0085	0.0020	0	0	0	0.3807	
190-200	0.1077	0.1679	0.0143	0.0005	0	0	0	0.2905	
200-210	0.0690	0.2238	0.0270	0.0008	0	0	0	0.3207	
210-220	0.0352	0.1929	0.0329	0.0013	0	0	0	0.2823	
220-230	0.0252	0.1471	0.0375	0.0024	0	0.0018	0.0017	0.2158	
230-240	0.0187	0.1644	0.0395	0.0021	0.0018	0.0023	0.0025	0.2331	
240-250	0.0079	0.2959	0.1251	0.0122	0.0040	0.0033	0.0033	0.4639	
250-260	0.0020	0.2242	0.1523	0.0189	0.0065	0.0038	0.0035	0.4762	
260-270	0.0003	0.0412	0.1002	0.0142	0.0111	0.0079	0.0047	0.4224	
270-280	0.0006	0.0148	0.0942	0.0125	0.0088	0.0076	0.0197	0.5148	
280-290	0.0004	0.0102	0.0922	0.0168	0.0077	0.0039	0.0749	0.5524	
290-300	0.0003	0.0097	0.0994	0.0417	0.0263	0.0164	0.0637	0.5226	
300-310	0.0002	0.0063	0.0986	0.0547	0.0322	0.0420	0.0010	0.5235	
310-320	0.0002	0.0066	0.1090	0.0594	0.0497	0.0841	0.2097	0.5187	
320-330	0.0003	0.0060	0.0350	0.1027	0.0884	0.2312	0.0719	0.6355	
330-340	0	0.0041	0.2272	0.3242	0.2483	0.2997	0.0055	0	
340-350	0	0.0032	0.1584	0.3067	0.3609	0.1920	0	1.0233	
350-360	0	0.0009	0.0266	0.0405	0.0943	0.0285	0	0.1907	
360-370	0	0	0.0023	0.0033	0.0052	0.0002	0	0.0109	
370-380	0	0	0.0009	0.0007	0.0009	0	0	0.0025	
380-390	0	0	0	0	0	0	0	0	
390-400	0	0	0	0	0	0	0	0	
AV CAS	164.4177	219.4184	291.6416	327.3398	333.9858	326.8281	303.0824	276.2697	
TOTAL HOURS IN ALT BAND	36.0296	32.2292	26.6611	17.2225	15.9795	15.4443	15.7916	18.5490	
PERCENT TIME IN ALT & DESCENT	2.1334	1.9084	1.5787	1.0198	0.9462	0.9145	0.9351	1.0983	
* PERCENT TIME = $\frac{\text{HOURS IN ALTITUDE \& AIRSPEED BANDS}}{\text{TOTAL TIME}}$									
TOTAL FLIGHTS	442								
TOTAL HOURS	1669								
X 100 = $\frac{\text{TH CAS}}{\text{TOTAL TIME}}$									

(c) Descent

Figure 5.-Continued.

PRESSURE ALTITUDE BANDS															
		-500 TO 4500 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	
CAS INTERVAL, KTS		500 TO 9500 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 4500 FT	4500 TO 9500 FT	0.0251	0	0	0	0	0	0	0	0	0	0	0	0.0251	-500 TO 4500 FT
120-130	130-140	0.0241	0.0041	0	0	0	0	0	0	0	0	0	0	0.2715	
140-150	150-160	0.0410	0.0318	0.0013	0	0	0	0	0	0	0	0	0	0.4741	
160-170	170-180	0.3770	0.0351	0.0010	0	0	0	0	0	0	0	0	0	0.4131	
180-190	190-200	0.4356	0.0677	0.0004	0	0	0	0	0	0	0	0	0	0.5037	
200-210	210-220	0.4899	0.1533	0.0037	0	0	0	0	0	0	0	0	0	0.6469	
220-230	230-240	0.3266	0.1984	0.0108	0.0020	0	0	0	0	0	0	0	0	0.5341	
240-250	250-260	0.2012	0.2174	0.0176	0.0005	0	0	0	0	0	0	0	0	0.4368	
260-270	270-280	0.1902	0.2923	0.0359	0.0008	0	0	0	0	0	0	0	0	0.5192	
280-290	290-300	0.1603	0.2601	0.0492	0.0013	0	0	0	0	0	0	0	0	0.4709	
300-310	310-320	0.1492	0.2216	0.0506	0.0026	0	0.0026	0	0.0026	0.0076	0.0067	0	0	0.4409	
320-330	330-340	0.1290	0.2489	0.0640	0.0082	0.0041	0.0086	0.0112	0.0150	0.005	0.005	0	0	0.4894	
340-350	350-360	0.0987	0.1460	0.2463	0.0306	0.0222	0.3526	0.1694	0.3949	0.0057	0.0057	0	0	0.3554	
360-370	370-380	0.0020	0.0452	0.2236	0.0353	0.0320	0.4606	0.2466	0.2504	0	0	0	0	0.3764	
380-390	390-400	0.0008	0.0317	0.2324	0.0619	0.0192	0.3221	1.4348	15.2893	0	0	0	0	0.2656	
AV CAS	179.1658	230.0328	288.9921	313.4856	315.1778	305.9575	300.5032	274.5074	252.0253						
TOTAL HOURS IN ALL BAND	57.6768	57.6147	54.8861	43.4753	48.5176	79.0583	273.3441	1055.4532	8.8058	1688.8319					
PERCENT TIME IN ALT AND DESCENT	3.4152	3.4115	3.2499	2.5743	2.8728	4.6812	16.1854	63.0882	0.5214	100.0000					
* PERCENT TIME = $\frac{\text{HOURS IN ALTITUDE & AIRSPEED BANDS}}{\text{TOTAL TIME}}$															
TOTAL FLIGHTS	442														
TOTAL HOURS	1689														

(d) All flight modes

Figure 5.-Concluded.

PRESSURE ALTITUDE BANDS

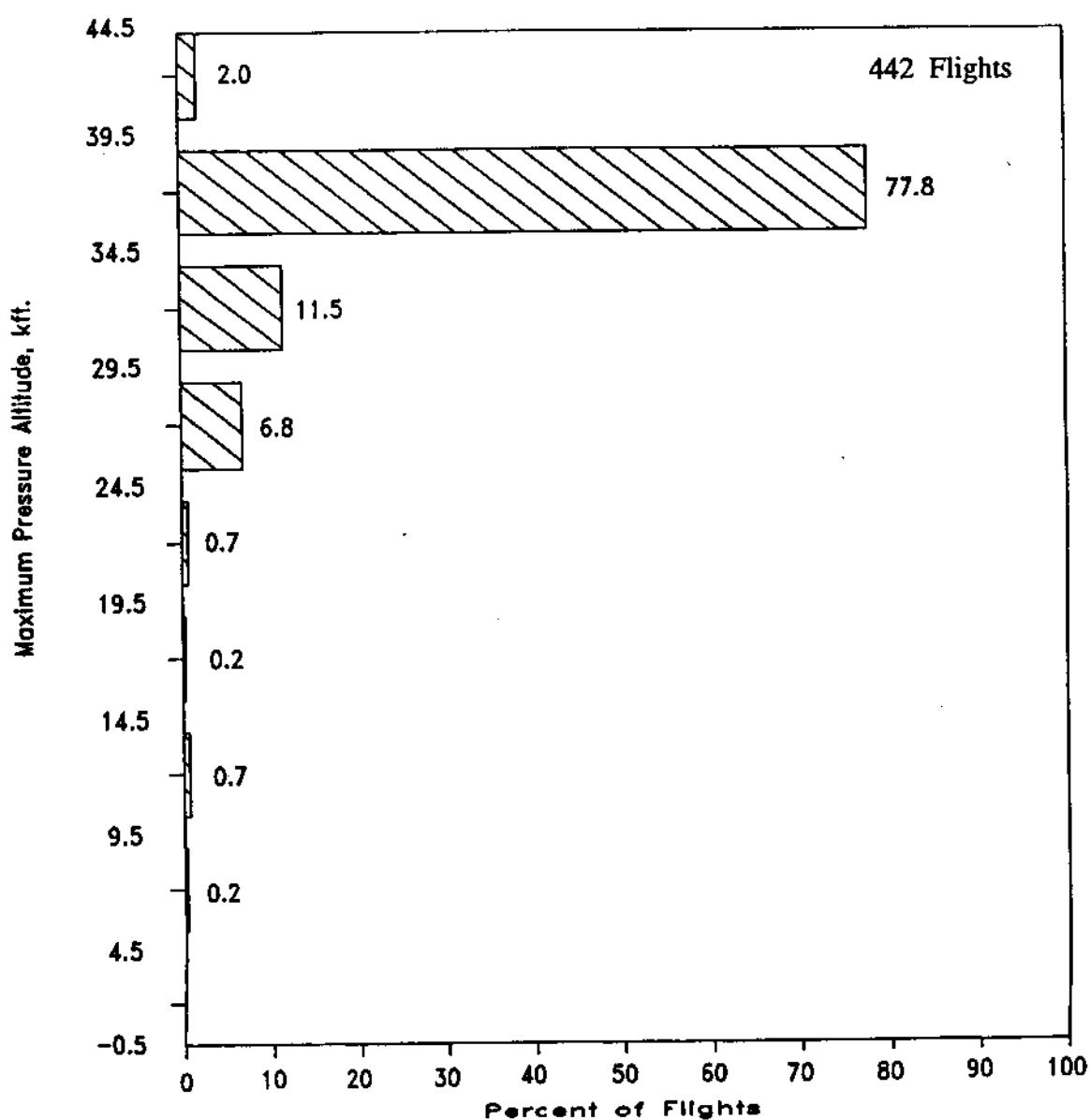
TIME INTERVAL, HRS IN ALTITUDE BAND	PRESSURE ALTITUDE BANDS									
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 39500 FT
8.50-9.00	0	0	0	0	0	0	0	0	0	0
8.00-8.50	0	0	0	0	0	0	0	0	0	0
7.50-8.00	0	0	0	0	0	0	0.226	0	0	0
7.00-7.50	0	0	0	0	0	0	0	0.226	0.679	0
6.50-7.00	0	0	0	0	0	0	0	0	3.394	0
6.00-6.50	0	0	0	0	0	0	0	0	2.489	0
5.50-6.00	0	0	0	0	0	0	0.226	0.679	2.489	0
5.00-5.50	0	0	0	0	0	0	0	0.226	5.882	0
4.50-5.00	0	0	0	0	0	0	0	1.357	3.394	0
4.00-4.50	0	0	0	0	0	0	0	1.131	2.036	0
3.50-4.00	0	0	0	0	0	0	0	2.036	2.036	0
3.00-3.50	0	0	0	0	0	0	0	0.679	8.371	0
2.50-3.00	0	0	0	0	0	0	0	0.226	6.787	0
2.00-2.50	0	0	0	0	0	0	0	0.226	1.131	0
1.50-2.00	0	0	0	0	0	0	0	0	7.919	0
1.00-1.50	0	0	0	0	0	0	0	0	14.253	0
.80-1.00	0	0	0	0	0	0	0	0	3.846	0.679
.70-.80	0	0	0	0	0	0	0	0	0.679	8.371
.60-.70	0	0	0	0	0	0	0	0	1.131	0.226
.50-.60	0	0.452	0	0	0	0	0	0	1.810	0.226
.40-.50	0	0	0	0	0	0	0.226	0.679	0.226	0
.30-.40	0	0.679	0	0.226	0	0	0	0	1.810	0.226
.20-.30	3.167	4.751	2.941	2.036	2.036	0	0	0	1.131	0.679
.15-.20	24.887	15.385	12.443	2.489	6.109	13.575	11.086	0	0	0
.10-.15	51.357	57.692	64.027	35.520	48.416	47.059	35.973	0	0	0
.05-.10	18.778	21.041	20.136	59.050	42.081	25.339	10.181	0	0	0
.00-.05	1.810	0	0	0	0	0.226	0	0	0	0
<b>TOTAL HOURS IN ALT BAND</b>	<b>57.6768</b>	<b>57.6147</b>	<b>54.8861</b>	<b>43.4753</b>	<b>48.5176</b>	<b>79.0583</b>	<b>273.3441</b>	<b>1065.4532</b>	<b>8.8058</b>	
<b>TOTAL PERCENT TIME IN ALT BAND</b>	<b>3.4152</b>	<b>3.4115</b>	<b>3.2499</b>	<b>2.5743</b>	<b>2.8728</b>	<b>4.6812</b>	<b>16.1654</b>	<b>63.0882</b>	<b>0.5214</b>	

Figure 6.- Percent of flights vs time in altitude bands.

		TO MAXIMUM PRESSURE ALTITUDE BAND IN EACH FLIGHT VS DURATION									
		-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	
DURATION OF FLIGHT, HOURS	0	0	0	0	0	0	0.2	0	2.3	0	
	0.5-9.0	0	0	0	0	0	0	0	2.9	0	
	9.0-13.5	0	0	0	0	0	0	0	5.4	0.2	
	7.5-8.0	0	0	0	0	0	0	0	3.8	0	
	7.0-7.5	0	0	0	0	0	0.2	0	6.3	0	
	6.5-7.0	0	0	0	0	0	0	0.5	3.4	0	
	6.0-6.5	0	0	0	0	0	0	0.2	1.6	0	
	5.5-6.0	0	0	0	0	0	0	0	0.9	0.5	
	5.0-5.5	0	0	0	0	0	0	0	4.1	0	
	4.5-5.0	0	0	0	0	0	0.2	0.2	6.4	0.2	
	4.0-4.5	0	0	0	0	0	0.2	0.2	8.8	0.9	
	3.5-4.0	0	0	0	0	0	0.2	0.5	3.2	0.2	
	3.0-3.5	0	0	0	0	0.2	0	0	13.1	0	
	2.5-3.0	0	0	0	0	0	0	0	4.1	0	
	2.0-2.5	0	0	0	0	0	0	0	0	0	
	1.5-2.0	0	0	0	0	0	0	1.1	5.4	0	
	1.0-1.5	0	0	0	0	0.7	5.9	8.8	4.1	0	
	.5-1.0	0	0.2	0.2	0	0	0	0	0	0	
	.0-.5	0	0.5	0.2	0	0	0	0	0	0	
TOTAL PERCENTS, ALL FLIGHTS	0	0.2	0.7	0.2	0.7	6.8	11.5	77.8	2.0		

(a) Maximum altitude vs flight duration matrix

Figure 7.- Percent of flights to maximum altitude.



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

Figure 7.- Concluded.

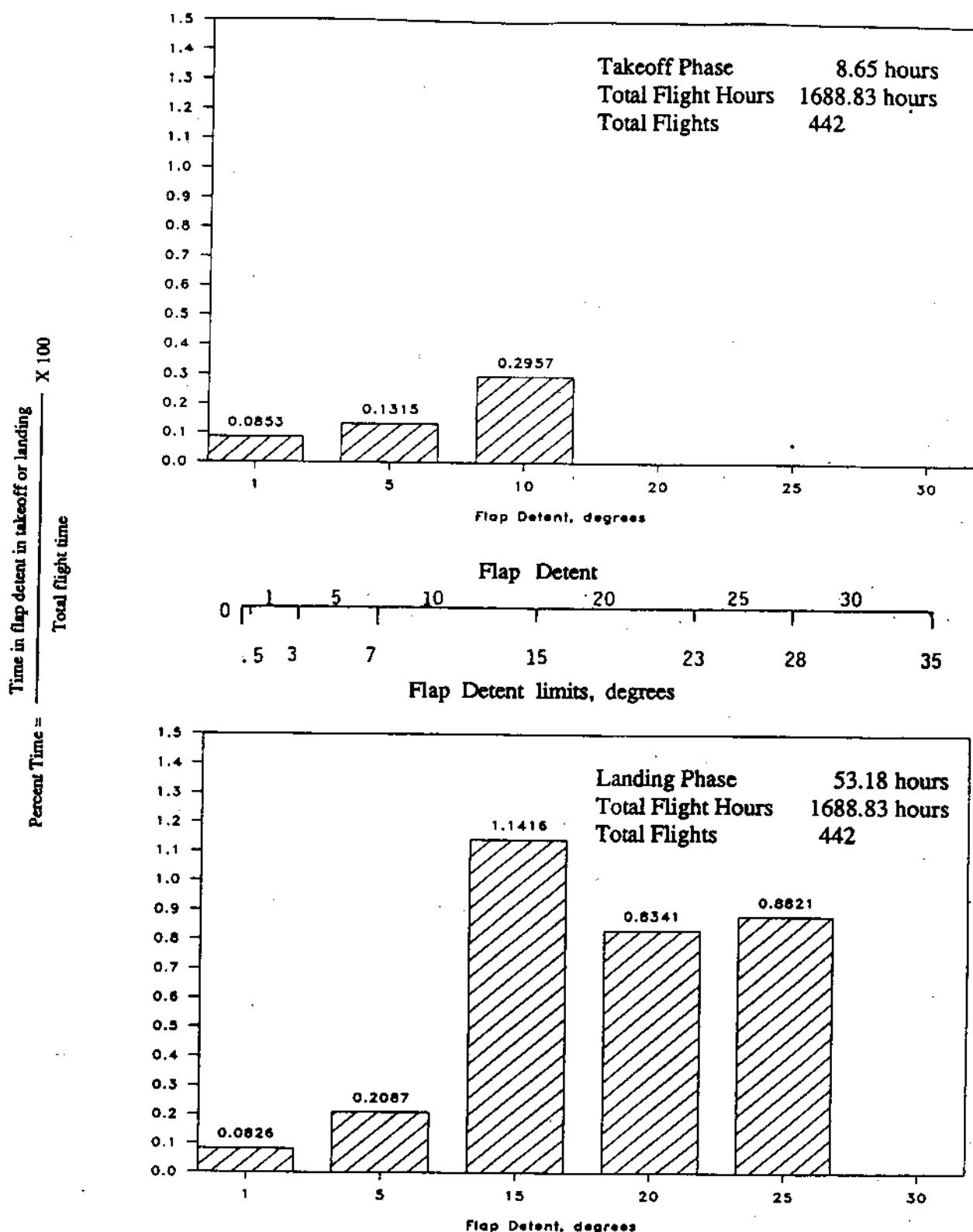
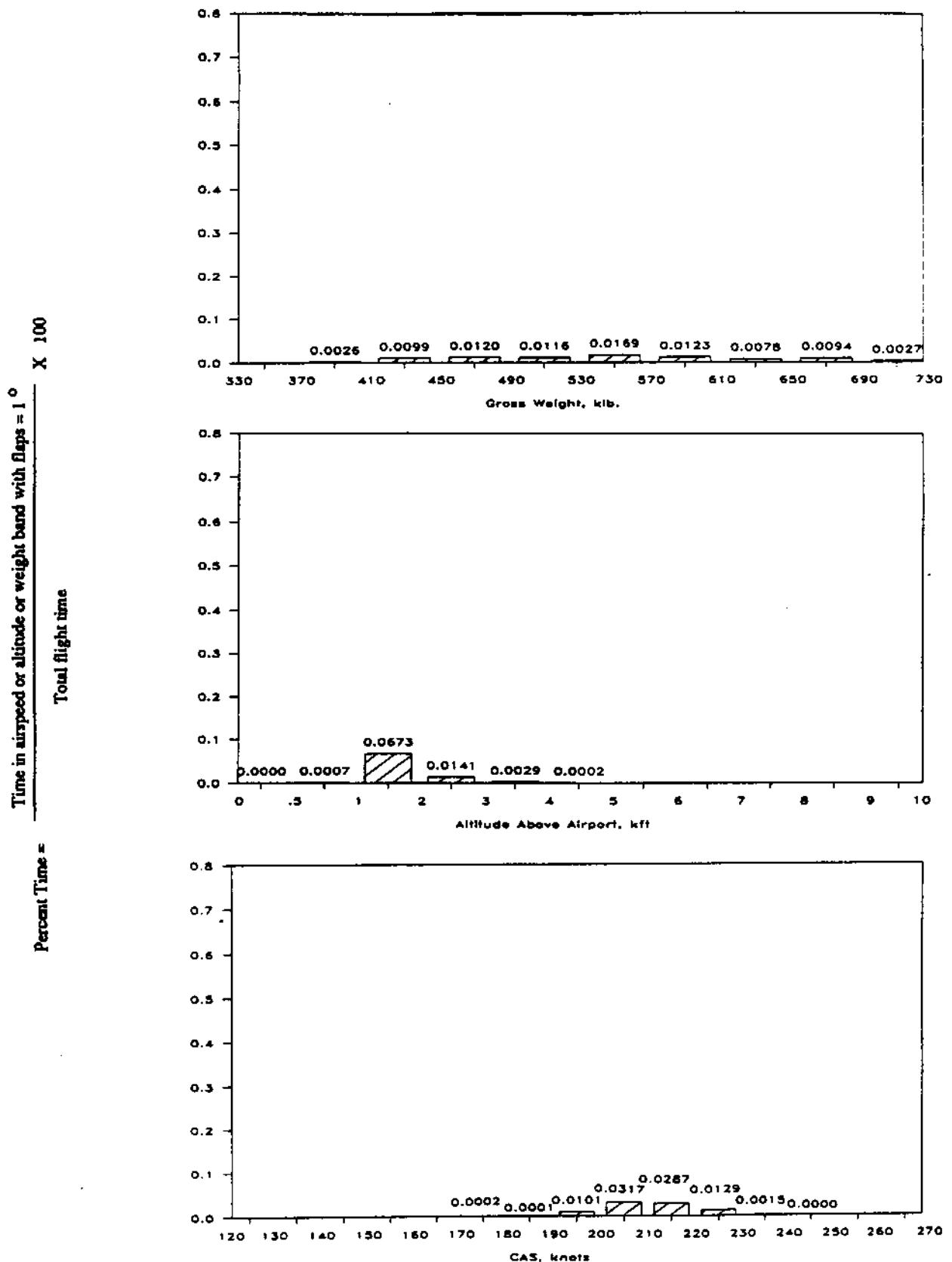
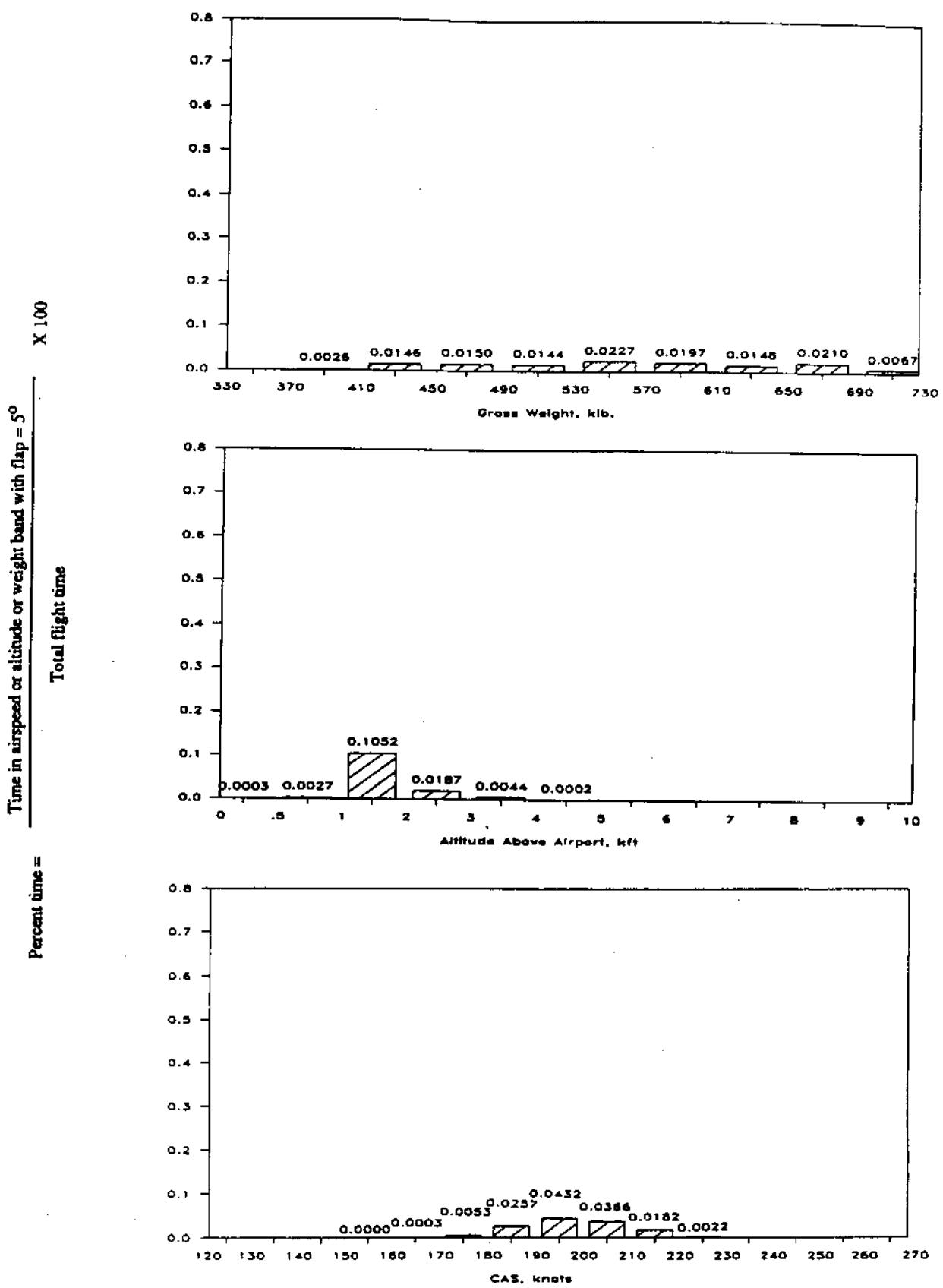


Figure 8.- Percent of total flight time at each flap detent.



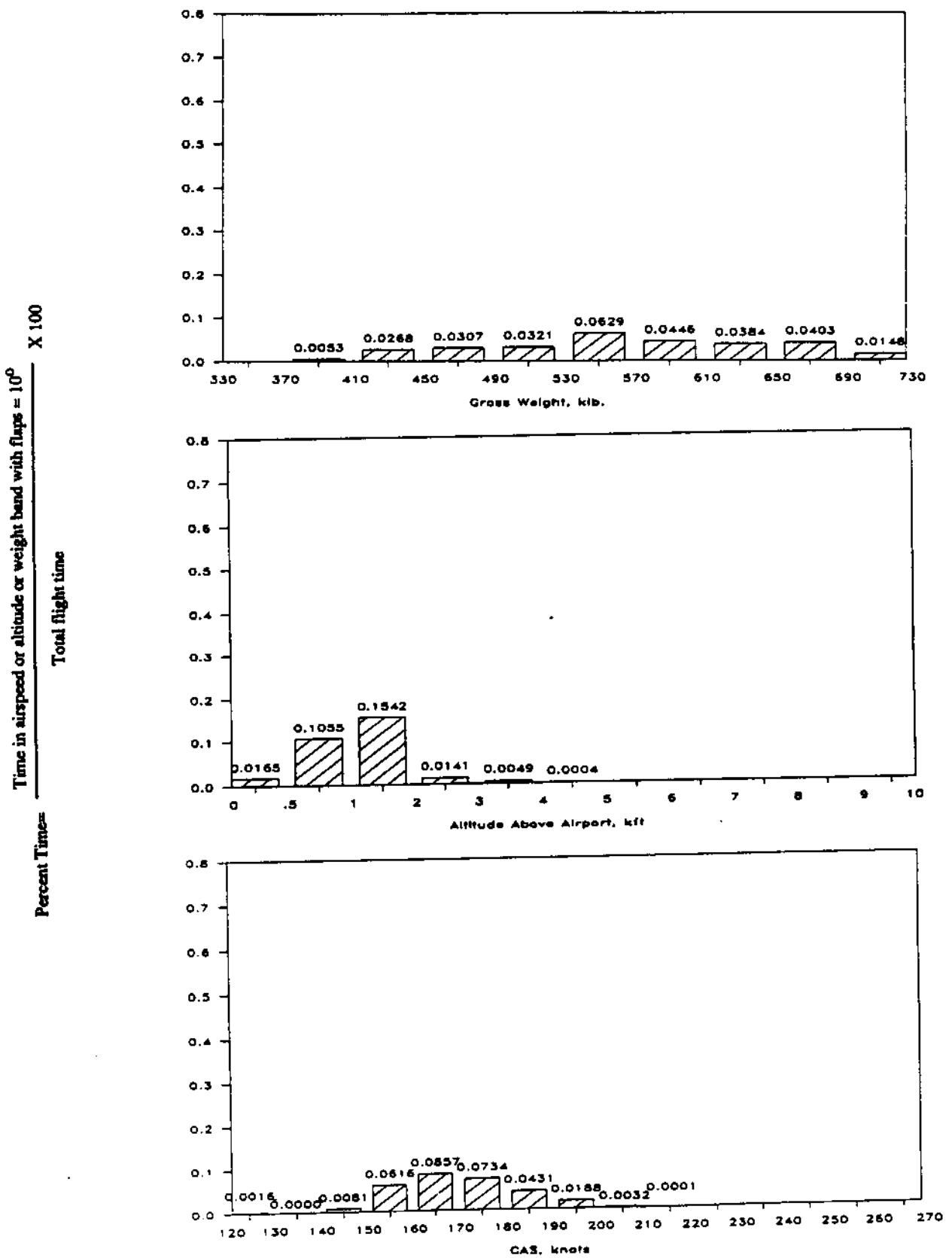
(a) Takeoff, flaps=1°; 1.4399 hours

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



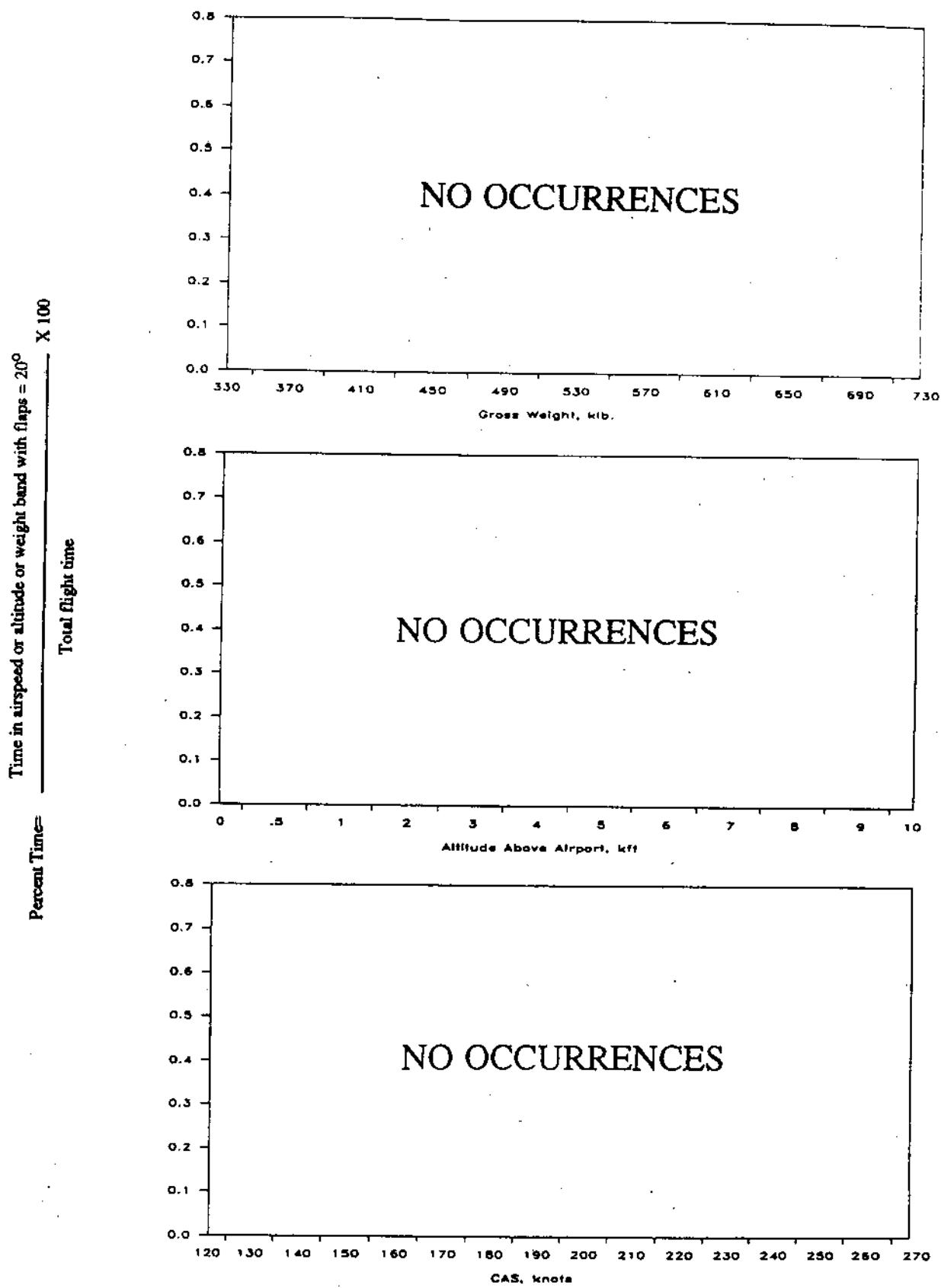
(b) Takeoff, flaps=5°; 2.2216 hours

Figure 9.- Continued.



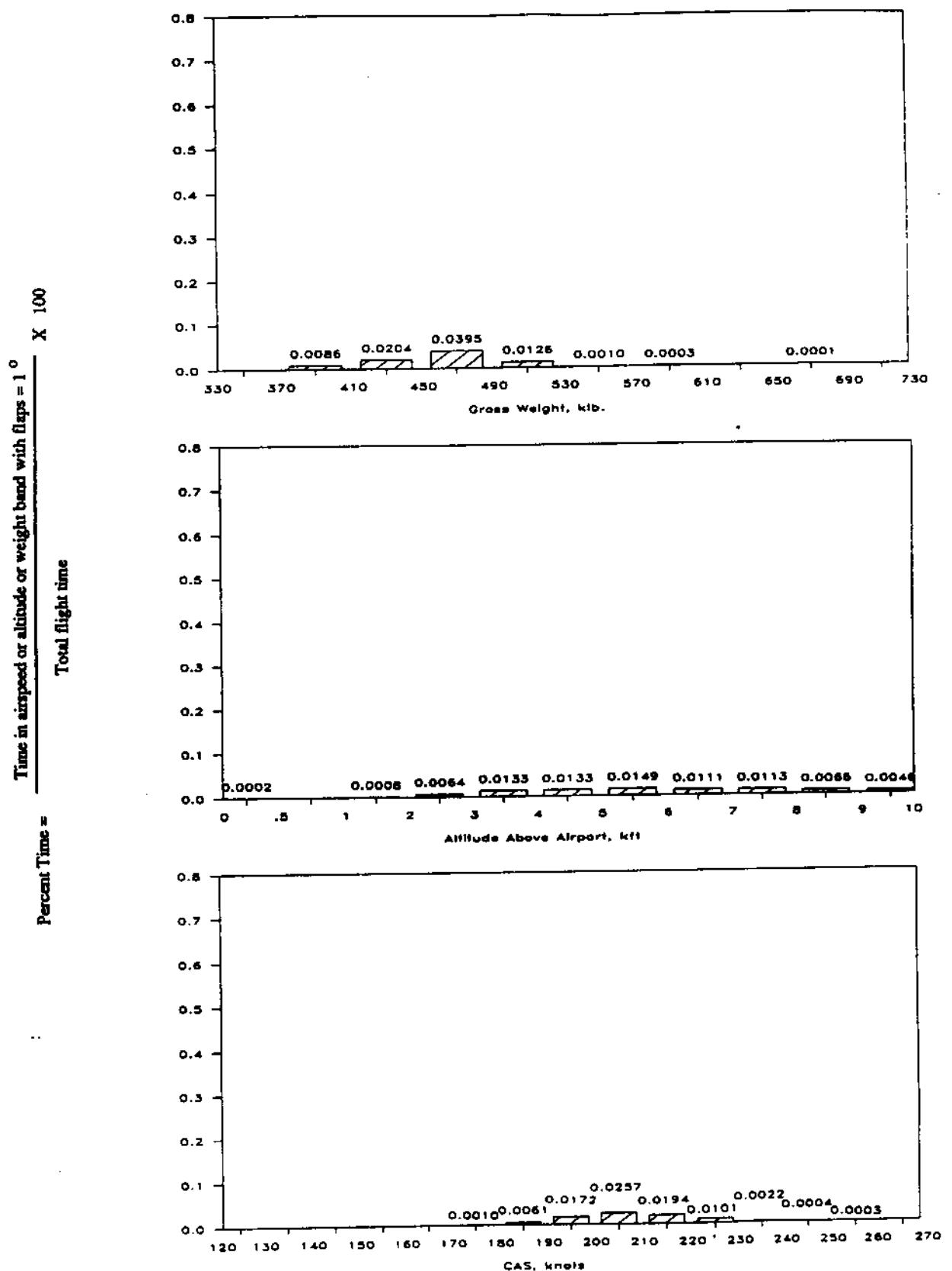
(c) Takeoff, flaps= $10^0$ ; 4.9931 hours

Figure 9.- Continued.



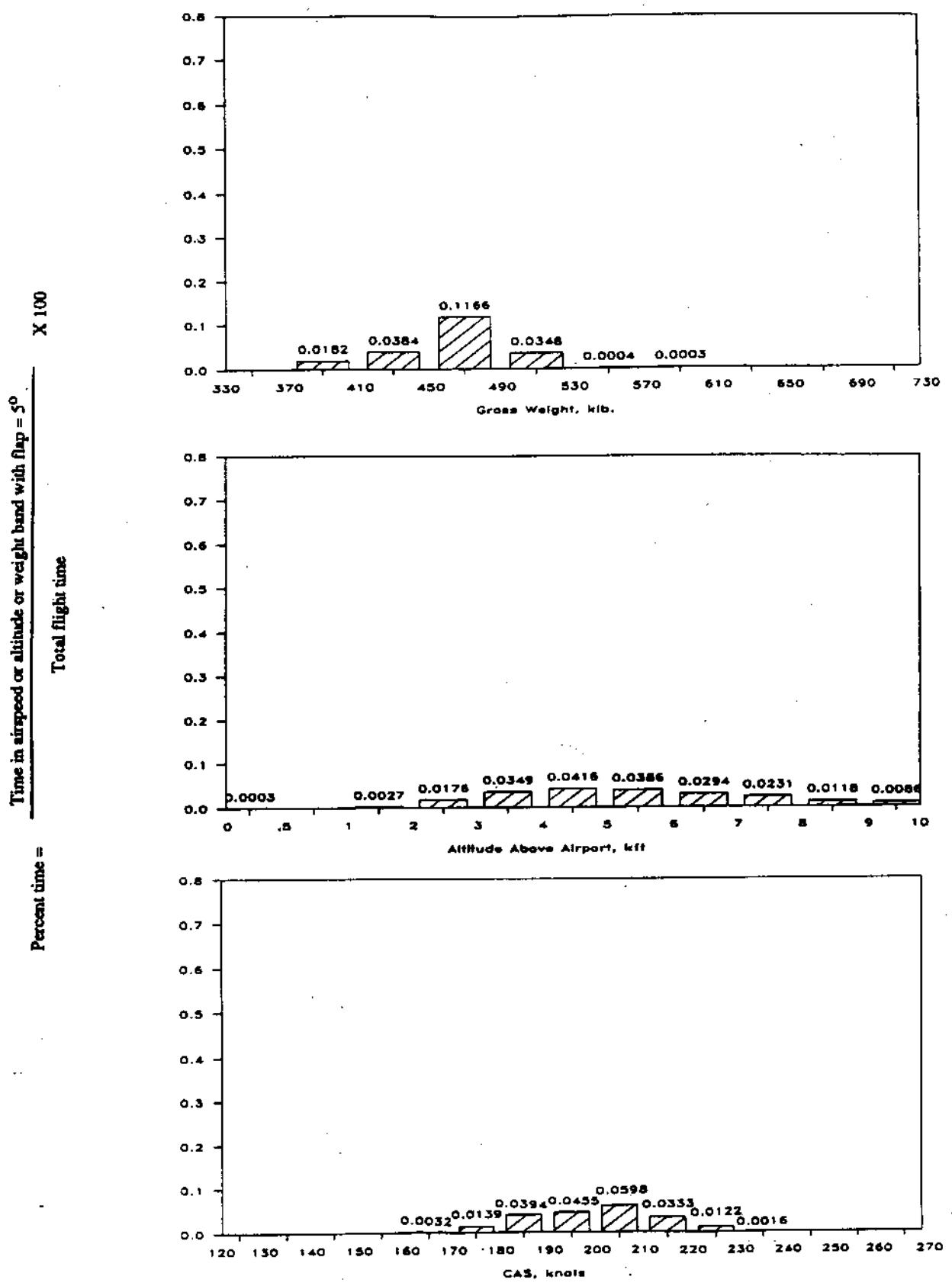
(d) Takeoff, flaps=20°; 0.0000 hours

Figure 9.- Continued.



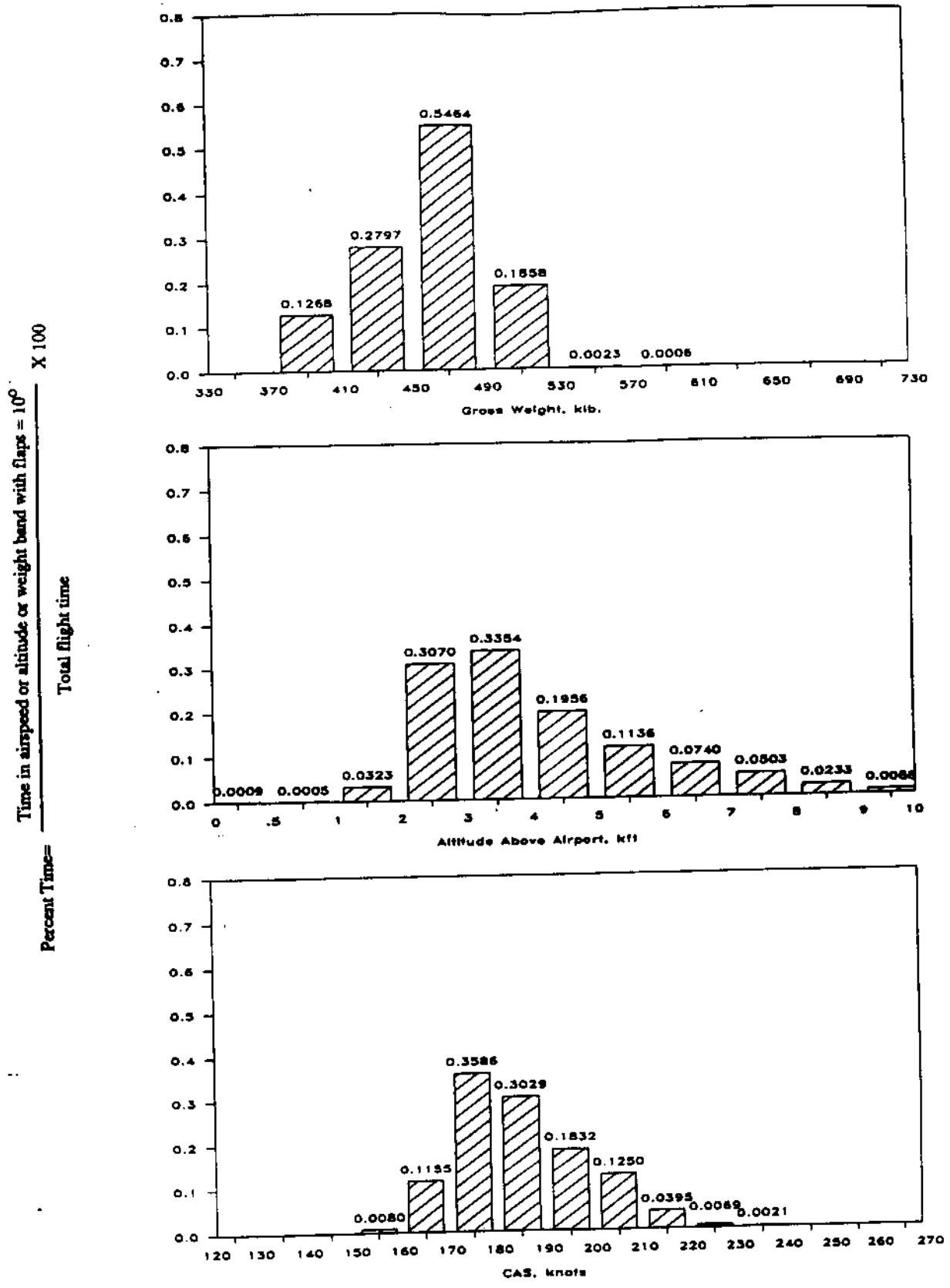
(e) Landing, flaps=1°; 1.3944 hours

Figure 9.- Continued.



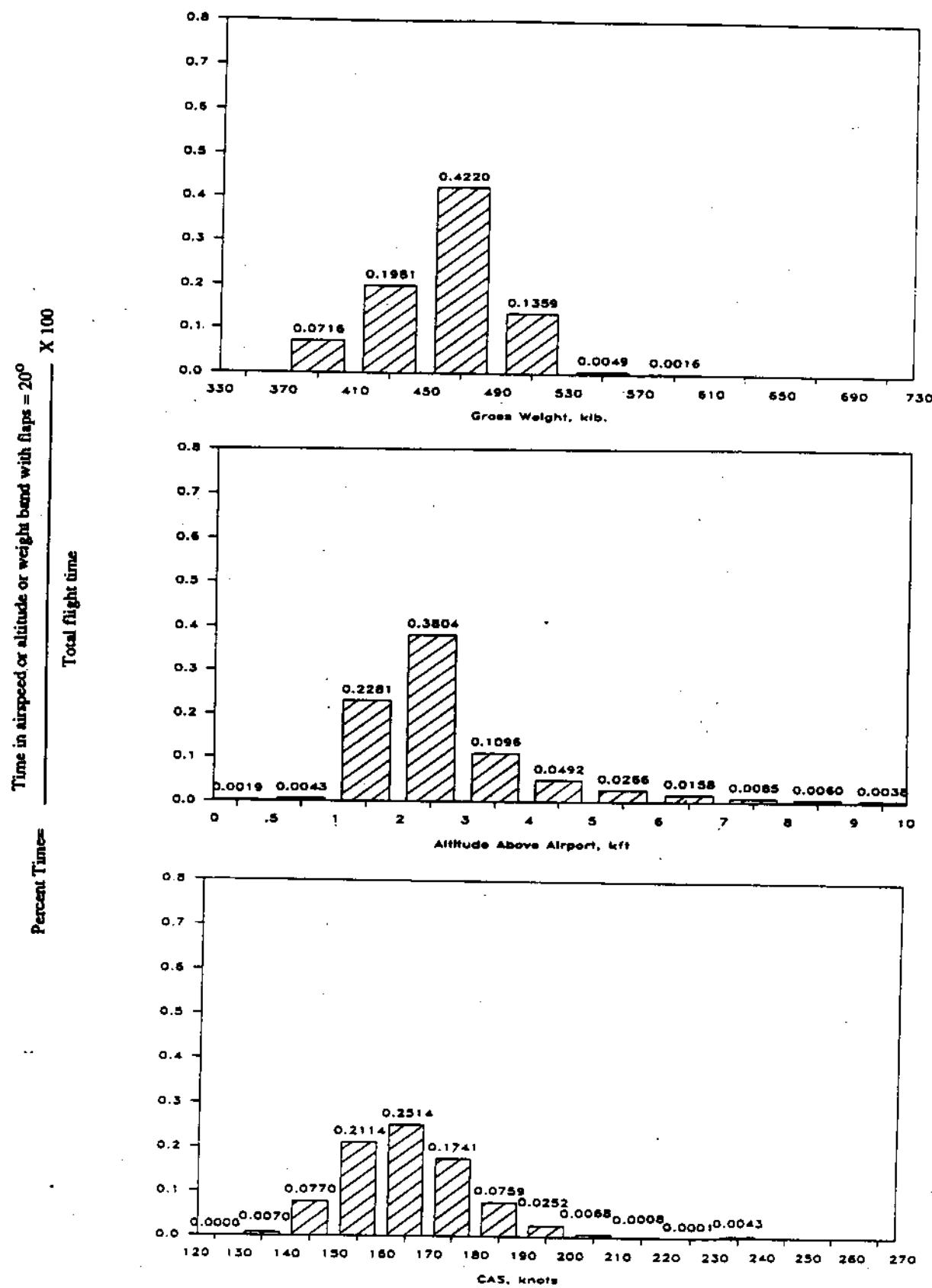
(f) Landing, flaps=5°; 3.5252 hours

Figure 9.- Continued.



(g) Landing, flaps=10°; 19.2804 hours

Figure 9.- Continued.



(h) Landing, flaps=20°; 14.0867 hours

Figure 9.- Continued.

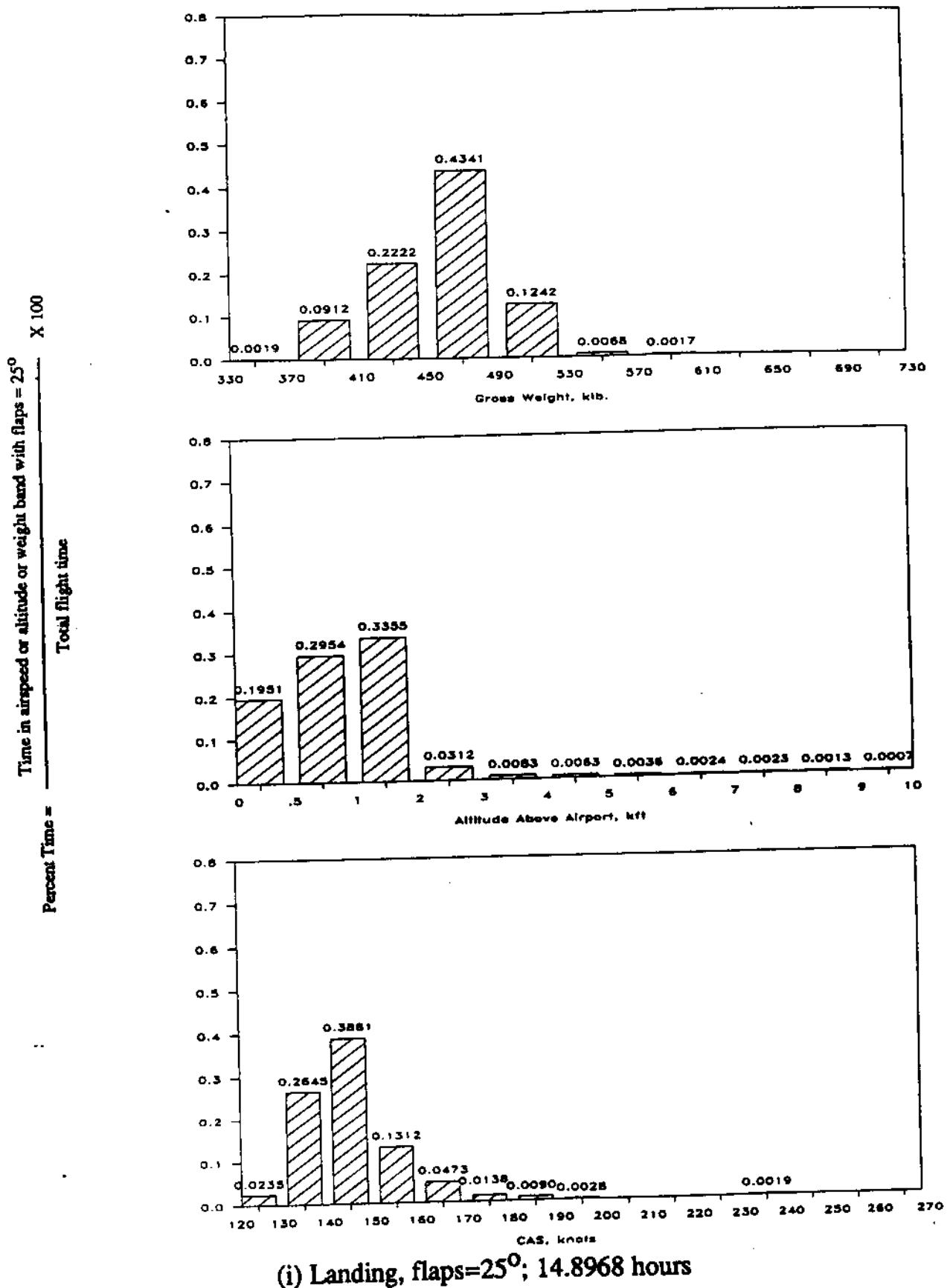
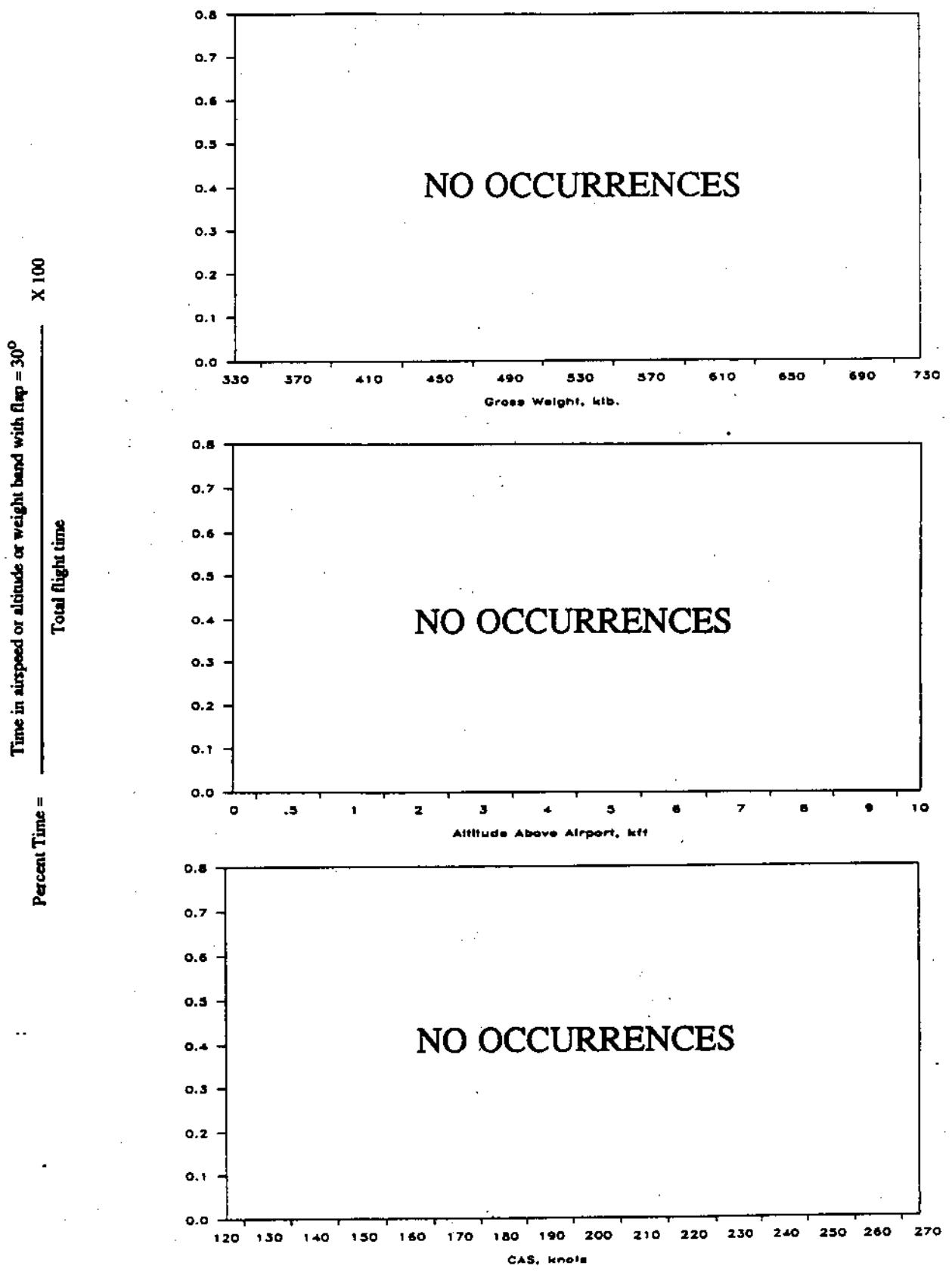


Figure 9.- Continued.



(j) Landing, flaps=30°; 0.0000 hours

Figure 9.- Concluded.

## FLAP DEFLECTION, DEGREES

TIME AFTER LIFTOFF MINUTES	23.0	15.0	7.0	3.0	0.5	0.2	NOTES
						0	
0.0 - .1	0	0	0	0	0	0	1. 442 flights
.1 - .2	0	0	0	0	0	0	2. The first 15 seconds after takeoff on each flight are not included.
.2 - .3	0	0	0	0	0	0.7	
.3 - .4	0	0	0	0	0	3.8	
.4 - .5	0	0	0	0	0	1.1	
.5 - .6	0	0	0	0	0	16.5	
.6 - .8	0	0	0	0	0	10.0	
.8 - 1.0	0	0	0	0	0	9.9	
1.0 - 1.2	0	0	0	0	0	13.3	
1.2 - 1.4	0	0	0	0	0	24.9	
1.4 - 1.6	0	0	0	0	0	32.4	
1.6 - 1.8	0	0	0	0	0	11.1	
1.8 - 2.0	0	0	0	0	0	25.3	
2.0 - 2.2	0	0	0	0	0	25.6	
2.2 - 2.4	0	0	0	0	0	4.3	
2.4 - 2.6	0	0	0	0	0	15.2	
2.6 - 2.8	0	0	0	0	0	14.3	
2.8 - 3.0	0	0	0	0	0	8.4	
3.0 - 3.5	0	0	0	0	0	0.5	
3.5 - 4.0	0	0	0	0	0	3.2	
4.0 - 4.5	0	0	0	0	0	8.1	
4.5 - 5.0	0	0	0	0	0	2.3	
5.0 - 6.0	0	0	0	0	0	2.3	
6.0 - 7.0	0	0	0	0	0	0.7	
7.0 - 8.0	0	0	0	0	0	0.2	
8.0 - 9.0	0	0	0	0	0	0.9	
9.0 - 10.0	0	0	0	0	0	0.7	
10.0 - 15.0	0	0	0	0	0	0.2	
15.0 - 20.0	0	0	0	0	0	0.5	
20.0 - 25.0	0	0	0	0	0	0.5	
0.0 - 25.0	0	0	0	0	0	0.5	

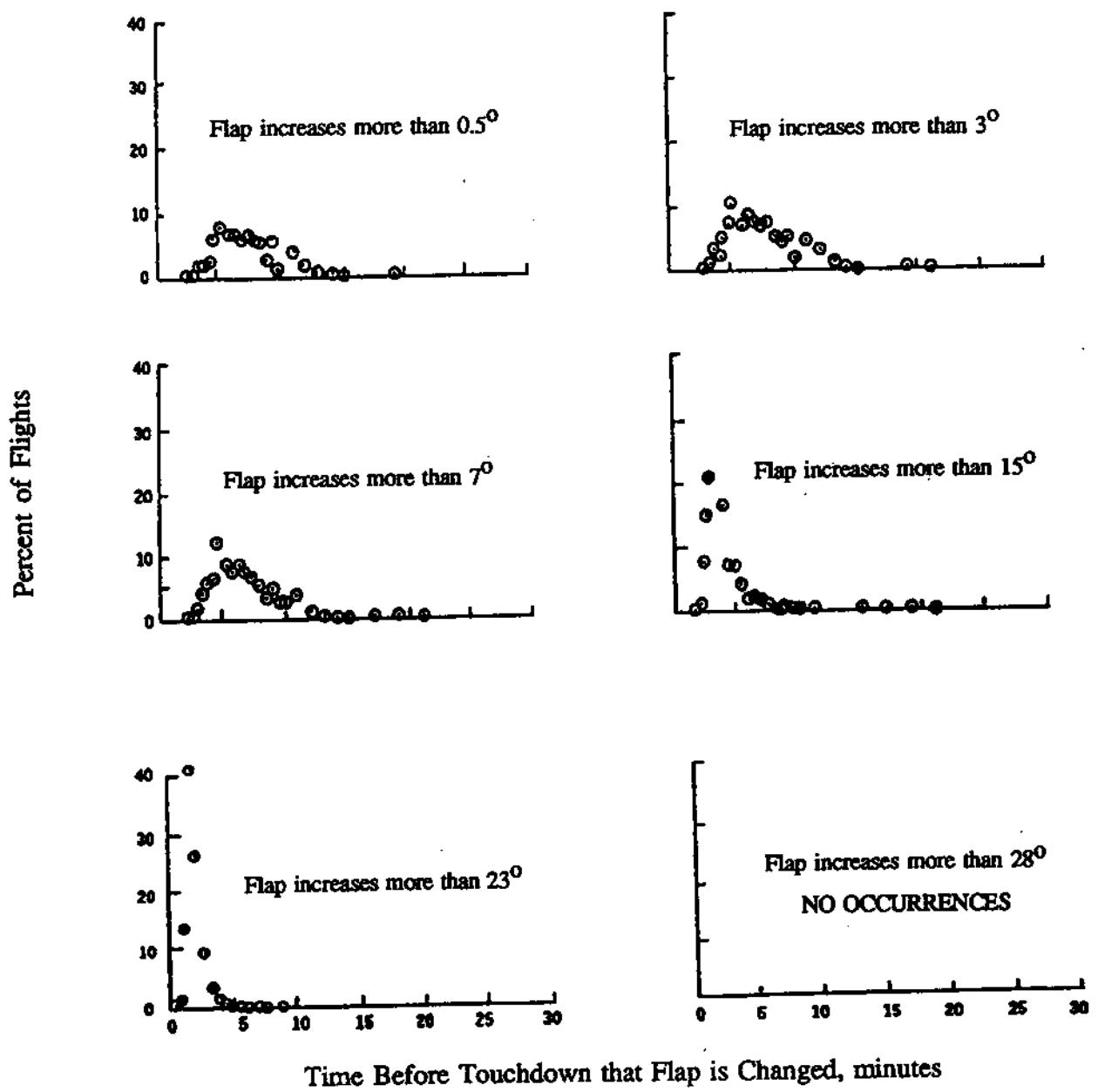
(a) Take off: Percent of flights vs times when take off flap deflection  
is reduced to less than indicated values

Figure 10.- Flap deflection times.

TIME BEFORE TOUCHDOWN MINUTES	FLAP DEFLECTION, DEGREES	NOTES				
		0.0	3.0	7.0	15.0	23.0
0.0 - 0.5	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	1.4
1.0 - 1.5	0	0	0	0	0.2	14.7
1.5 - 2.0	0	0	0	0.2	2.5	41.0
2.0 - 2.5	0.2	0.2	0.2	0.5	0.1	26.5
2.5 - 3.0	0.5	1.1	1.1	1.8	15.4	9.3
3.0 - 3.5	2.5	3.4	4.1	21.9	3.2	
3.5 - 4.0	2.7	2.5	5.7	17.9	1.4	
4.0 - 4.5	3.4	5.0	6.1	7.9	0.7	
4.5 - 5.0	6.1	6.8	11.2	7.9	0.2	
5.0 - 5.5	6.1	10.9	8.8	5.4	0.2	
5.5 - 6.0	7.7	7.0	7.9	2.7	0.2	
6.0 - 6.5	7.9	9.0	8.8	3.2	0	
6.5 - 7.0	6.8	7.9	7.5	2.7	0.2	
7.0 - 7.5	7.7	7.0	7.0	1.1	0.2	
7.5 - 8.0	6.6	7.9	6.1	0.5	0	
8.0 - 8.5	6.3	5.4	3.8	0.5	0	
8.5 - 9.0	3.8	4.1	5.4	0.7	0.2	
9.0 - 9.5	5.7	5.2	2.7	0.2	0	
9.5 - 10.0	1.8	1.8	2.7	0.2	0	
10.0 - 11.0	4.8	4.8	4.3	0.2	0	
11.0 - 12.0	2.5	2.7	1.5	0		
12.0 - 13.0	0.9	1.4	0.7	0		
13.0 - 14.0	0.5	0.5	0.2	0		
14.0 - 15.0	0.2	0.2	0.2	0.2	0	
15.0 - 17.0	0	0	0.2	0.2	0	
17.0 - 19.0	0.5	0.5	0.5	0		
19.0 - 21.0	0	0.2	0.2	0		
21.0 - 23.0	0	0	0	0		
23.0 - 25.0	0	0	0	0		
25.0 - 30.0	0	0	0	0		
30.0 - 35.0	0.2	0	0	0		
35.0 - 40.0	0	0	0	0		
40.0 - 60.0	1.6	0	0	0		
0.0 - 60.0	89.0	95.5	98.2	99.8	99.8	

(b) Landing: Percent of flights vs times when landing flap deflection is increased to greater than indicated values

Figure 10. Continued.



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

Figure 10.- Flap deflection times.

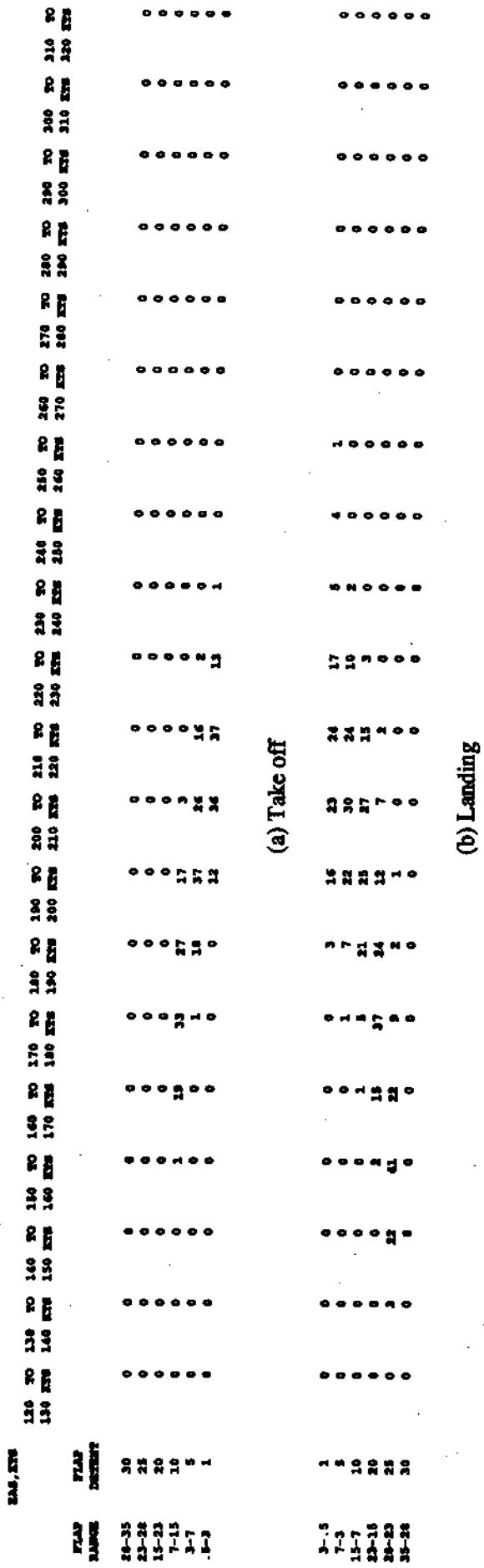
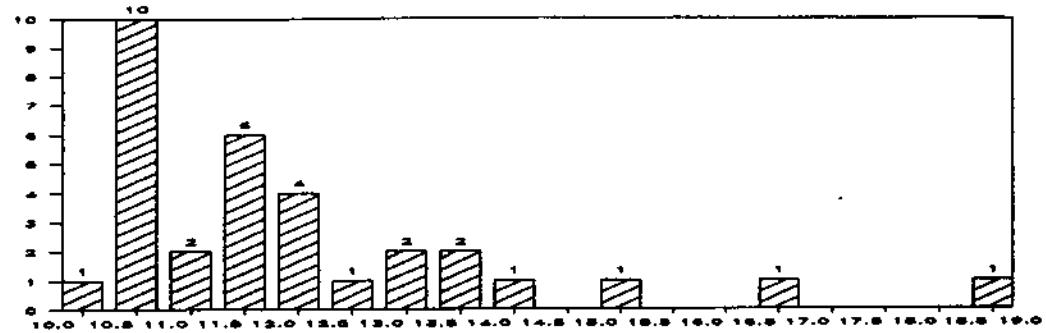
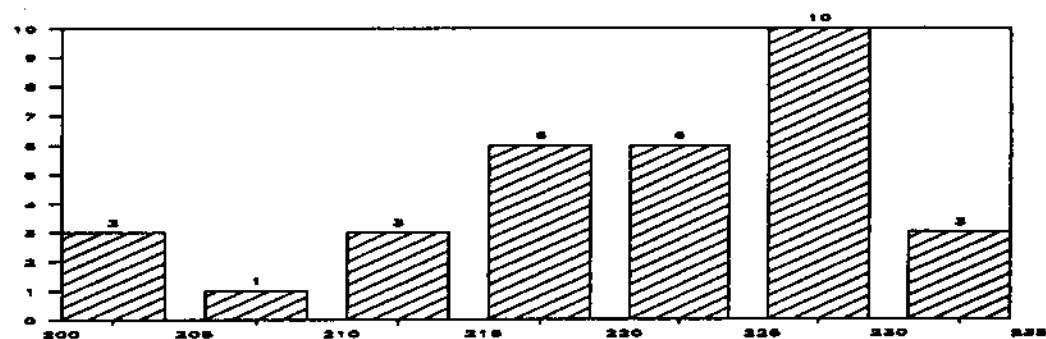


Figure 11.- Percent of flights vs equivalent airspeed at flap detent change.

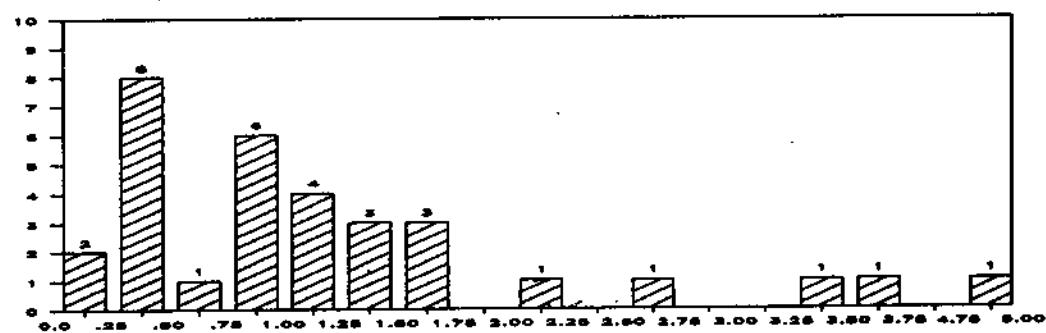
Number of Flights



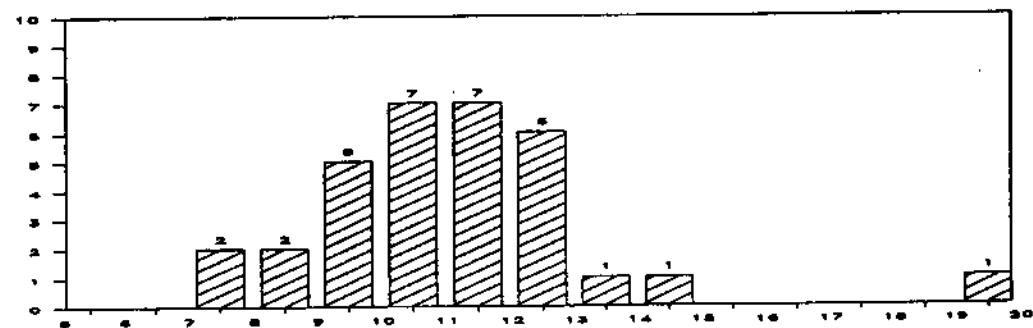
(a) Pressure altitude at initial flap deflection, kft.



(b) Calibrated airspeed at initial flap deflection, kft.



(c) Minutes above 10,000 ft. that flaps deflected > .5 degrees



(d) Minutes before touchdown of initial flap detection

Figure 12.- Flap use above 10,000 feet pressure altitude: 32 flights included.

LEVEL	PRESSURE ALTITUDE BANDS									
	-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
g's	0	0	0	0	0	0	0	0	0	0
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	0.02	0	0	0	0	0	0	0
.40	0.02	0.03	0.05	0.02	0.02	0	0	0.01	0.23	0.01
.30	0.43	0.54	0.15	0.09	0.02	0.01	0.01	0.03	2.27	0.08
.20	8.67	5.38	1.48	0.67	0.31	0.18	0.10	0.18	7.84	0.73
.15	33.46	19.32	5.27	2.76	1.40	1.15	0.50	0.60	16.24	2.68
.10	108.62	56.79	26.31	13.25	8.24	5.21	2.56	3.01	37.93	9.84
.05	304.47	162.73	126.33	76.55	55.57	38.07	25.99	22.64	120.37	45.20
0	669.40	636.77	653.44	785.69	685.27	983.03	1195.28	1202.38	1008.20	1114.77
-.05	233.94	131.60	62.30	51.91	36.56	32.49	18.45	19.61	103.57	34.96
-.10	60.86	27.06	12.94	7.36	4.68	3.52	2.13	2.46	32.36	5.97
-.15	14.58	7.10	2.86	1.82	0.85	0.68	0.46	0.55	12.38	1.42
-.20	3.35	2.31	0.67	0.60	0.14	0.08	0.11	0.17	6.13	0.39
-.30	0.12	0.26	0.05	0	0	0	0.01	0.02	1.36	0.04
-.40	0	0	0.02	0	0	0	0	0.01	0.57	0.01
-.50	0	0	0.02	0	0	0	0	0	0.11	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
-.200	0	0	0	0	0	0	0	0	0	0
-.300	0	0	0	0	0	0	0	0	0	0
-.400	0	0	0	0	0	0	0	0	0	0
-.500	0	0	0	0	0	0	0	0	0	0
FLIGHT BOOTS @ ALT	57.68	57.61	54.89	43.49	49.52	79.06	273.34	1065.45	9.31	1688.83
FLIGHT MIRRORS @ ALT	10712.91	14655.73	13759.60	17393.17	21054.53	36267.12	133304.10	516183.63	4282.14	772612.93
TOTAL FLIGHTERS									442	
TOTAL FLIGHT BOOTS FLAPS UP AND DOWN										1688.83
TOTAL FLIGHT MIRRORS FLAPS UP AND DOWN										772612.93

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

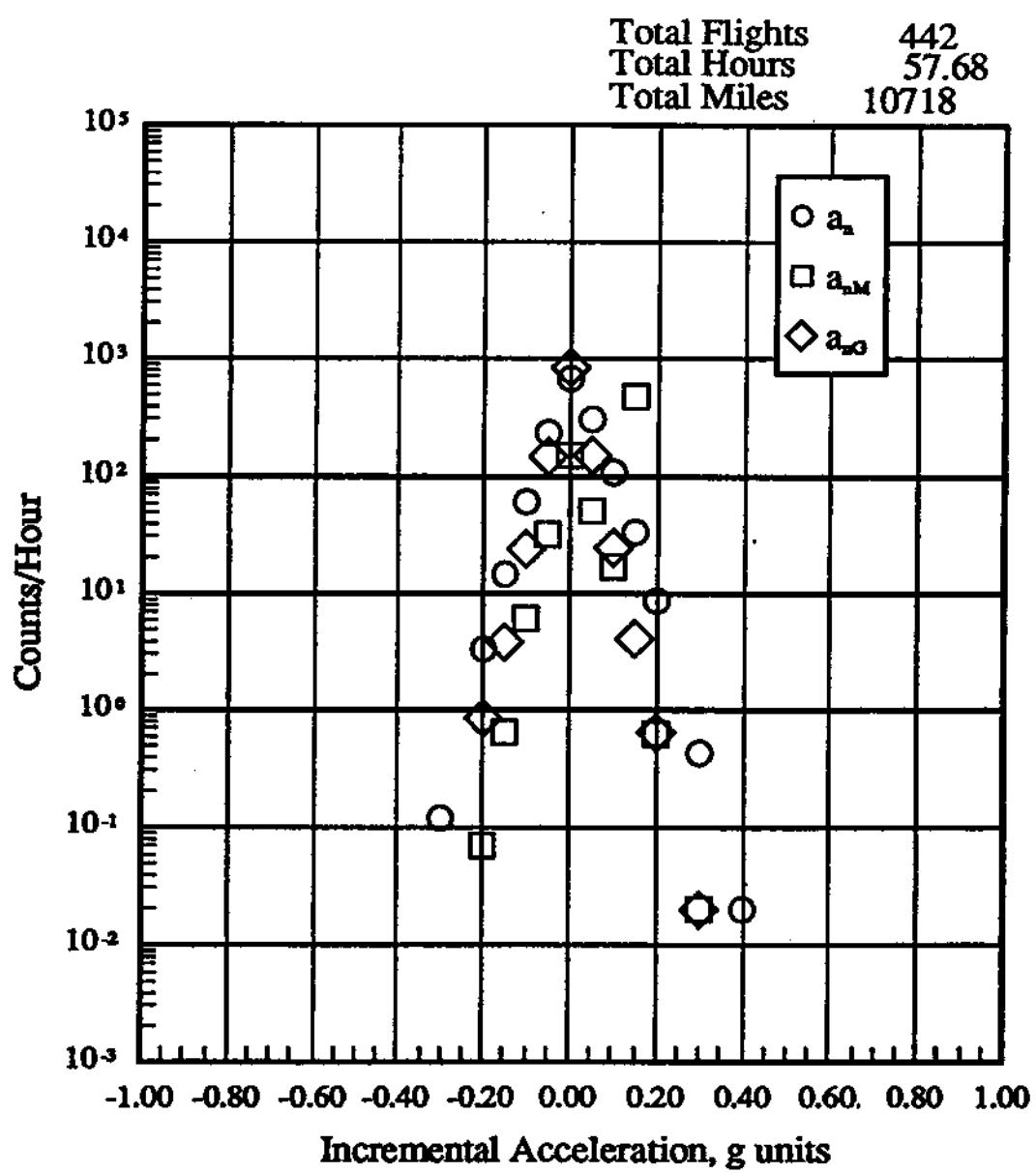
Figure 13.- Normal acceleration exceedances.

LEVEL G'S	PRESSURE ALTITUDE BANDS											
	-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		
.60	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.02	0.03	0	0	0.02	0.02	0.01	0	0	0	0.68	0.05
.20	0.62	0.43	0.15	0.02	0.42	0.14	0.03	0.01	0.02	0.79	0.29	0.29
.15	472.00	2.69	0.42	0.42	10.33	3.95	1.43	0.58	0.32	0.17	0.15	1.27
.10	17.06	34.51	25.02	12.17	119.33	114.36	121.65	117.93	162.15	2.29	14.86	6.48
.05	50.54	123.35	32.08	20.53	12.52	5.59	2.82	2.76	1.60	1.41	11.24	3.76
0	150.88	32.08	6.12	2.24	0.86	0.41	0.25	0.16	0.08	0.06	2.50	0.42
-.05	32.08	6.12	0.64	0.23	0.04	0.02	0.02	0	0	0	0.57	0.05
-.10	0	0.07	0.02	0	0	0	0	0	0	0	0.57	0.01
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.10	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0									

LEVEL	PRESSURE ALTITUDE BANDS										TOTAL FLIGHT HOURS FLAPS UP AND DOWN	TOTAL FLIGHT MILES FLAPS UP AND DOWN
	-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		
g' 3	0	0	0	0	0	0	0	0	0	0	0	0
1.60	0	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.02	0.05	0.02	0	0	0	0	0	0	0.01	0.23	0.01
.20	0.64	0.87	0.29	0.16	0.02	0.03	0.02	0.04	0.04	1.59	0.10	
.15	4.11	2.79	0.97	0.60	0.25	0.14	0.11	0.14	0.14	4.66	0.43	
.10	24.52	10.85	4.23	2.58	1.38	0.94	0.48	0.69	0.69	13.06	2.07	
.05	150.37	63.79	26.51	17.62	11.95	8.90	4.89	6.32	6.32	49.60	14.42	
0	932.76	349.54	873.74	962.55	1025.26	1085.15	1143.63	1121.41	1088.03	1089.10		
-.05	147.62	63.44	26.25	17.48	12.45	8.17	4.99	6.36	6.36	48.15	14.32	
-.10	23.94	11.75	4.12	2.83	1.48	0.68	0.59	0.72	0.72	14.31	2.12	
-.15	3.85	2.85	0.97	0.60	0.25	0.11	0.12	0.15	0.15	4.43	0.42	
-.20	0.95	0.92	0.22	0.14	0	0.03	0.01	0.04	0.04	1.46	0.11	
-.30	0	0.03	0	0	0	0	0	0.01	0.01	0	0.01	
-.40	0	0	0	0	0	0	0	0	0	0	0	
-.50	0	0	0	0	0	0	0	0	0	0	0	
-.60	0	0	0	0	0	0	0	0	0	0	0	
-.70	0	0	0	0	0	0	0	0	0	0	0	
-.80	0	0	0	0	0	0	0	0	0	0	0	
-.90	0	0	0	0	0	0	0	0	0	0	0	
-.1.00	0	0	0	0	0	0	0	0	0	0	0	
-.1.20	0	0	0	0	0	0	0	0	0	0	0	
-.1.40	0	0	0	0	0	0	0	0	0	0	0	
-.1.60	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.91	1688.83		
FLIGHT MILES @ ALT	10712.91	14555.73	10759.60	17393.17	21054.53	36267.12	133304.10	516103.63	4282.14	772612.93		
TOTAL FLIGHTS									442			
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									1688.83			
TOTAL FLIGHT MILES FLAPS UP AND DOWN									772612.93			

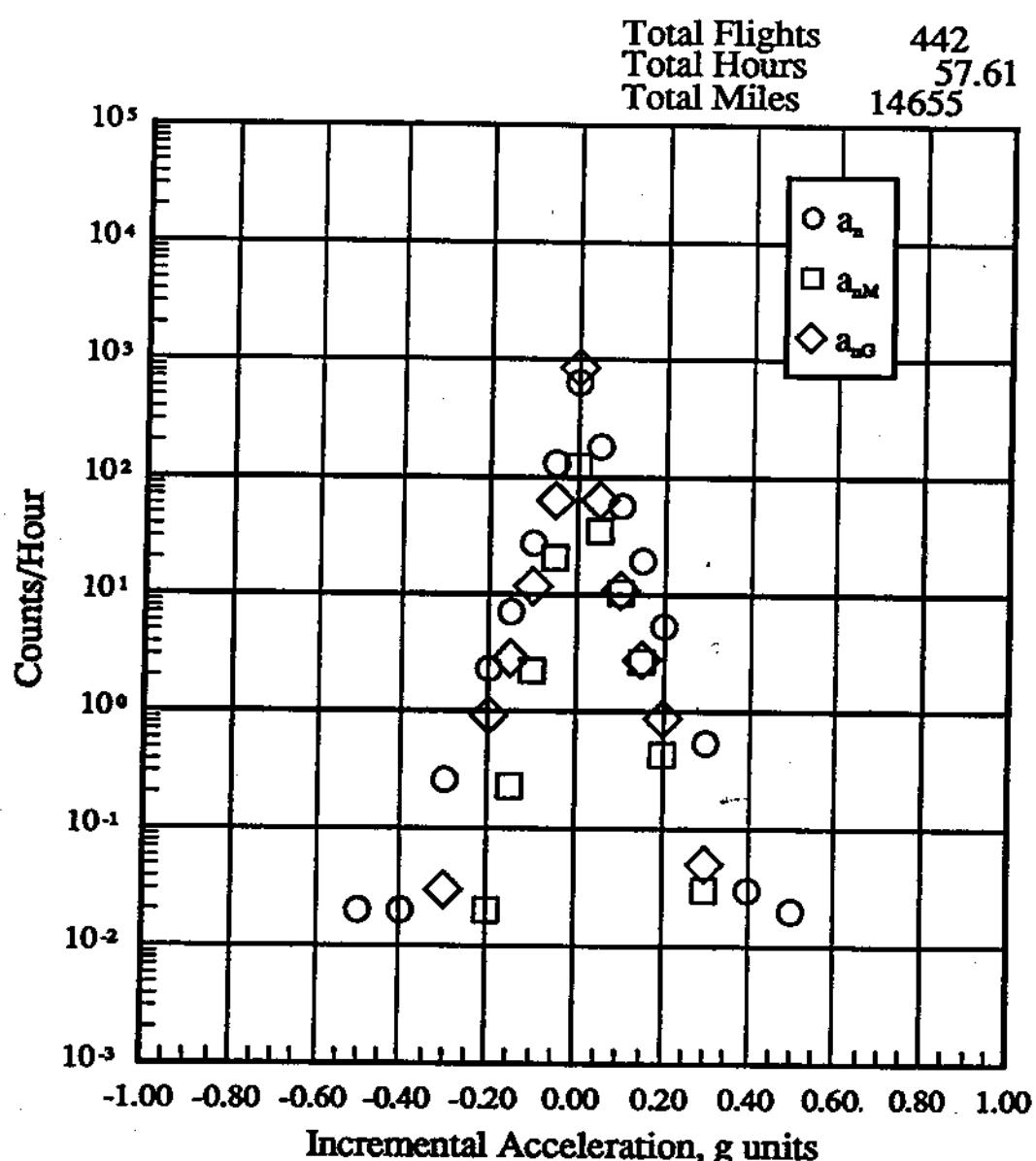
(c)  $a_{nG}$  Level crossing counts per hour within pressure altitude bands

Figure 13.- Continued.



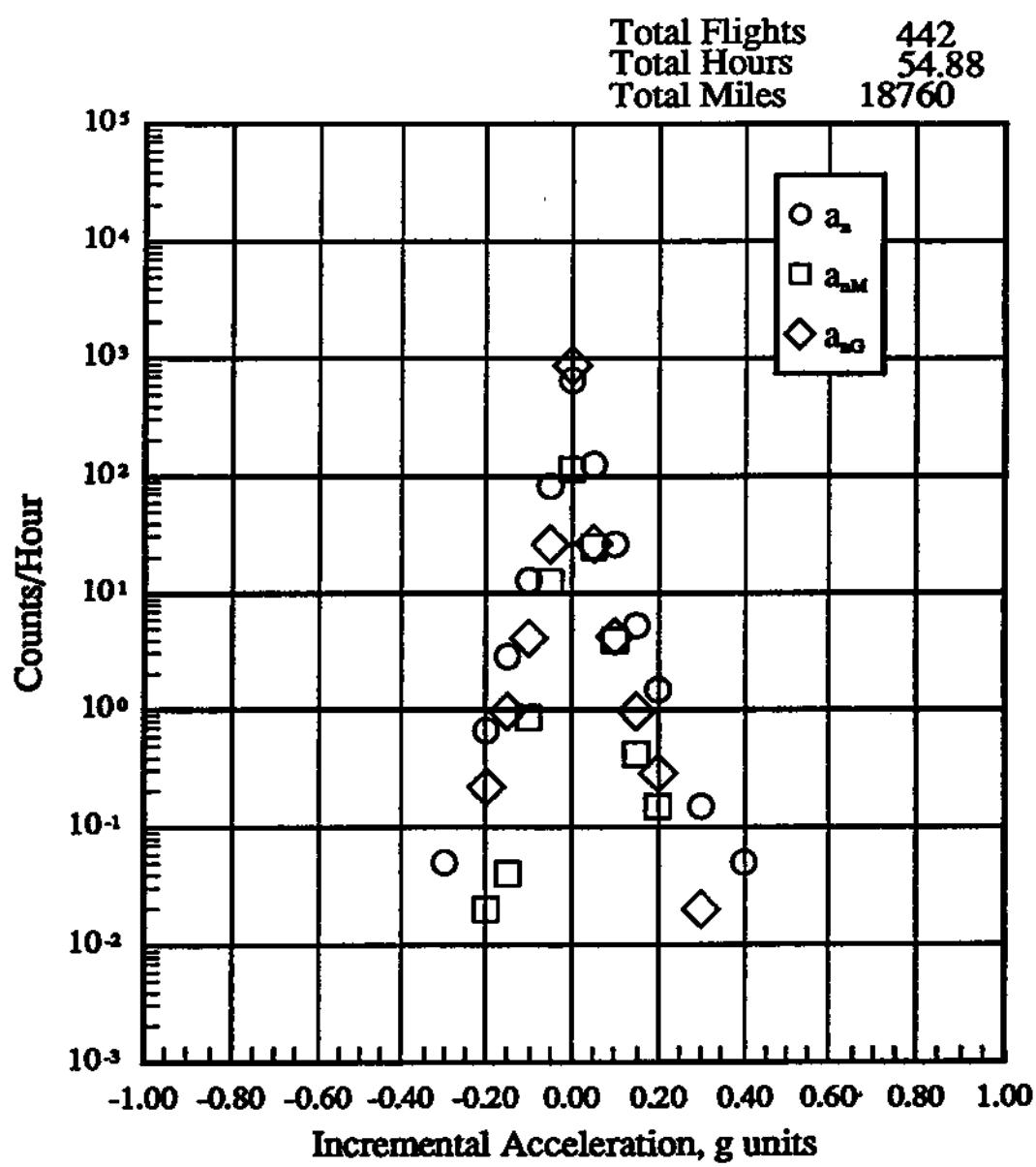
(d)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 4500 feet altitude

Figure 13.- Continued.



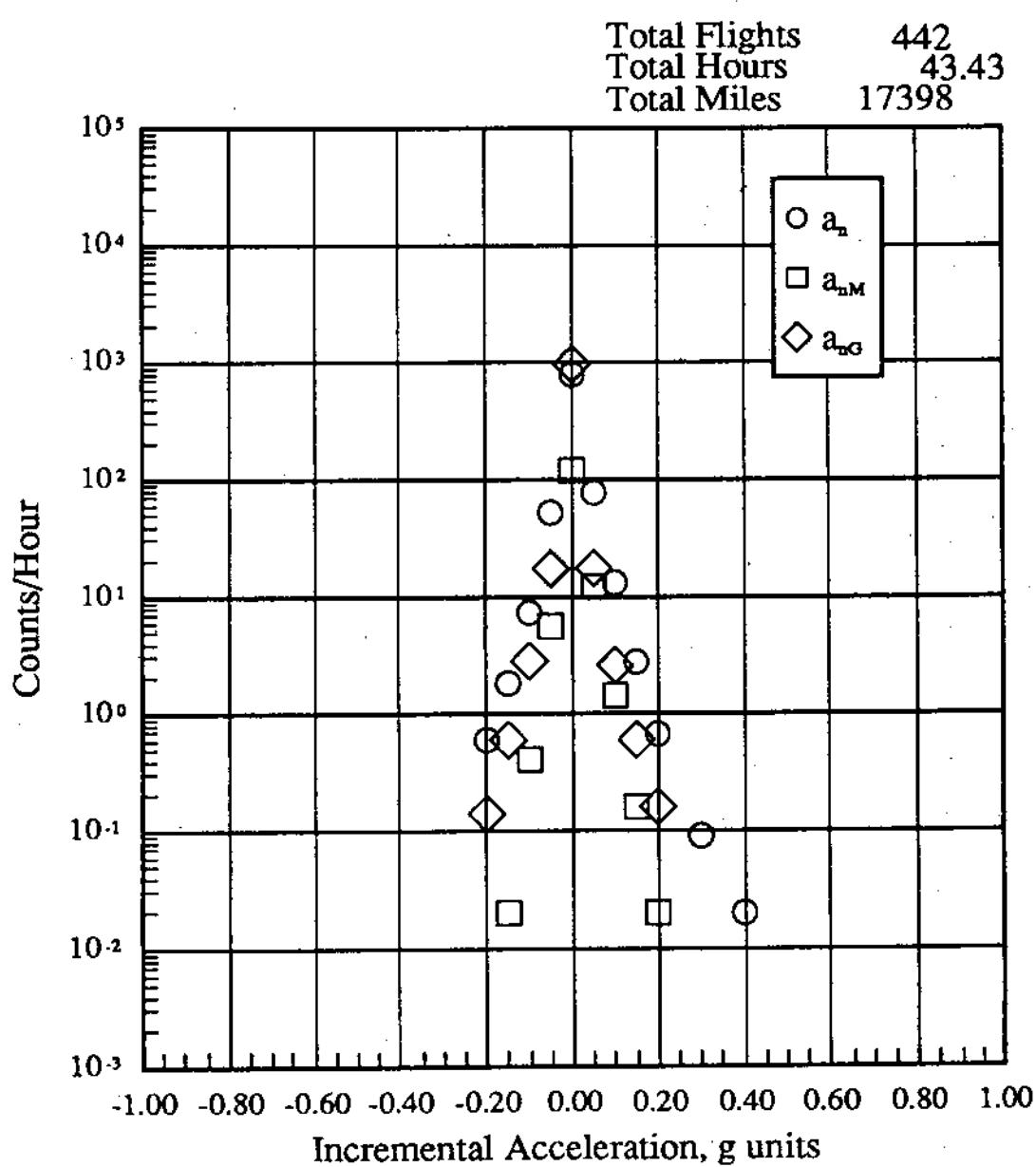
(e)  $a_s$ ,  $a_M$ ,  $a_G$ , 4500 to 9500 feet altitude

Figure 13.- Continued.



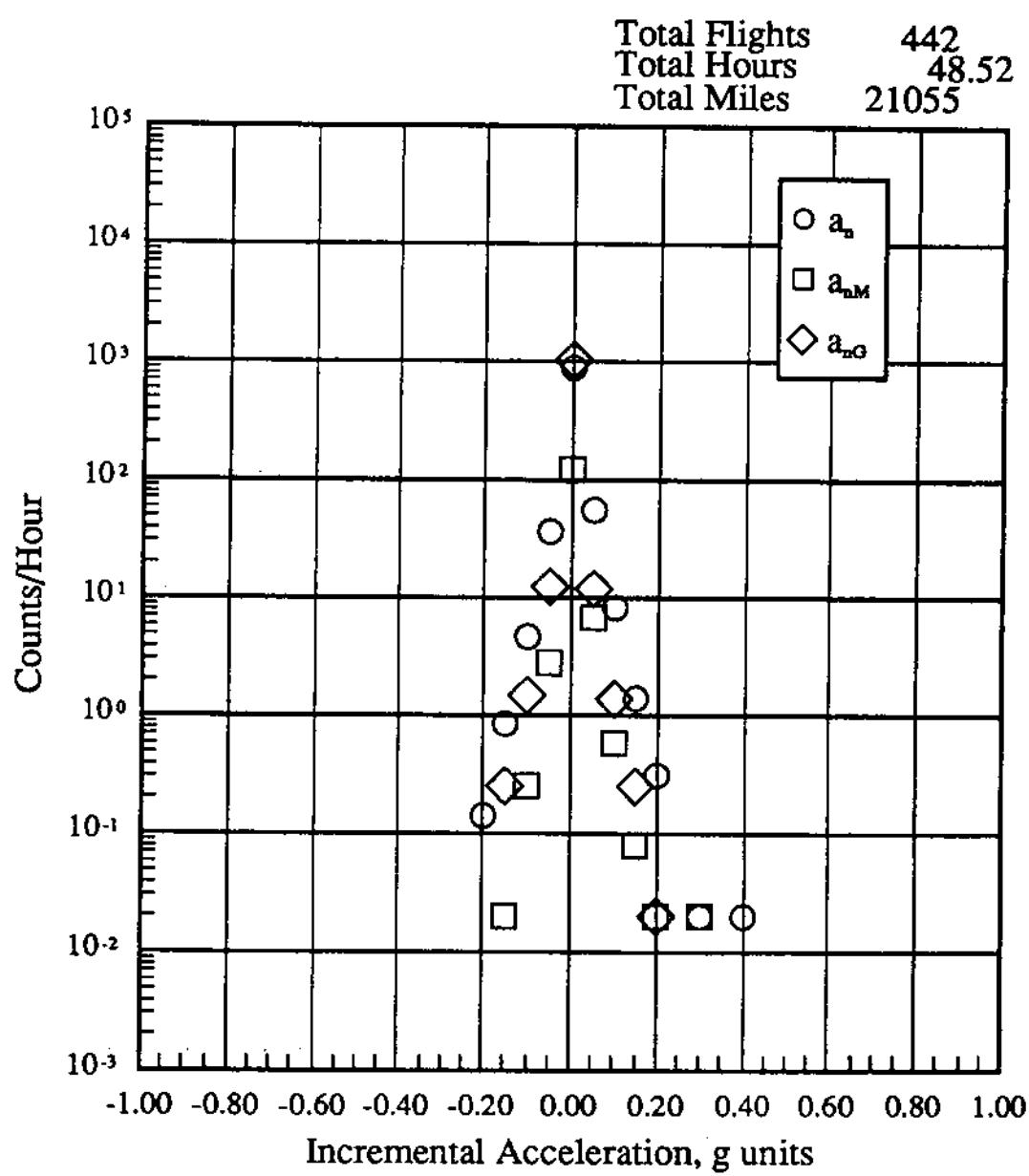
(f)  $a_n$ ,  $a_{AM}$ ,  $a_{AC}$ , 9500 to 14500 feet altitude

Figure 13.- Continued.



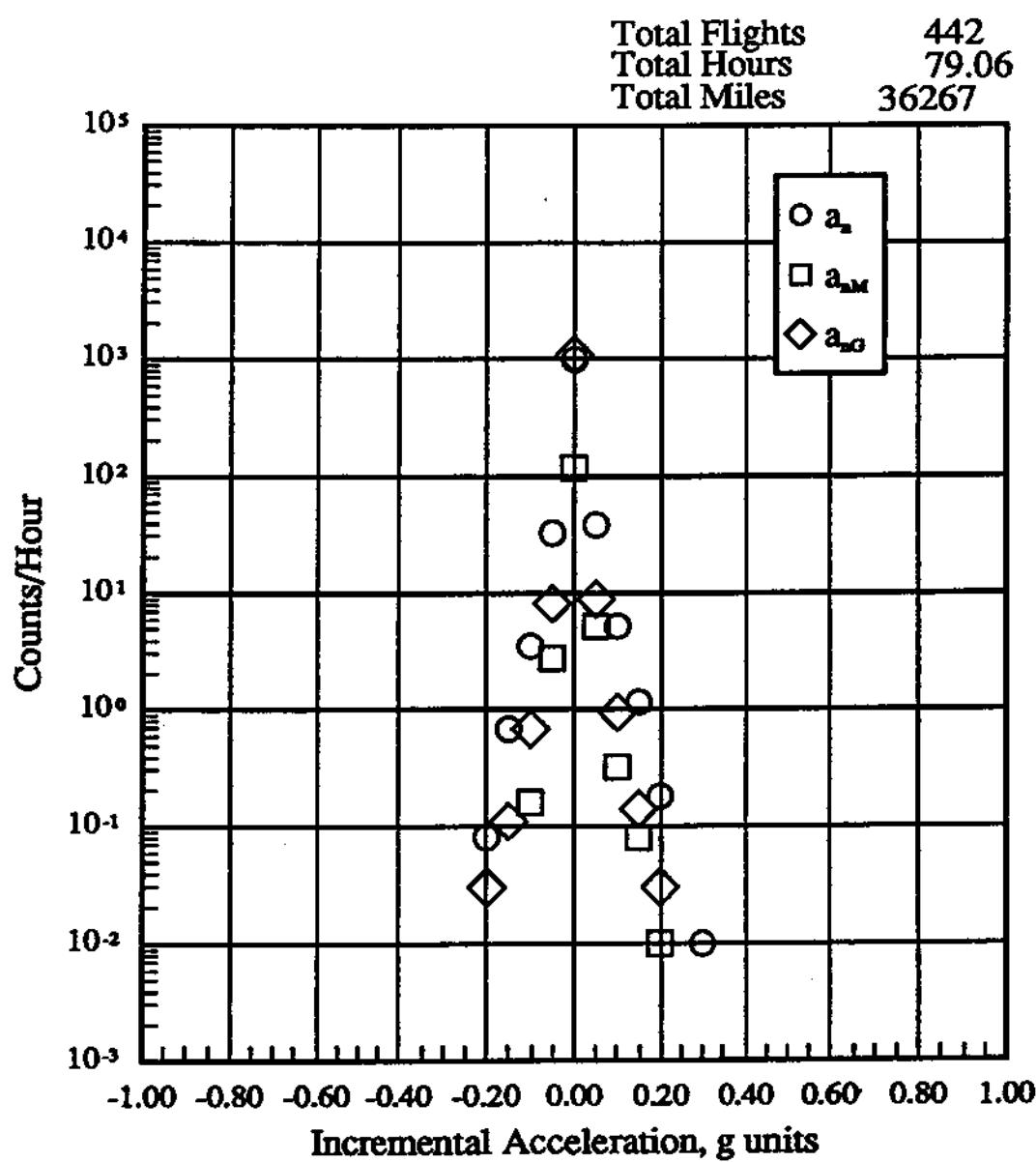
(g)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 14500 to 19500 feet altitude

Figure 13.- Continued.



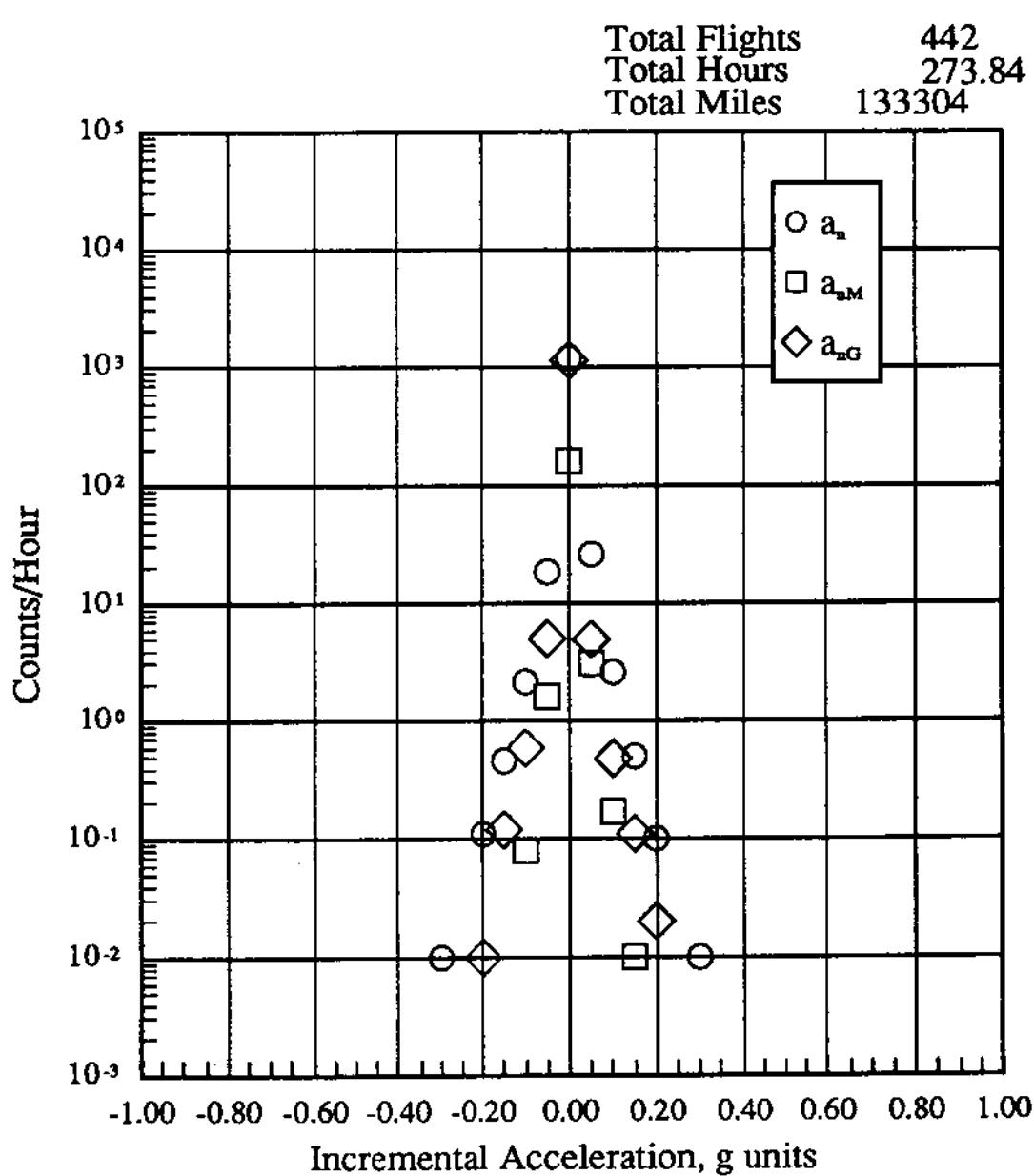
(h)  $a_n$ ,  $a_{nm}$ ,  $a_{ng}$ , 19500 to 24500 feet altitude

Figure 13.- Continued.



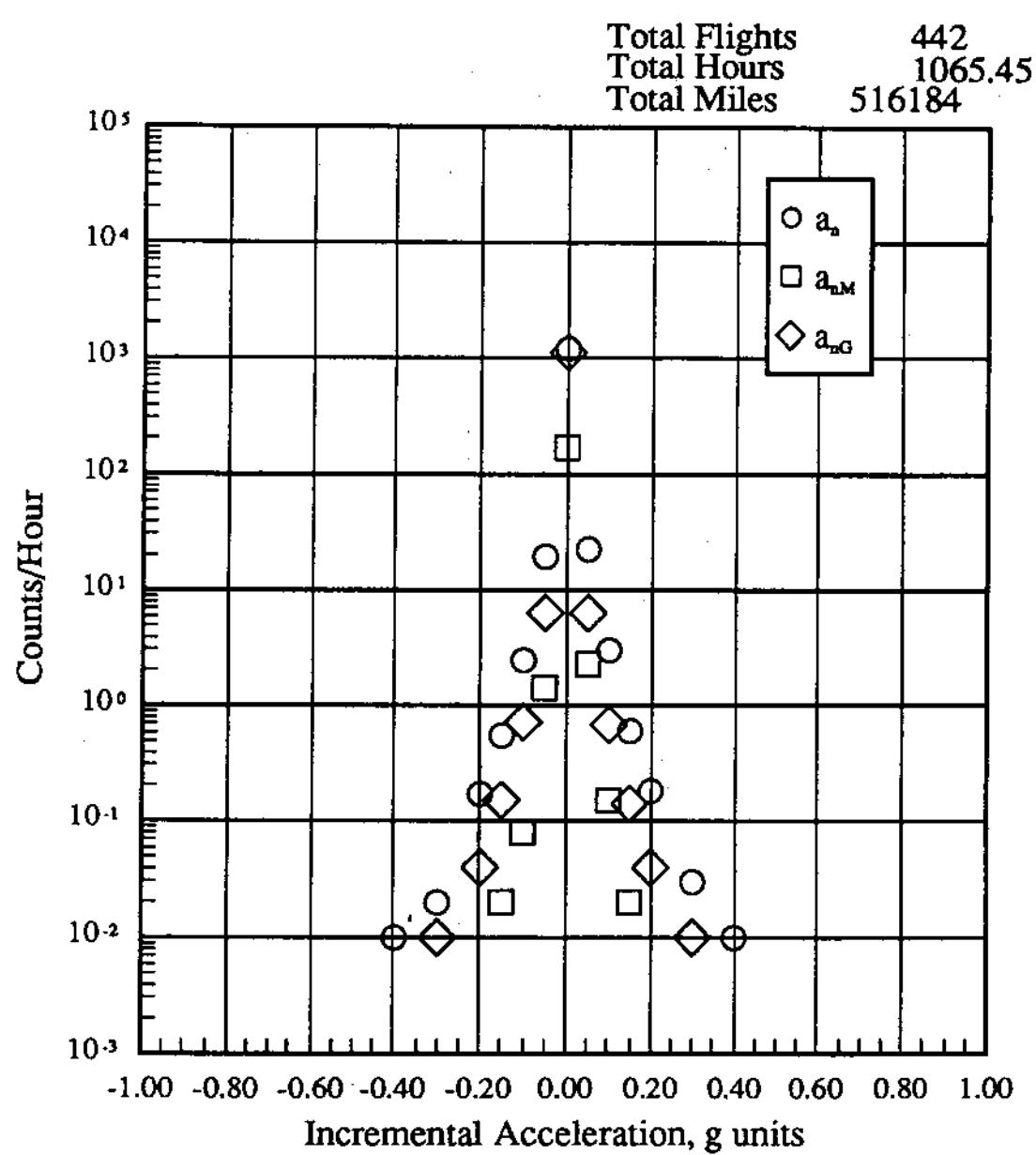
(i)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 24500 to 29500 feet altitude

Figure 13.- Continued.



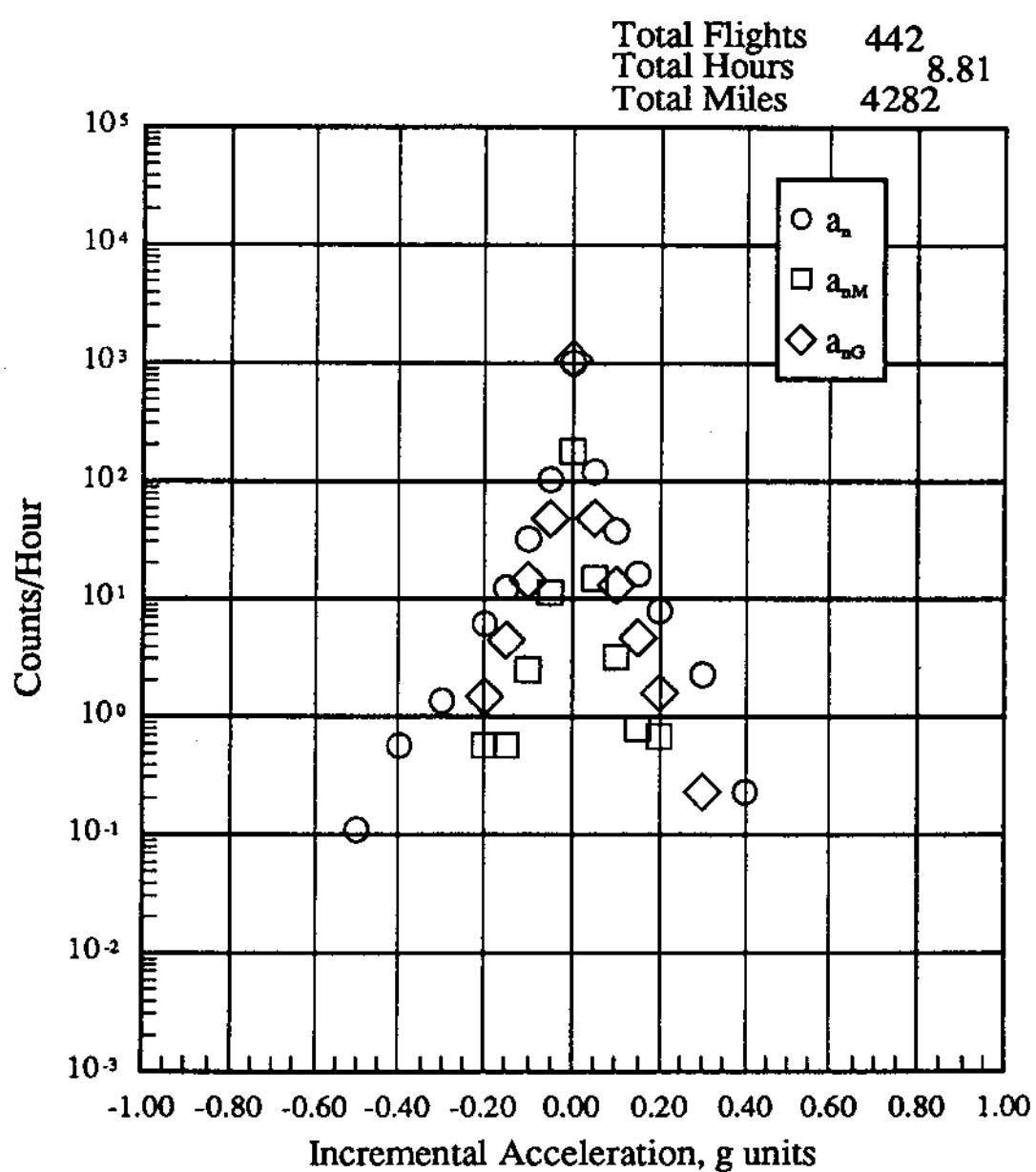
(j)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 29500 to 34500 feet altitude

Figure 13.- Continued.



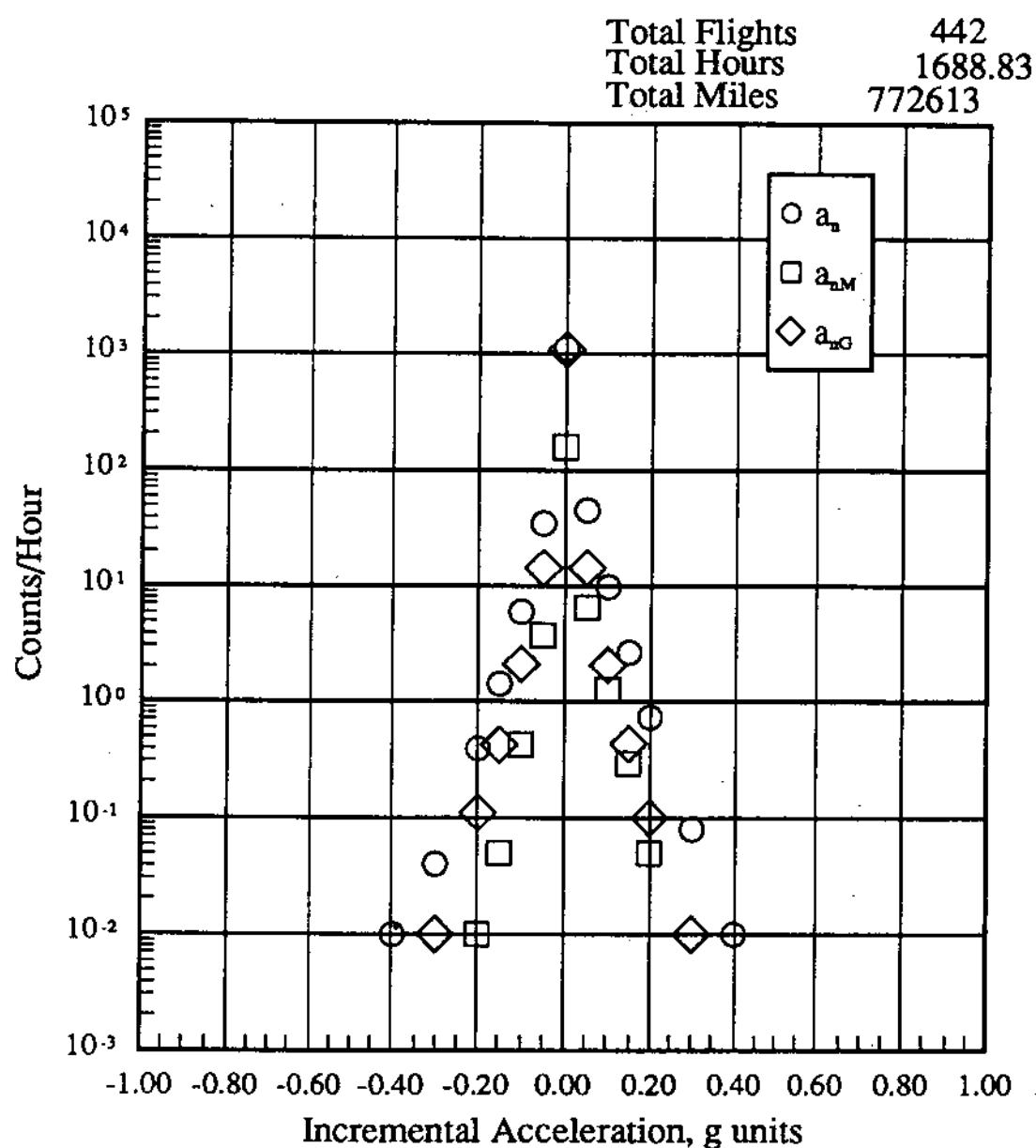
(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

Figure 13.- Continued.



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

Figure 13.- Continued.



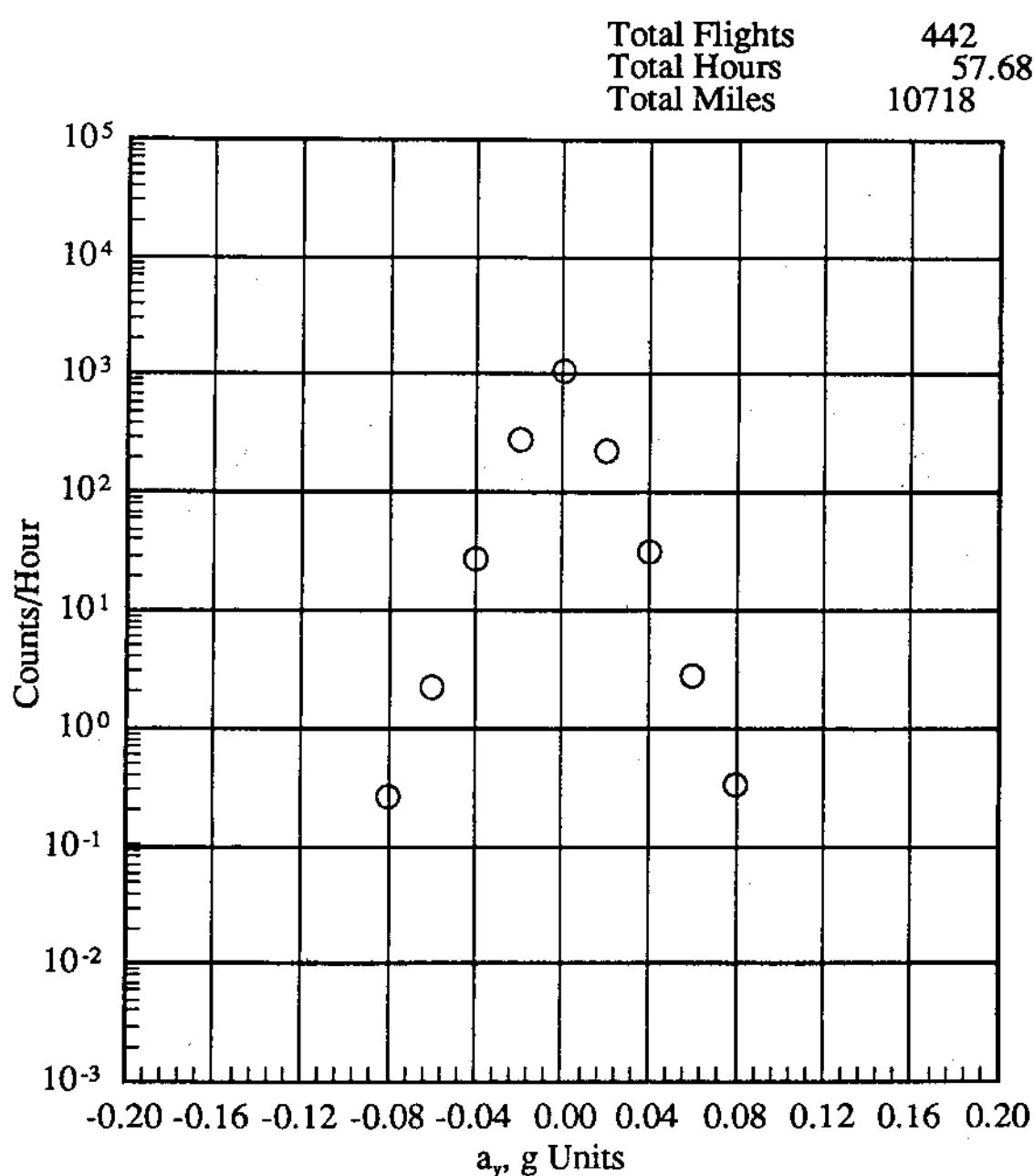
(m)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 44500 feet altitude

Figure 13.- Concluded.

LEVEL $a_y$ g's	PRESSURE ALTITUDE BANDS											
	-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	39500 TO 44500 FT	-500 TO 4500 FT	
.48	0	0	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0
.16	0	0	0	0	0	0	0	0	0	0	0	0
.12	0	0	0	0	0.02	0	0	0	0	0	0	0
.08	0.33	0.09	0.09	0.12	0.02	0	0	0	0	0	0	0
.06	2.76	0.94	0.66	0.46	0.11	0.23	0.03	0.04	0.25	0.06	0.36	0.36
.04	31.59	8.99	2.92	2.23	2.12	1.78	1.03	1.35	4.77	0.77	2.80	2.80
.02	228.12	84.68	29.02	16.70	20.09	15.96	9.67	13.75	79.72	24.03	1274.08	1274.08
0	1077.16	950.24	593.08	569.08	647.19	1022.62	1394.45	1387.04	1368.87	1022.89	38.51	38.51
-.02	283.44	165.51	123.22	86.83	62.45	37.35	13.86	16.38	10.17	3.30	0.45	0.45
-.04	27.13	16.68	9.47	6.79	2.60	2.33	0.90	1.40	0.26	0.08	0.02	0.02
-.06	2.20	2.22	1.55	1.10	0.29	0.27	0.08	0.16	0.06	0.02	0.01	0.01
-.08	0.26	0.28	0.18	0.48	0.04	0.06	0.02	0.02	0.01	0.01	0.00	0.00
-.12	0	0.02	0	0.07	0	0	0	0	0	0	0	0
-.16	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.91	1688.83	442	442
FLIGHT MILES @ ALT	10712.91	14635.73	18759.60	17393.17	21054.53	36267.12	133304.10	516183.63	4282.14	772612.93	1688.83	1688.83
TOTAL FLIGHTS												
TOTAL FLIGHT HOURS FLAPS UP AND DOWN												
TOTAL FLIGHT MILES FLAPS UP AND DOWN												

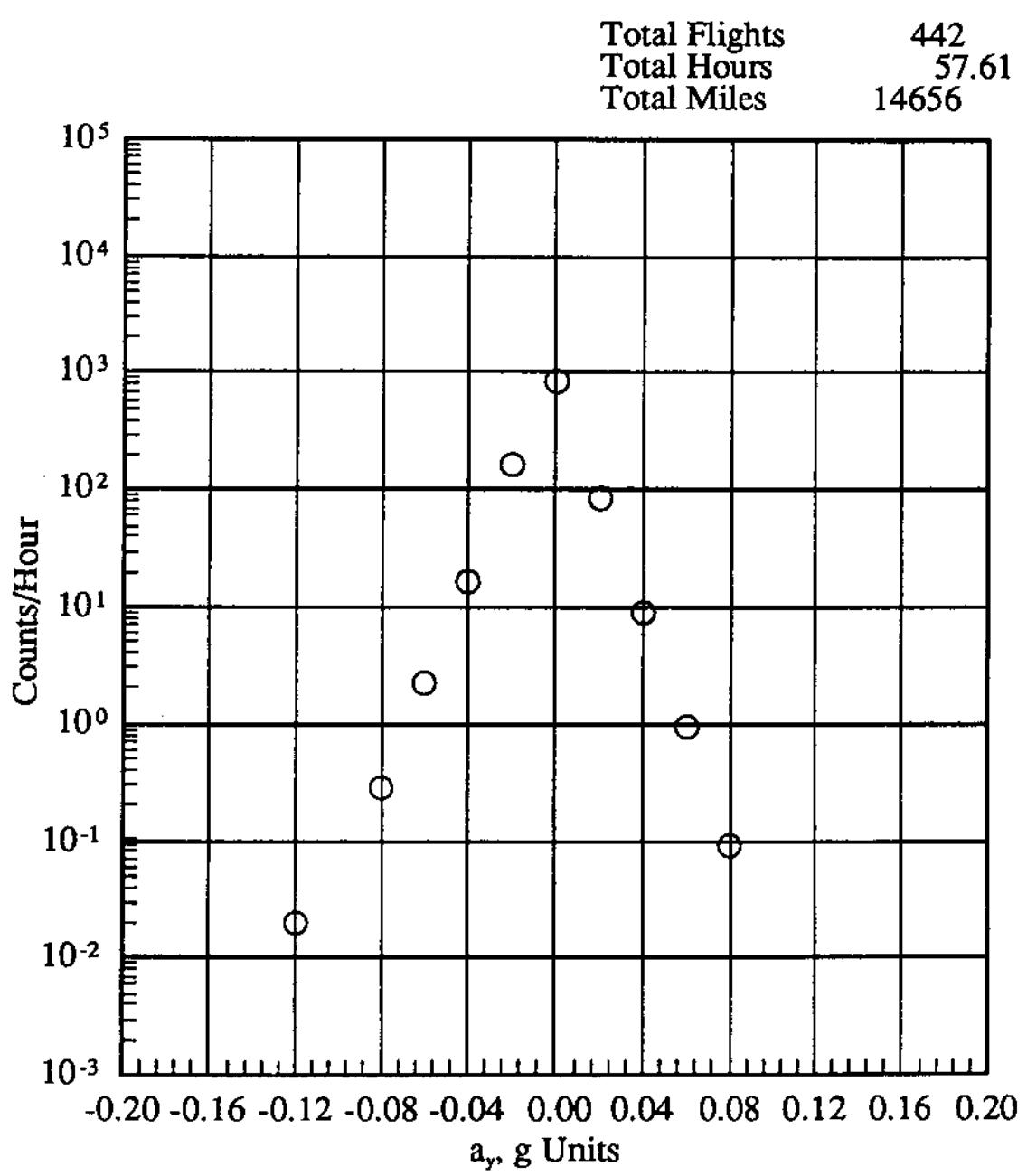
(a)  $a_y$  Level crossing counts per hour within pressure altitude bands

Figure 14.- Lateral acceleration exceedances.



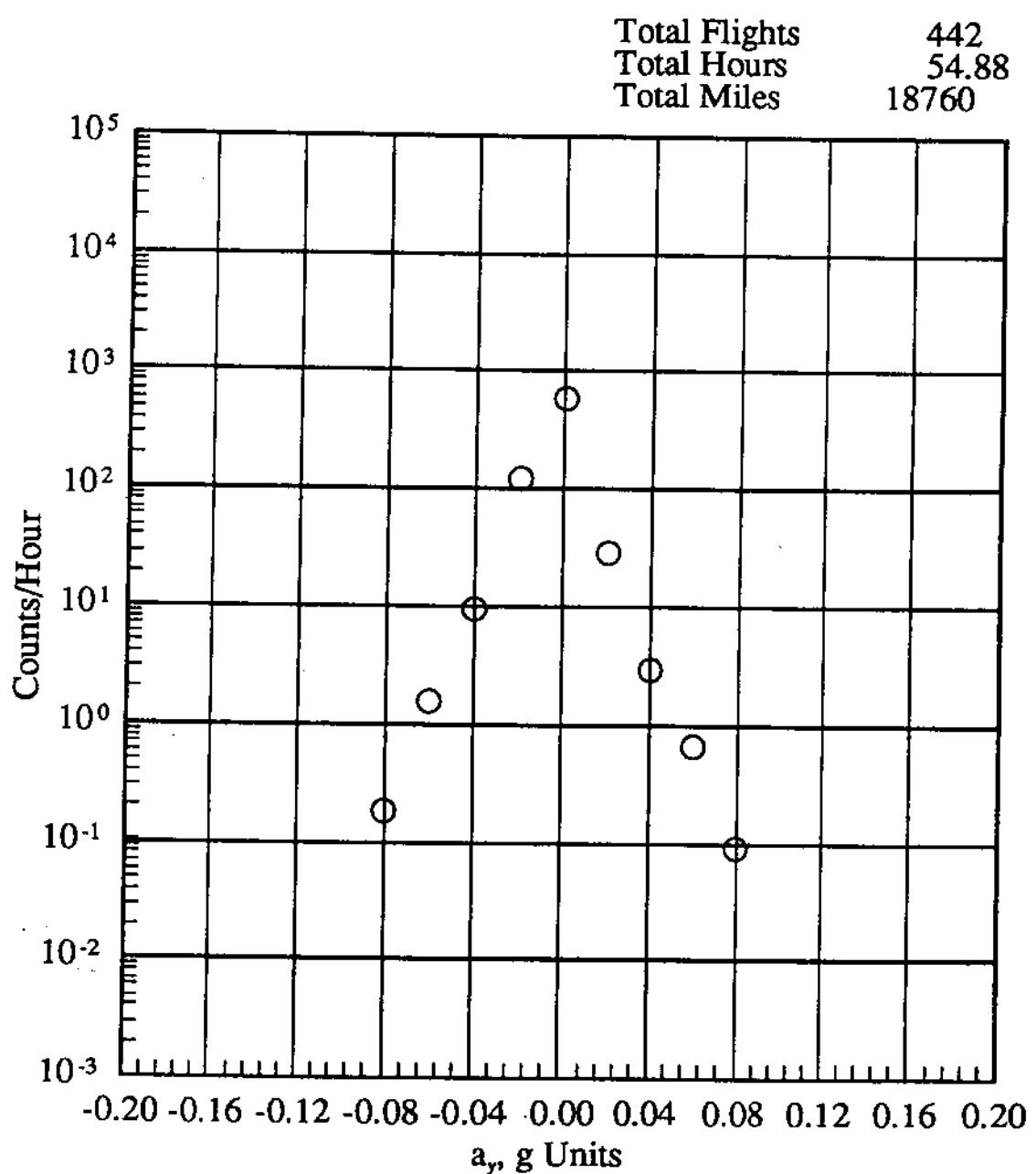
(b) -500 to 4500 feet altitude

Figure 14.- Continued.



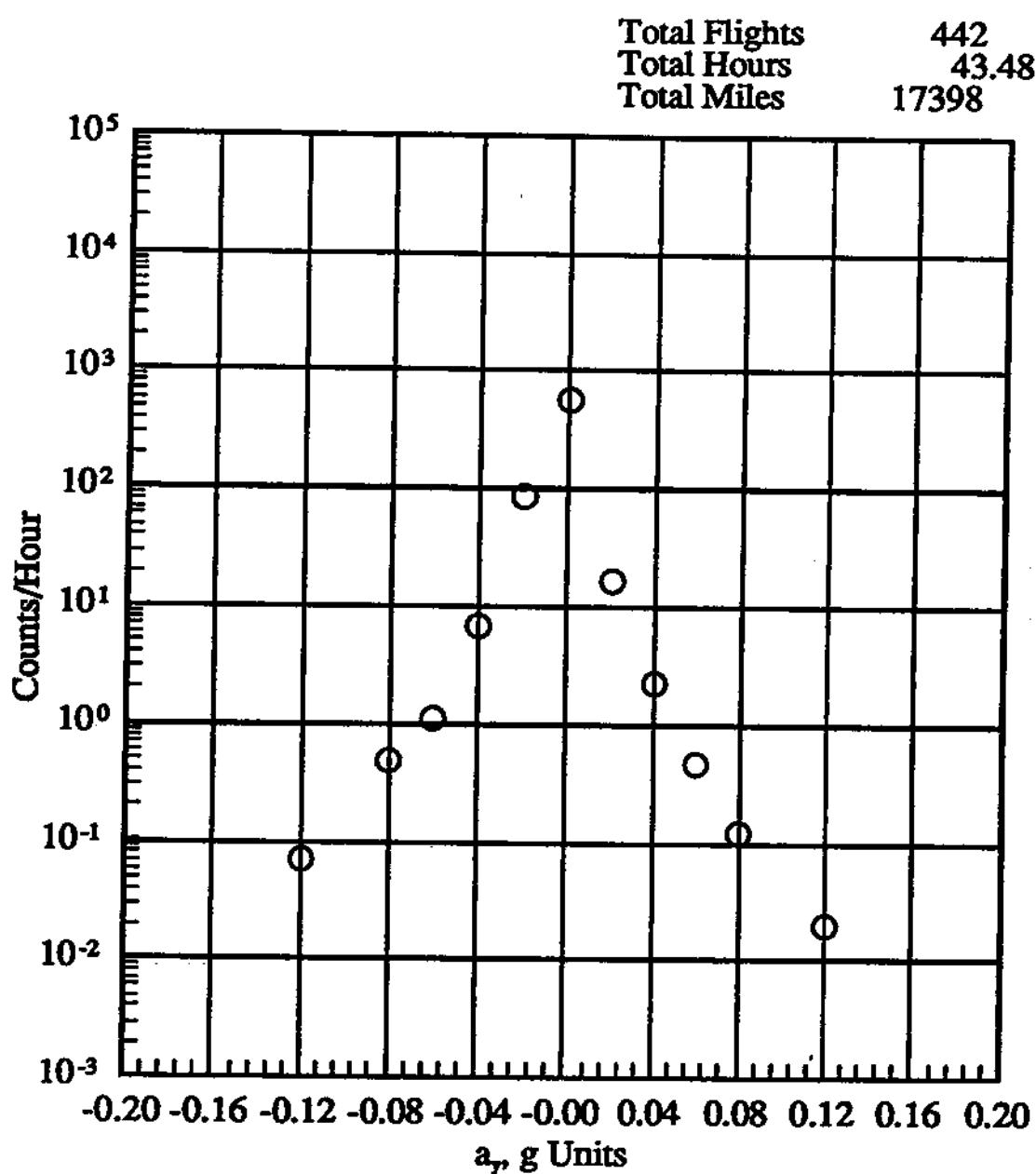
(c) 4500 to 9500 feet altitude

Figure 14.- Continued.



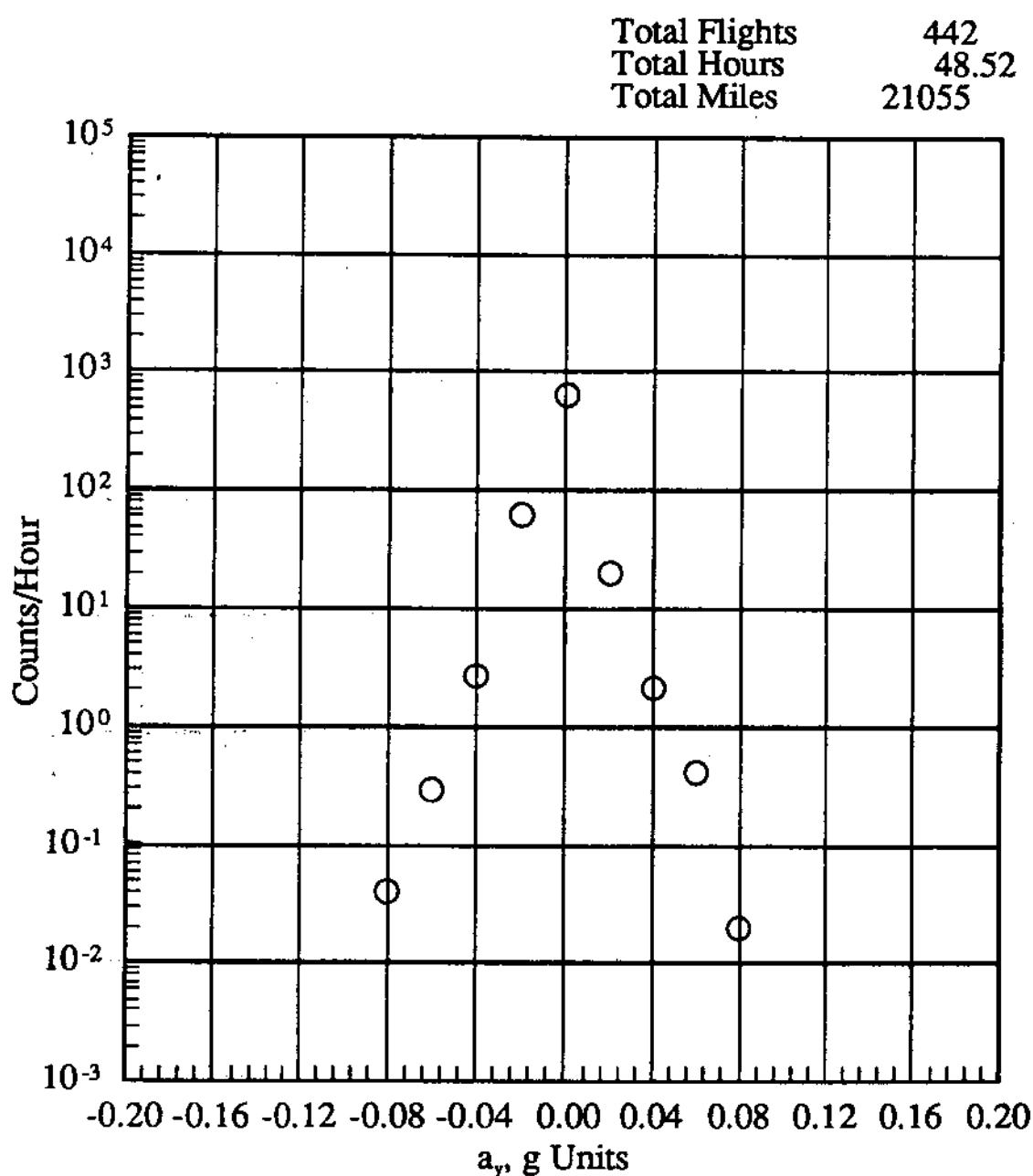
(d) 9500 to 14500 feet altitude

Figure 14.- Continued.



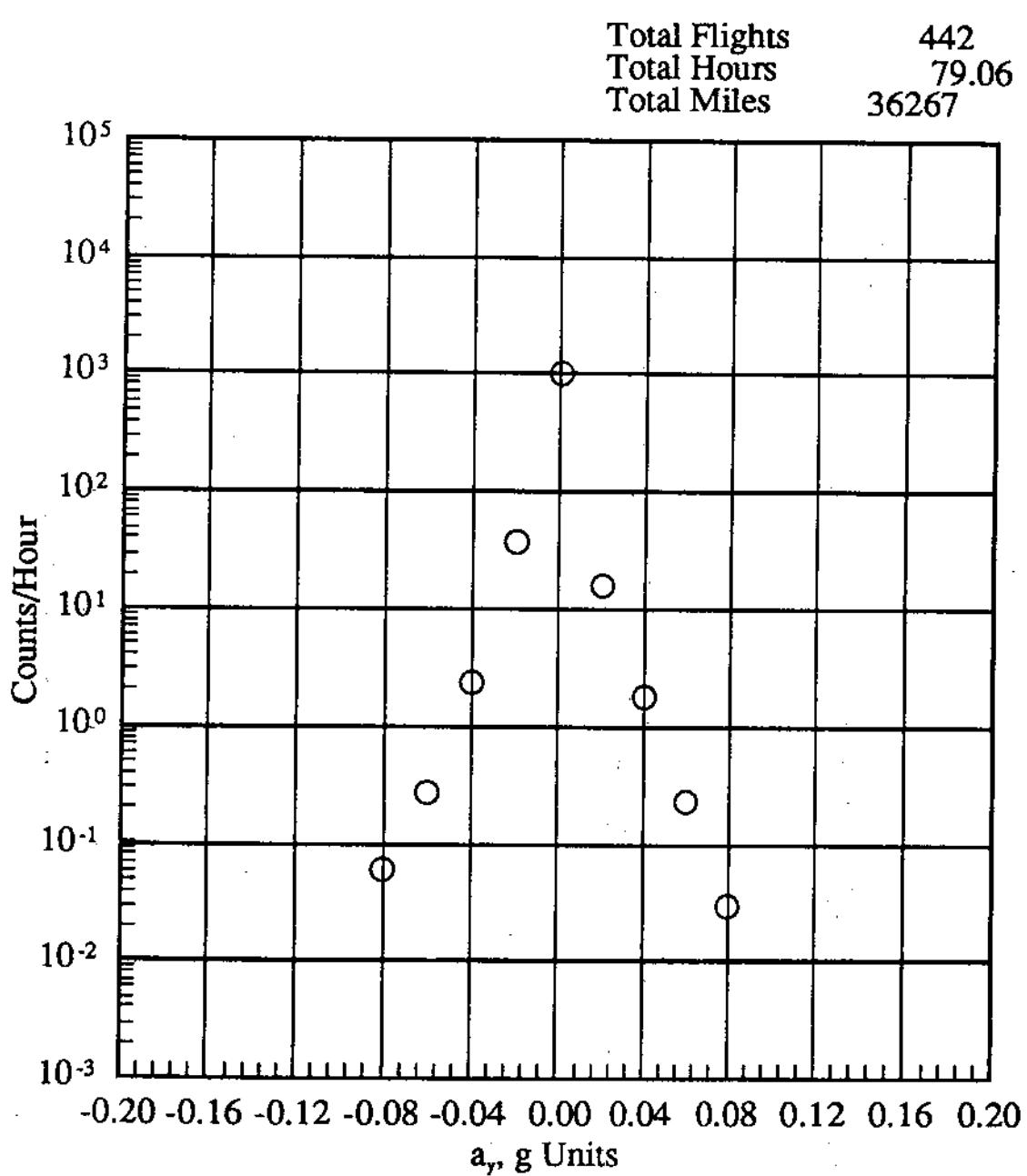
(e) 14500 to 19500 feet altitude

Figure 14.- Continued.



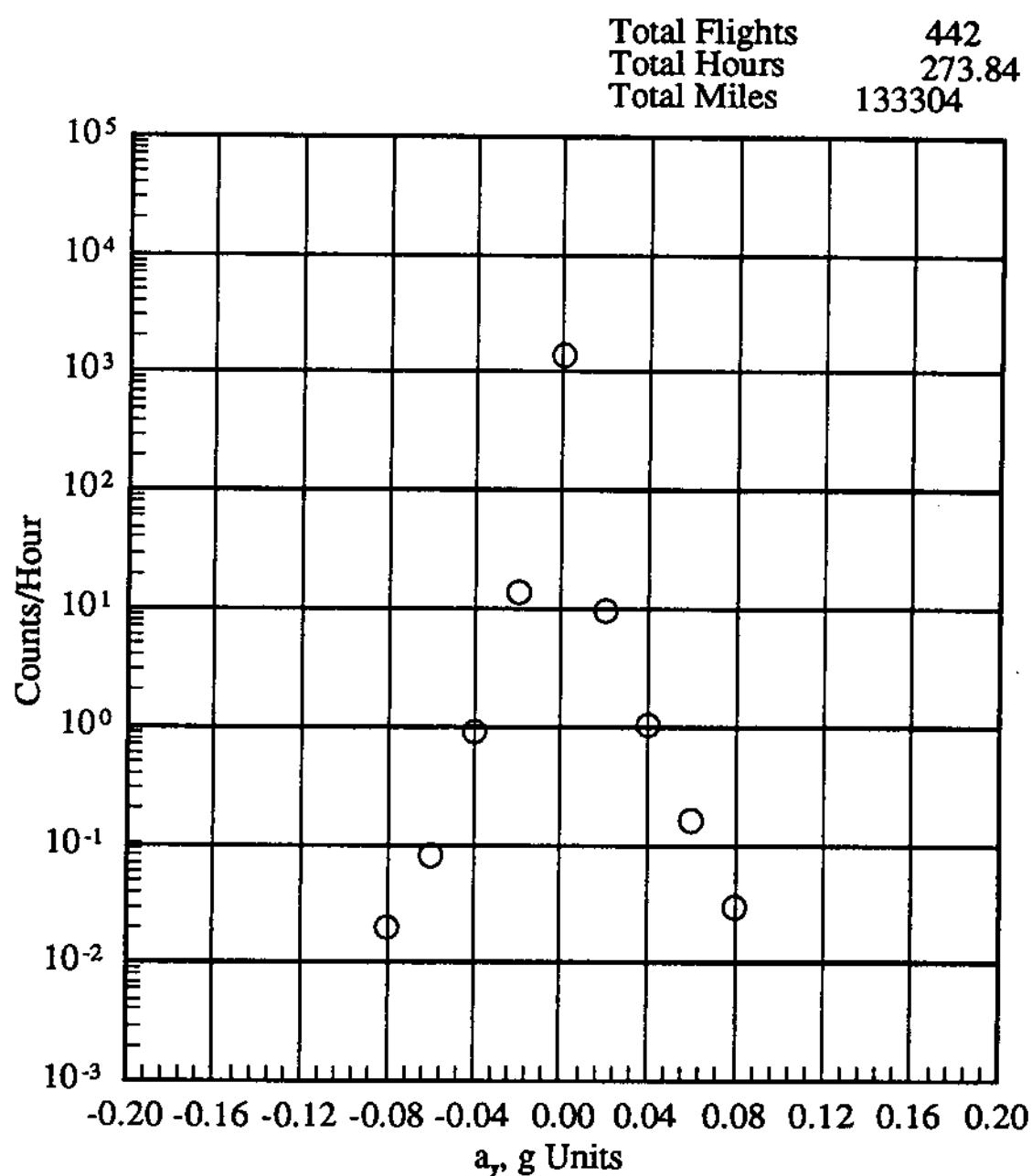
(f) 19500 to 24500 feet altitude

Figure 14.- Continued.



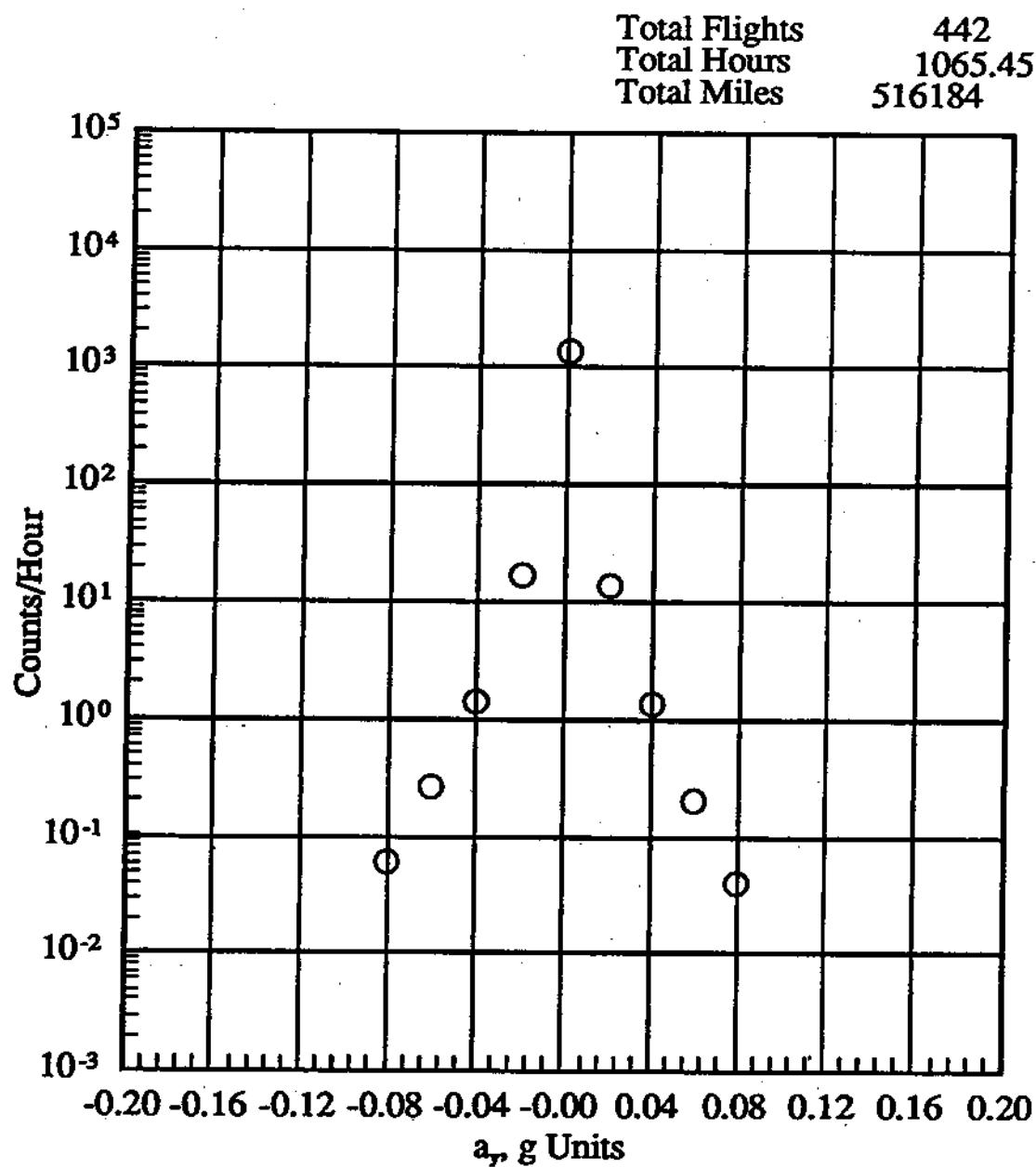
(g) 24500 to 29500 feet altitude

Figure 14.- Continued.



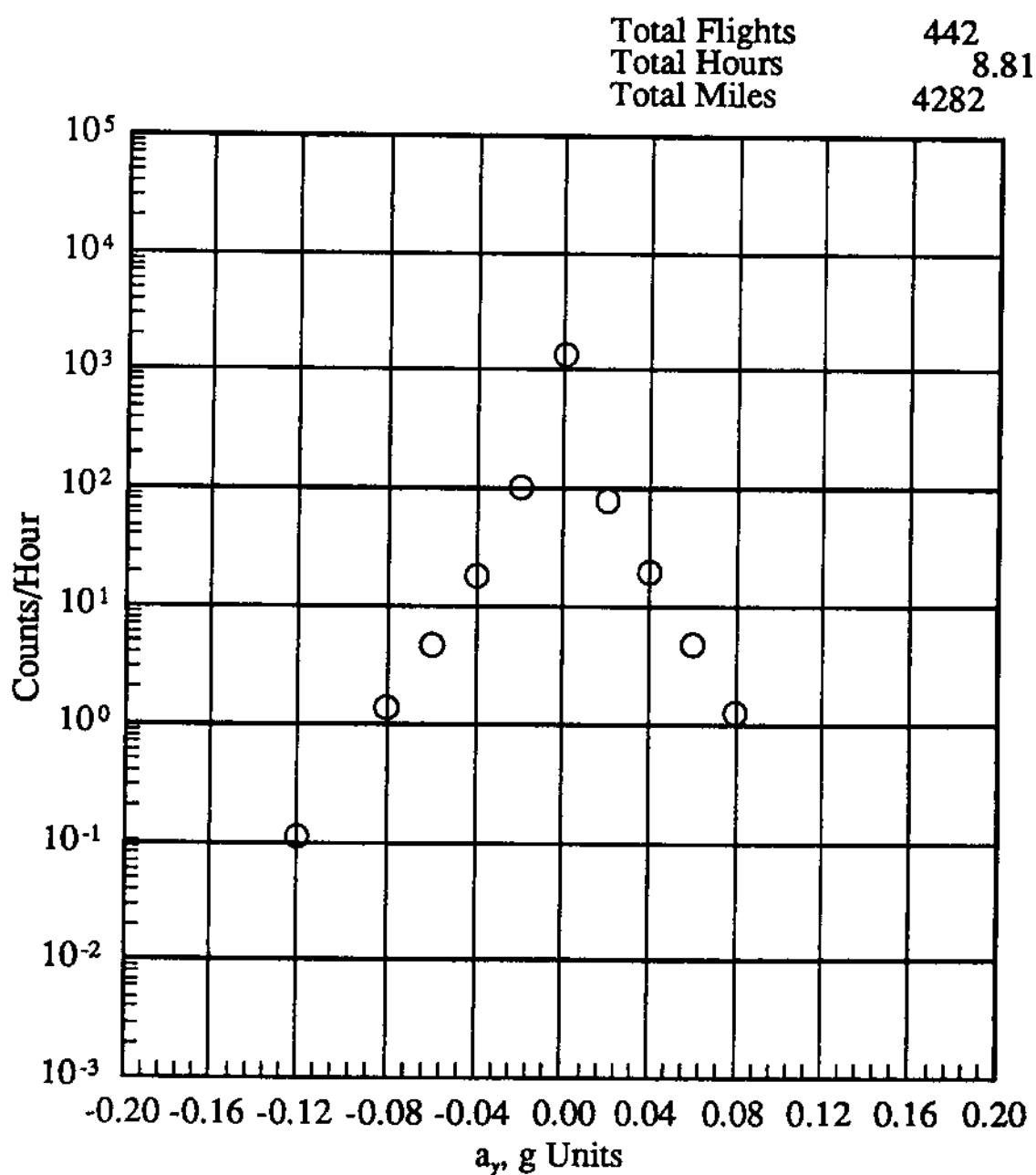
(h) 29500 to 34500 feet altitude

Figure 14.- Continued.



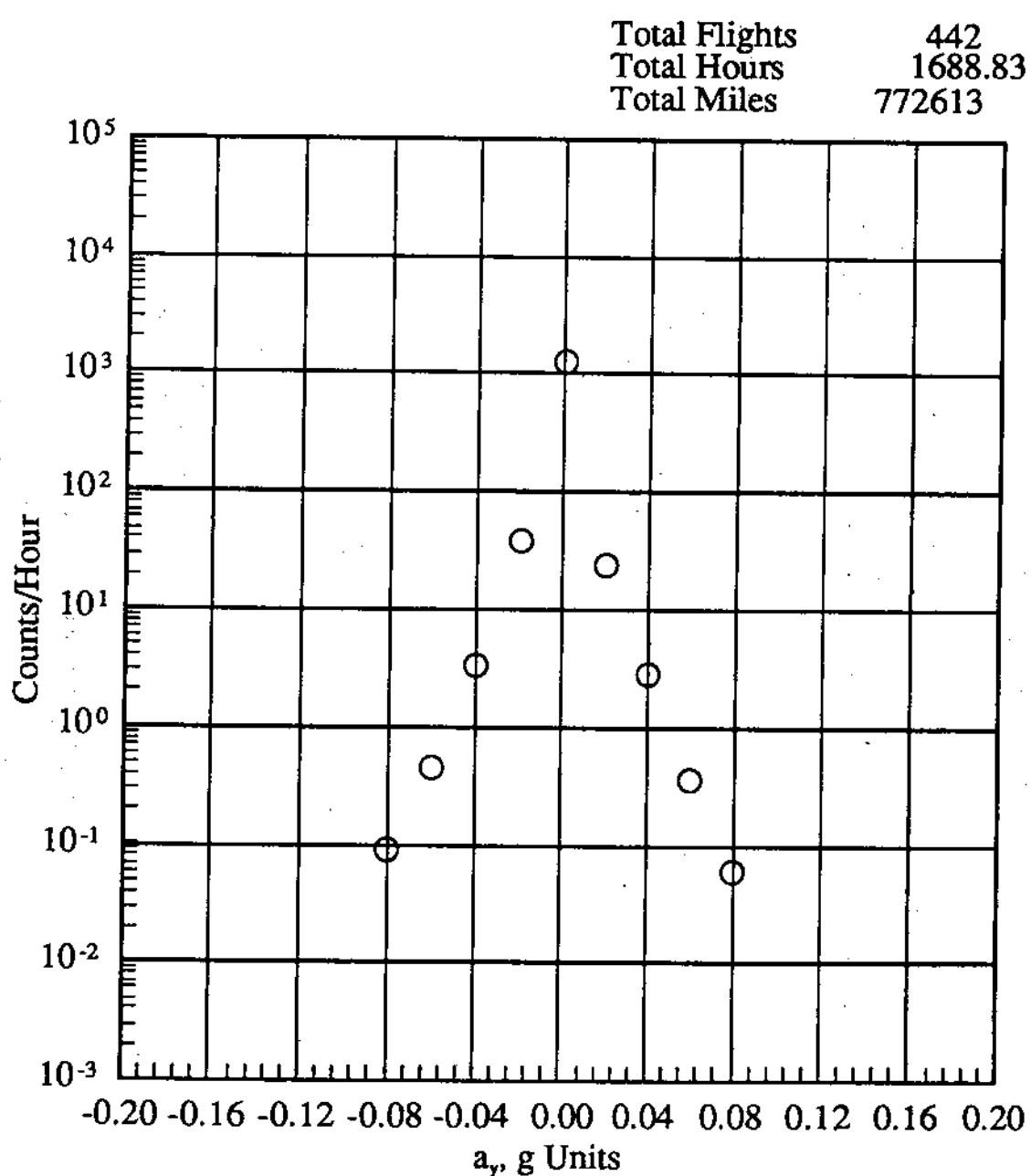
(i) 34500 to 39500 feet altitude

Figure 14.- Continued.



(j) 39500 to 44500 feet altitude

Figure 14.- Continued.



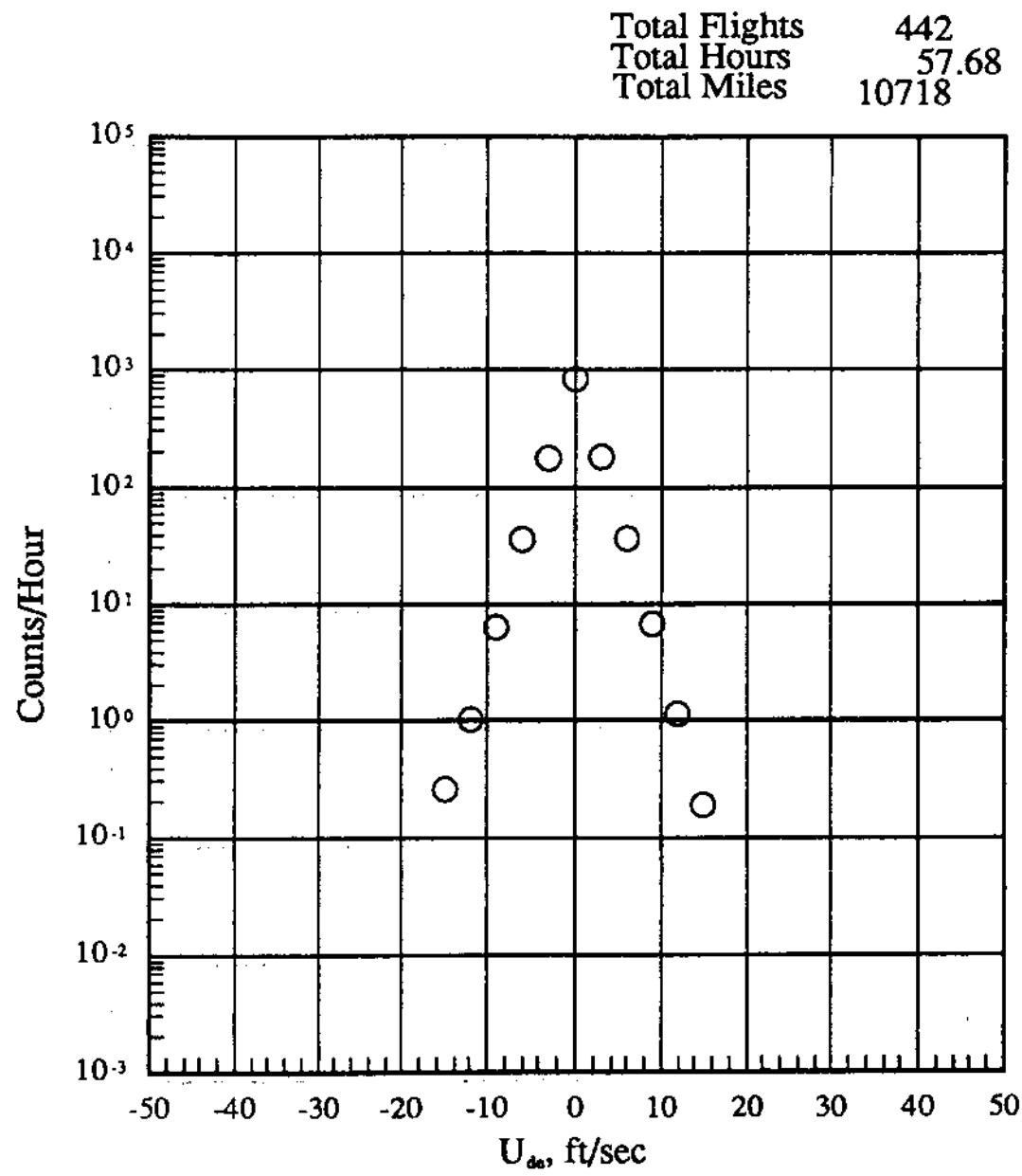
(k) -500 to 44500 feet altitude

Figure 14.- Concluded.

		PRESSURE ALTITUDE BANDS										
		-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	
U <sub>de</sub>		DERIVED GUST FT/SEC	VELOCITY LEVEL	20	30	40	50	60	70	80	90	100
0.19	0.07	0.45	0.04	0.05	0	0	0	0	0	0	0	0
1.13	1.13	1.97	0.29	0.14	0	0	0	0	0	0	0	0
6.74	6.74	8.63	1.44	0.74	0.23	0.13	0.16	0.16	0.20	0.20	0.23	0.23
36.10	36.10	6.14	1.64	0.53	0.14	0.09	0.09	0.09	0.09	0.09	0.09	0.09
181.56	181.56	53.60	12.74	6.74	3.98	2.53	1.96	1.96	2.61	2.61	2.61	2.61
822.76	822.76	849.54	873.74	962.55	1025.26	1085.15	1143.63	1121.41	1089.10	1089.10	1089.10	1089.10
177.06	177.06	53.23	12.79	6.72	4.45	2.35	2.08	2.08	2.64	2.64	2.64	2.64
35.54	35.54	9.63	1.44	0.74	0.23	0.13	0.19	0.19	0.23	0.23	0.23	0.23
6.33	6.33	1.75	0.35	0.09	0	0.01	0.01	0.01	0.03	0.03	0.03	0.03
1.02	1.02	0.54	0.02	0	0	0	0	0	0.01	0.01	0.01	0.01
-1.15	-1.15	0.26	0.17	0	0	0	0	0	0	0	0	0
-2.20	-2.20	0	0.02	0	0	0	0	0	0	0	0	0
-3.30	-3.30	0	0	0	0	0	0	0	0	0	0	0
-4.40	-4.40	0	0	0	0	0	0	0	0	0	0	0
-5.50	-5.50	0	0	0	0	0	0	0	0	0	0	0
-6.60	-6.60	0	0	0	0	0	0	0	0	0	0	0
-7.70	-7.70	0	0	0	0	0	0	0	0	0	0	0
-8.80	-8.80	0	0	0	0	0	0	0	0	0	0	0
-9.90	-9.90	0	0	0	0	0	0	0	0	0	0	0
-10.00	-10.00	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS & ALR	FLIGHT MILES & ALR	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.81	1688.83	442
		10712.91	14655.73	18759.60	17393.17	21051.53	36267.12	133304.10	516183.63	4212.14	772612.93	1688.83
TOTAL FLIGHTS												
TOTAL FLIGHTS WITH PLANS UP AND DOWN												
TOTAL FLIGHTS WITH PLANS UP AND DOWN												

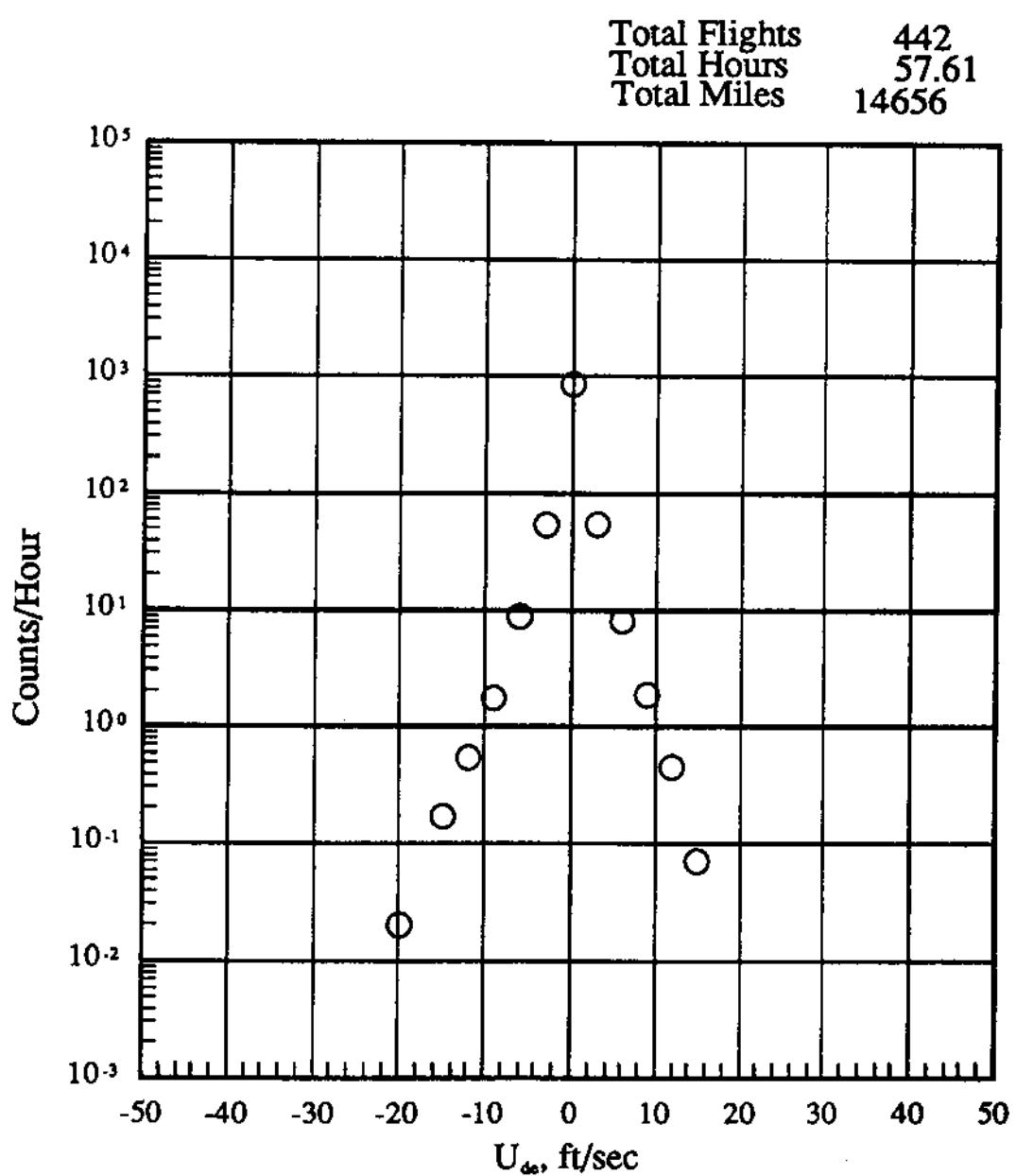
(a) U<sub>de</sub> Level crossing counts per hour within pressure altitude bands

Figure 15.- U<sub>de</sub> exceedances.



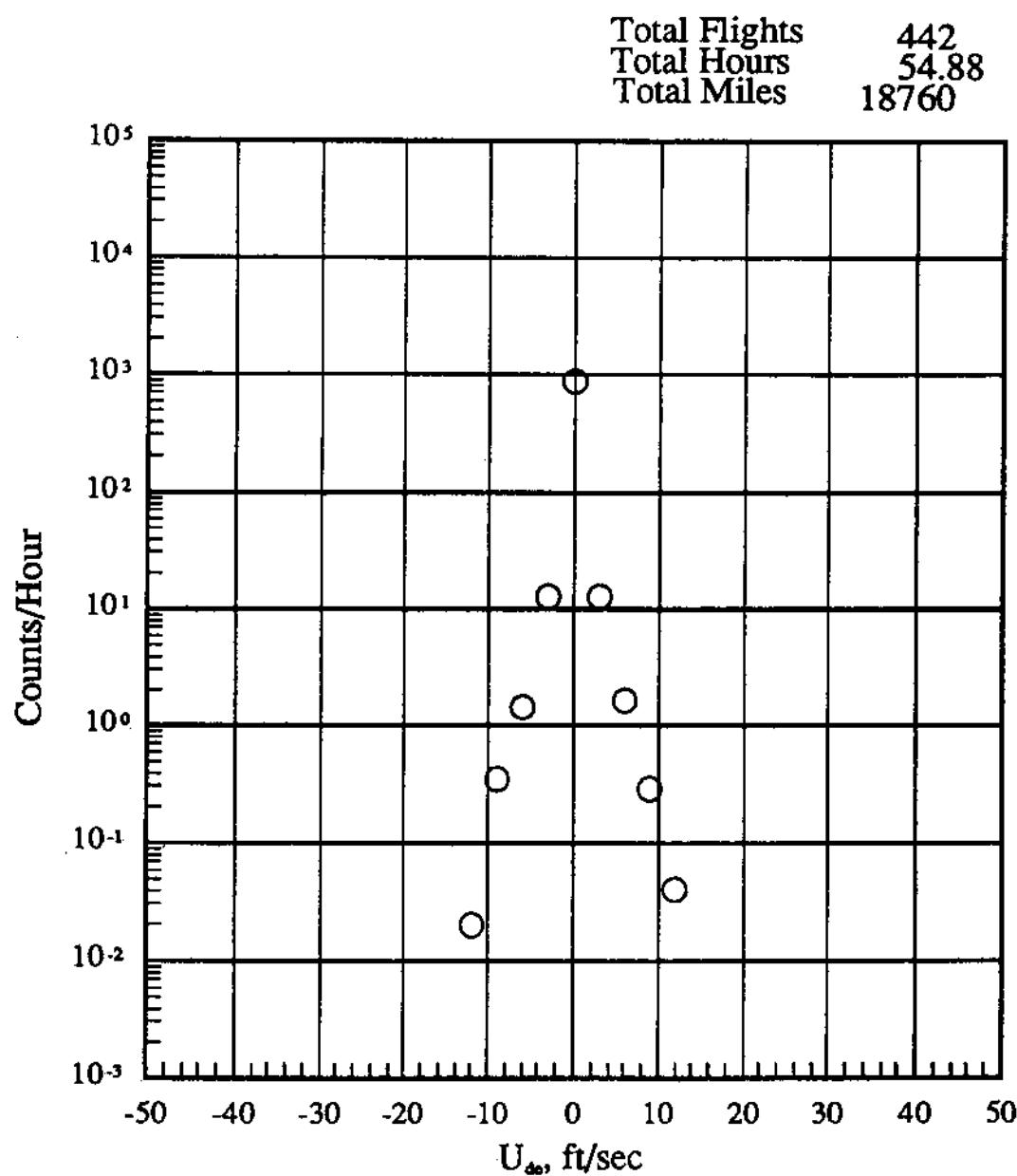
(b) -500 to 4500 feet altitude

Figure 15.- Continued.



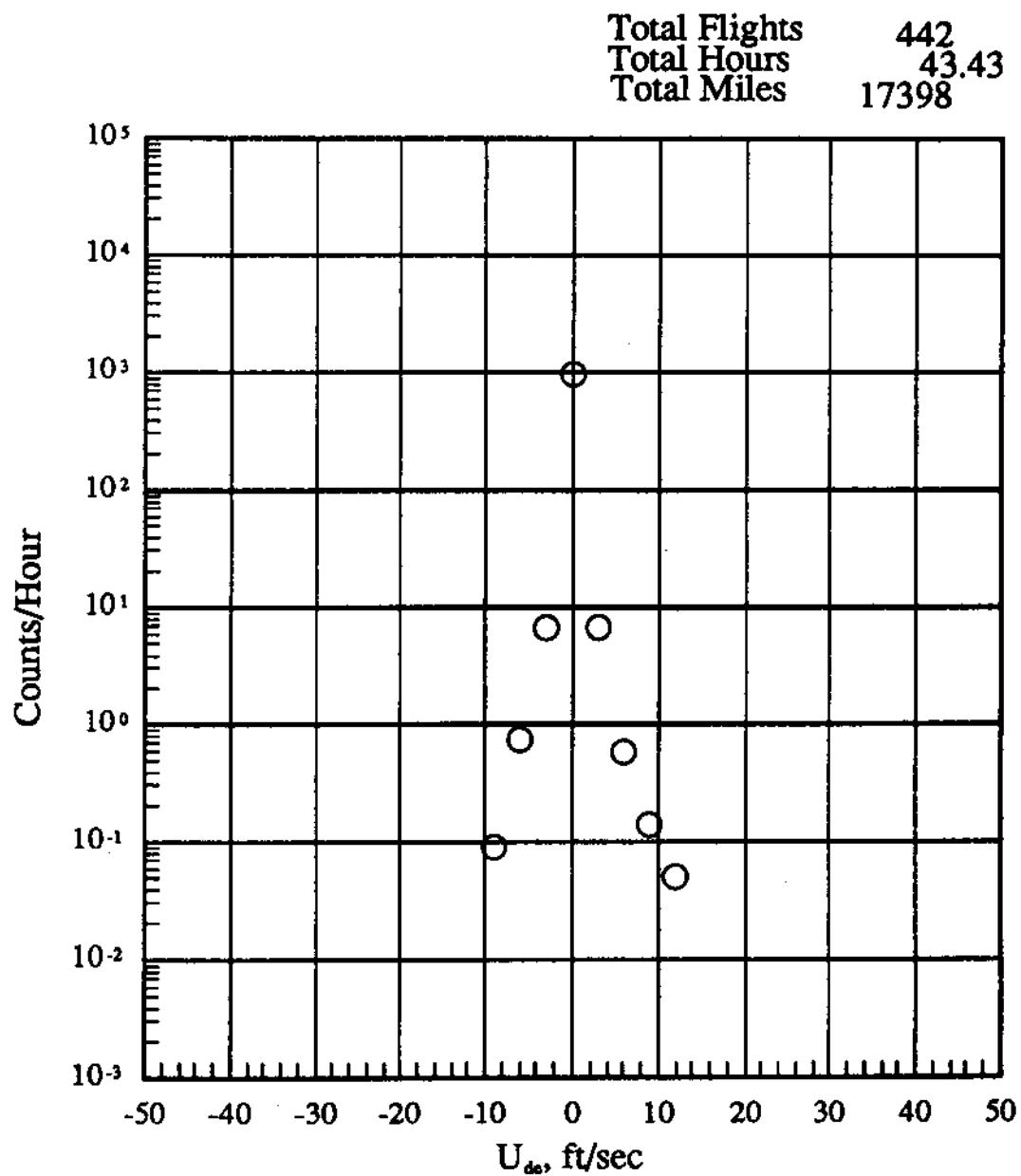
(c) 4500 to 9500 feet altitude

Figure 15.- Continued.



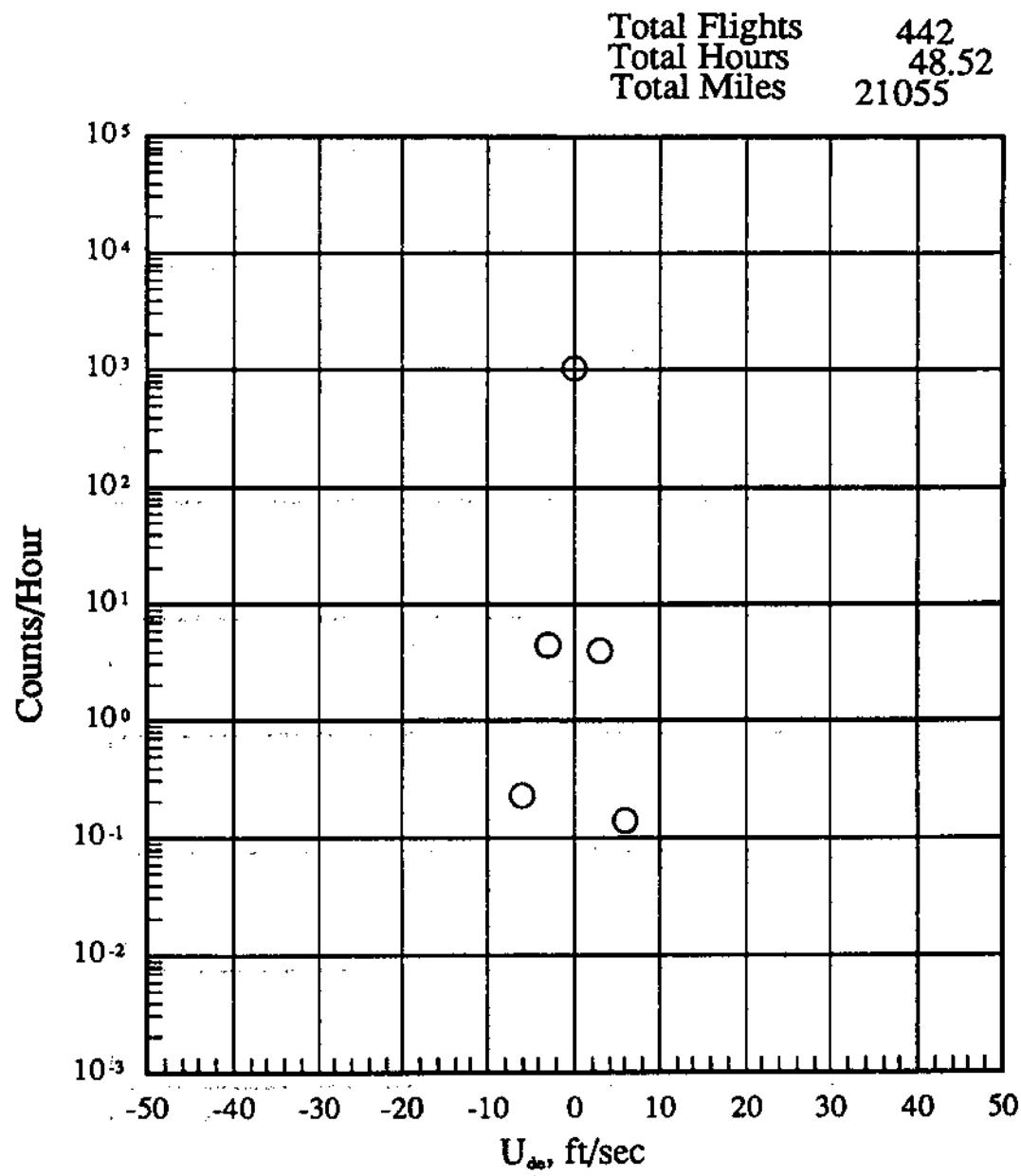
(d) 9500 to 14500 feet altitude

Figure 15.- Continued.



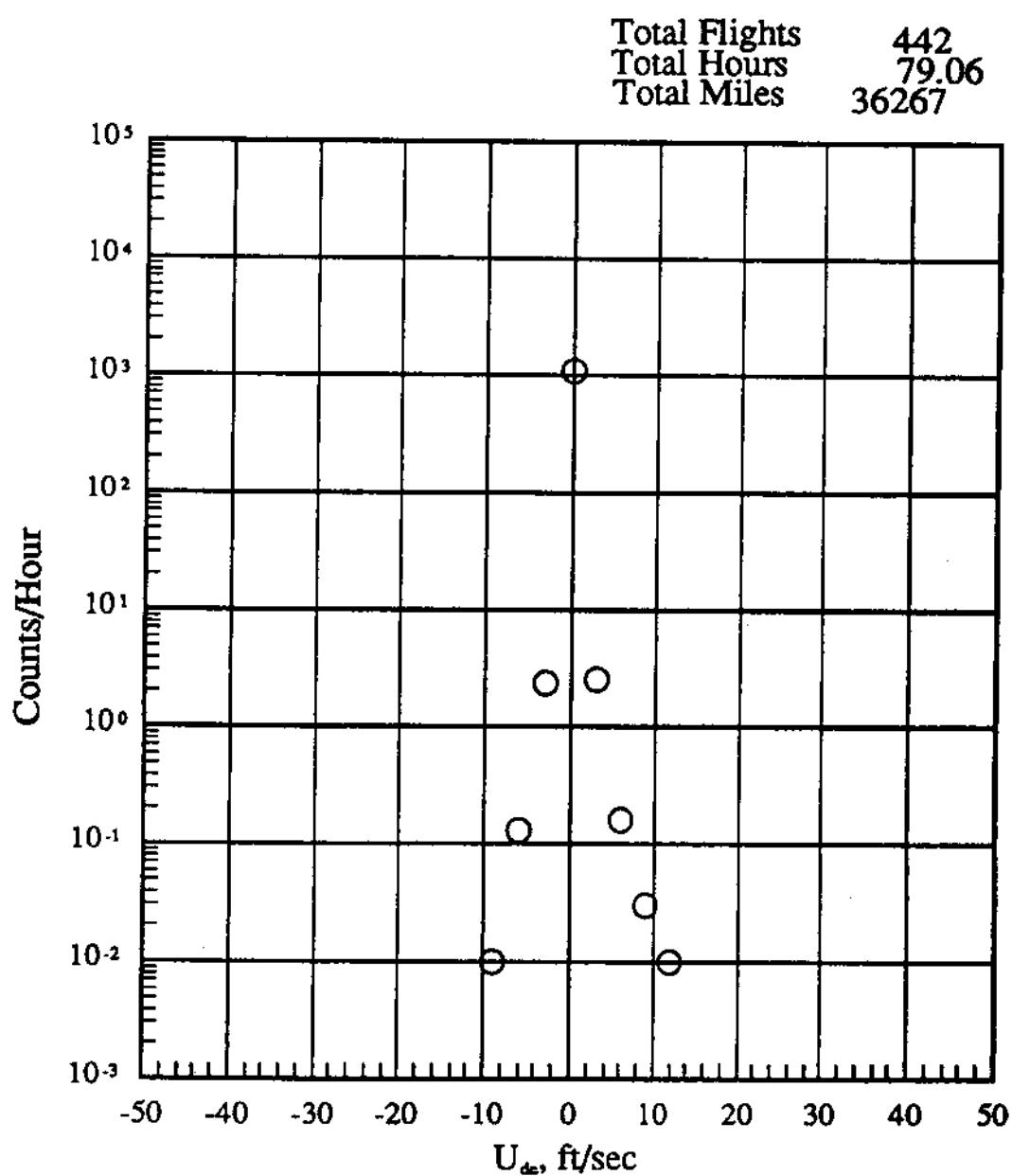
(e) 14500 to 19500 feet altitude

Figure 15.- Continued.



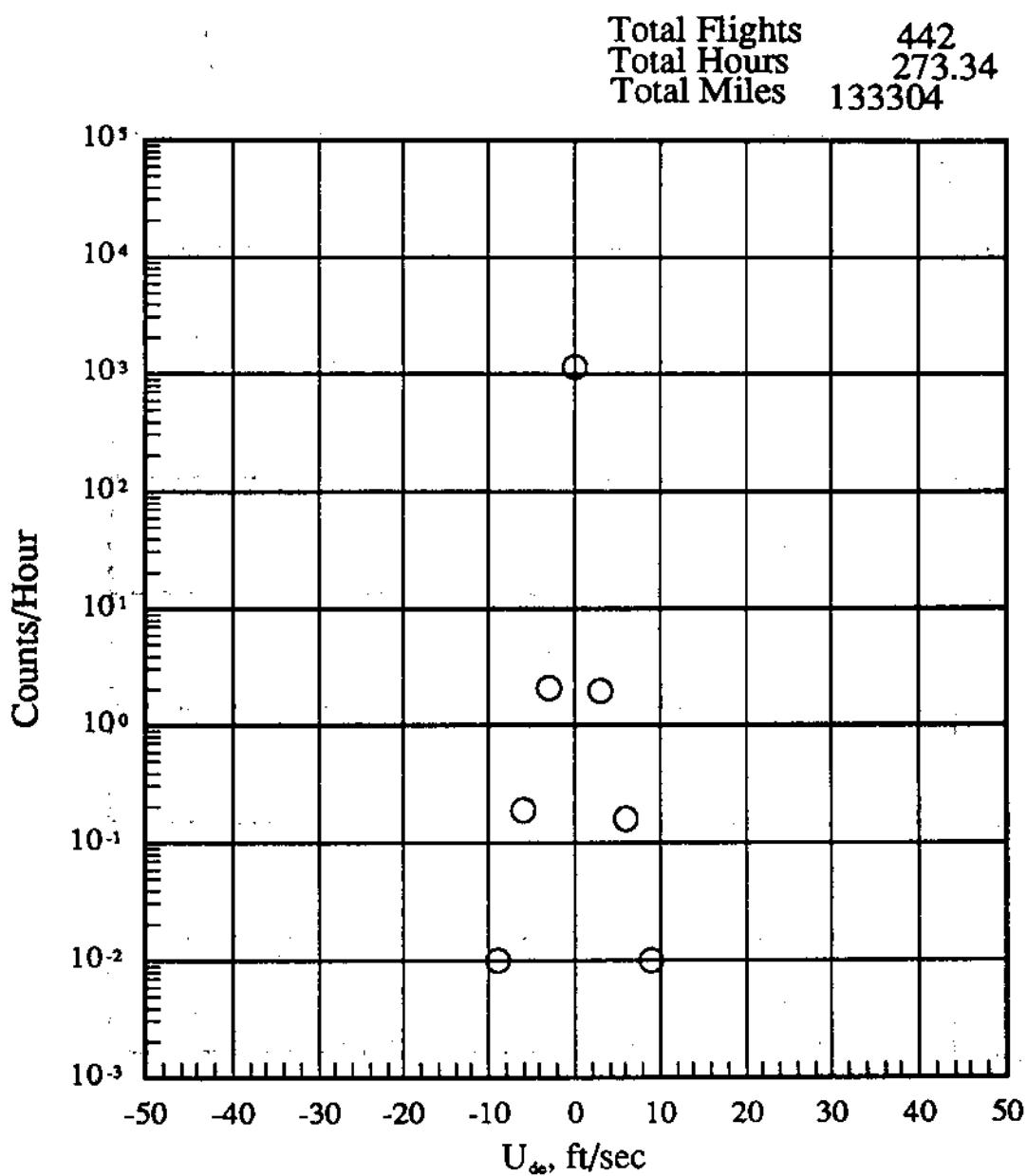
(f) 19500 to 24500 feet altitude

Figure 15.- Continued.



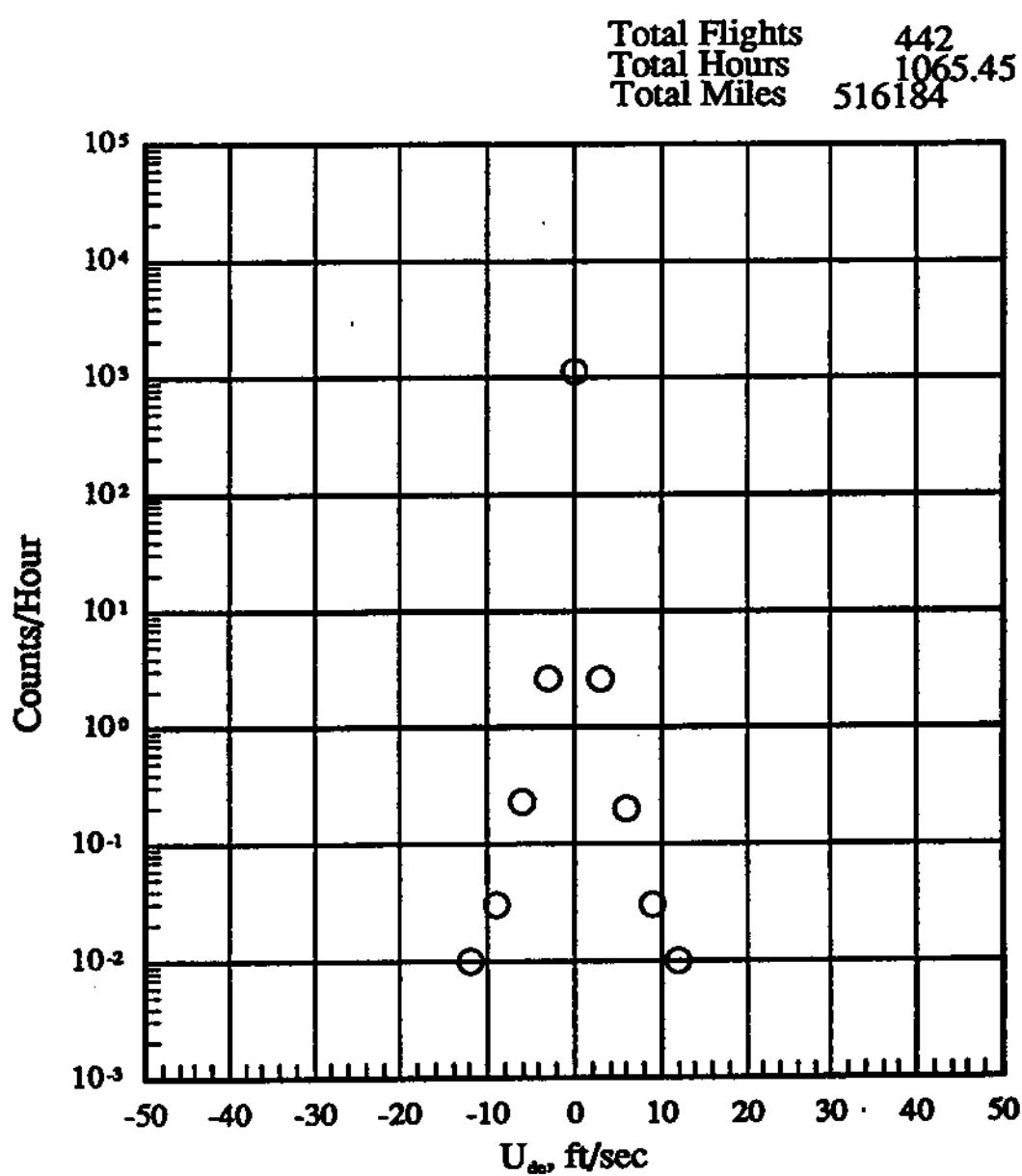
(g) 24500 to 29500 feet altitude

Figure 15.- Continued.



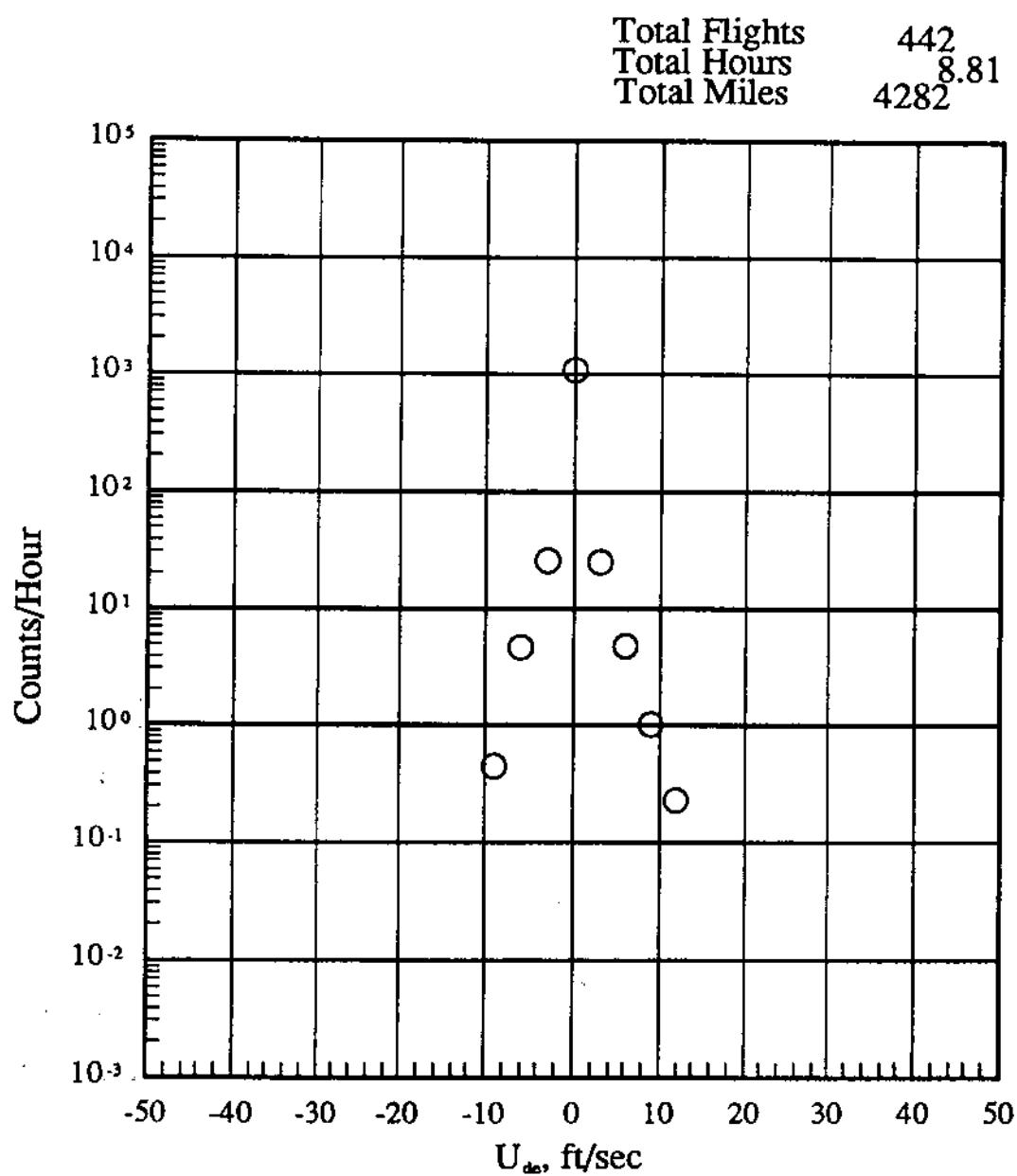
(h) 29500 to 34500 feet altitude

Figure 15.- Continued.



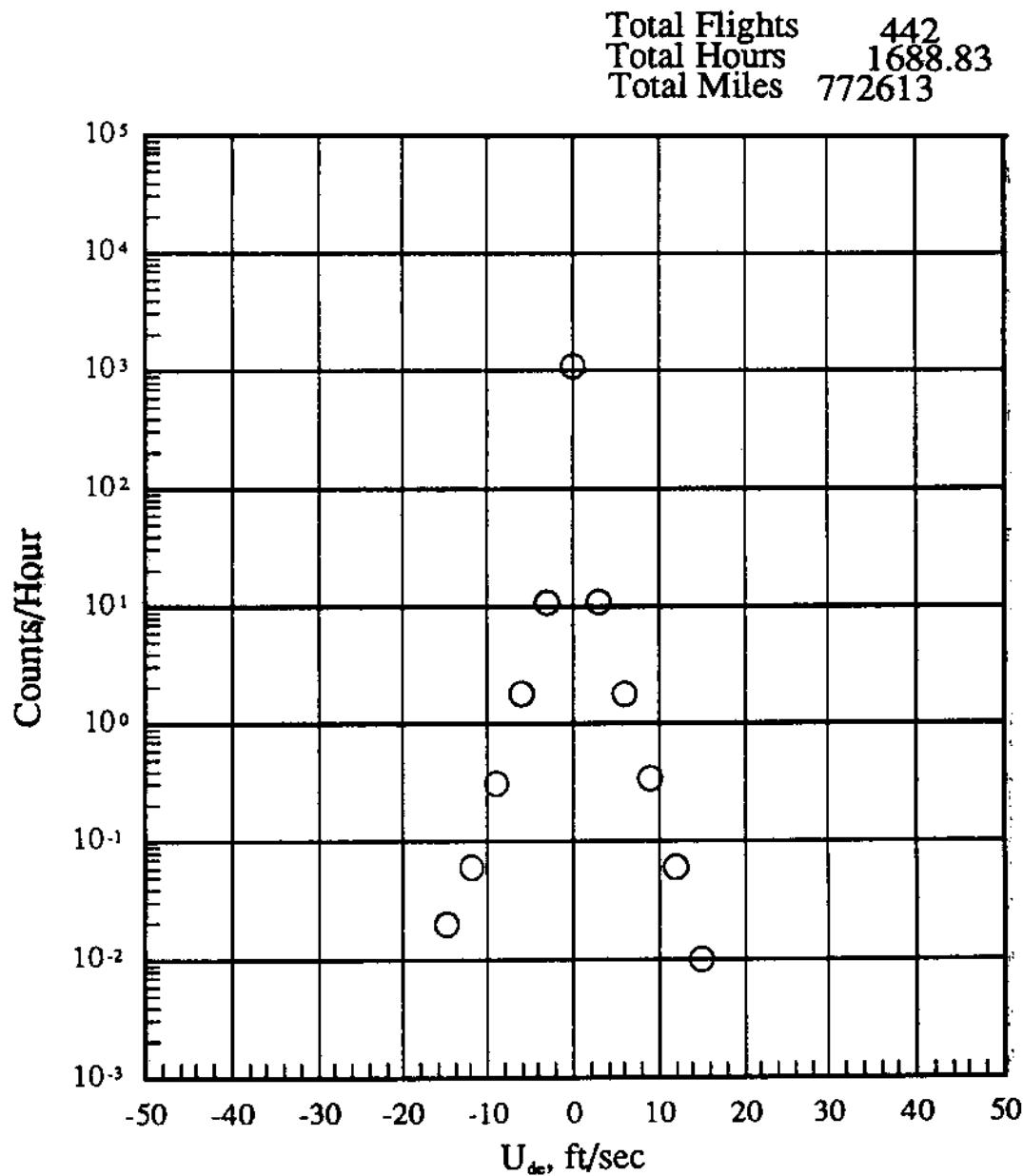
(i) 34500 to 39500 feet altitude

Figure 15.- Continued.



(j) 39500 to 44500 feet altitude

Figure 15.- Continued.



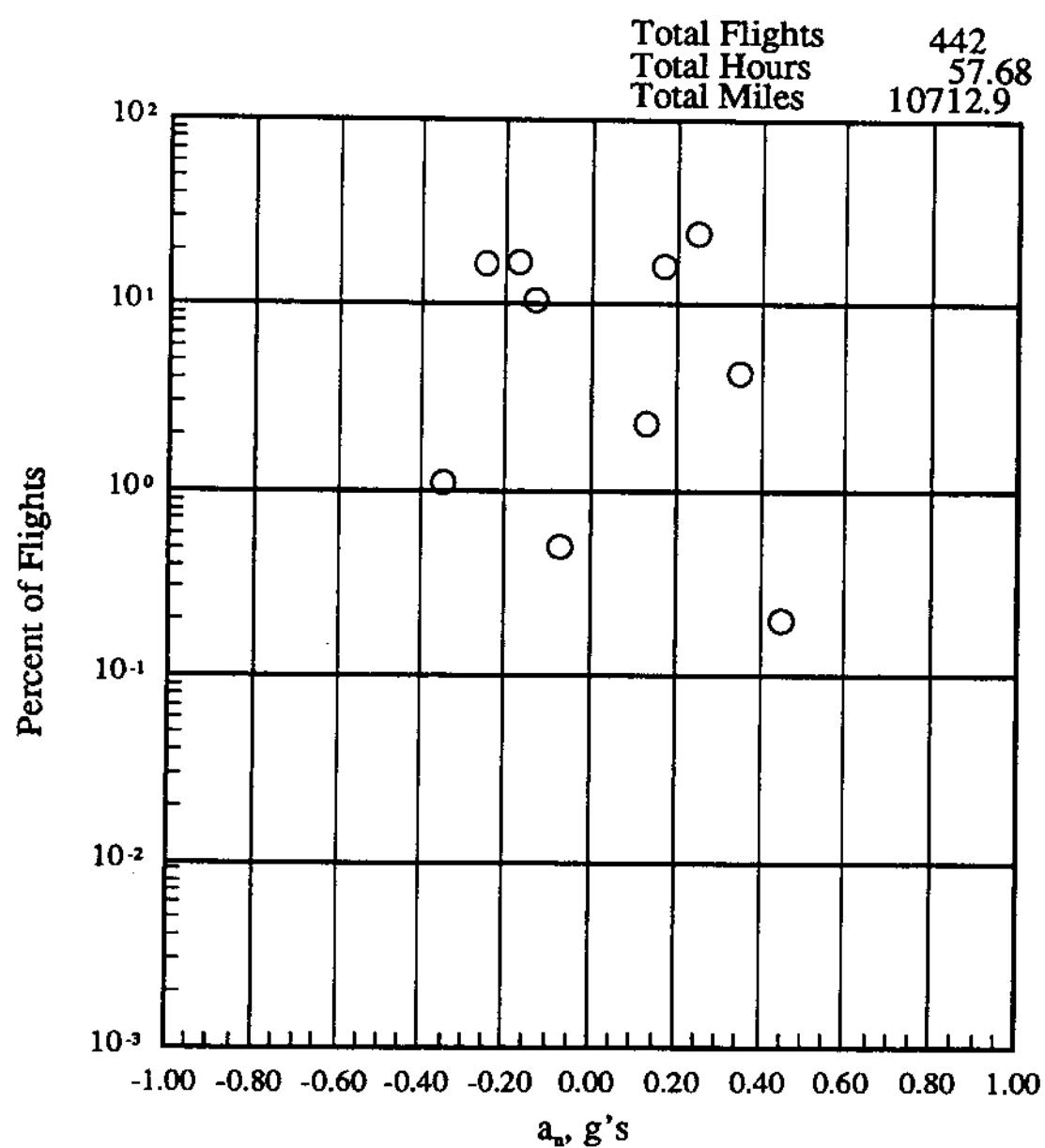
(k) -500 to 44500 feet altitude

Figure 15.- Concluded

MAXIMUM $\alpha_0$	LEVEL FOR EACH FLIGHT	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS	
		-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	0	
1.40	1.60	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	
1.00	1.20	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	
.70	0.80	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	
.50	0.60	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	
.30	0.40	4.3	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	
.20	0.30	24.4	12.0	3.6	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	
.15	0.20	16.3	6.3	1.8	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	
.10	0.15	2.3	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	
.05	0.10	0	0	0	0	0	0	0	0	0	0	0	
-0.05	-0.10	0.5	0.2	0	0.2	0	0	0	0	0.2	0	1.1	
-0.10	-0.15	10.6	1.6	0.9	0	0.2	0.5	0.7	2.7	0.2	17.4		
-0.15	-0.20	17.0	6.3	2.9	1.1	0.9	0.9	2.7	2.9	0.2	35.1		
-0.20	-0.30	16.7	9.0	1.6	1.1	0.5	0.5	1.6	9.1	0	39.1		
-0.30	-0.40	1.1	2.5	0.5	0	0	0	0.2	1.1	0	5.4		
-0.40	-0.50	0	0	0	0	0	0	0.2	0.7	0.2	1.1		
-0.50	-0.60	0	0	0	0	0	0	0	0	0.2	0.5		
-0.60	-0.70	0	0	0	0	0	0	0	0	0	0		
-0.70	-0.80	0	0	0	0	0	0	0	0	0	0		
-0.80	-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		
		57.68	57.61	54.89	43.48	46.52	79.06	273.34	1065.45	8.61	1688.83		
		10712.91	14655.73	18759.60	17393.17	21034.53	362267.13	159304.11	516183.66	42822.14	772612.98		442

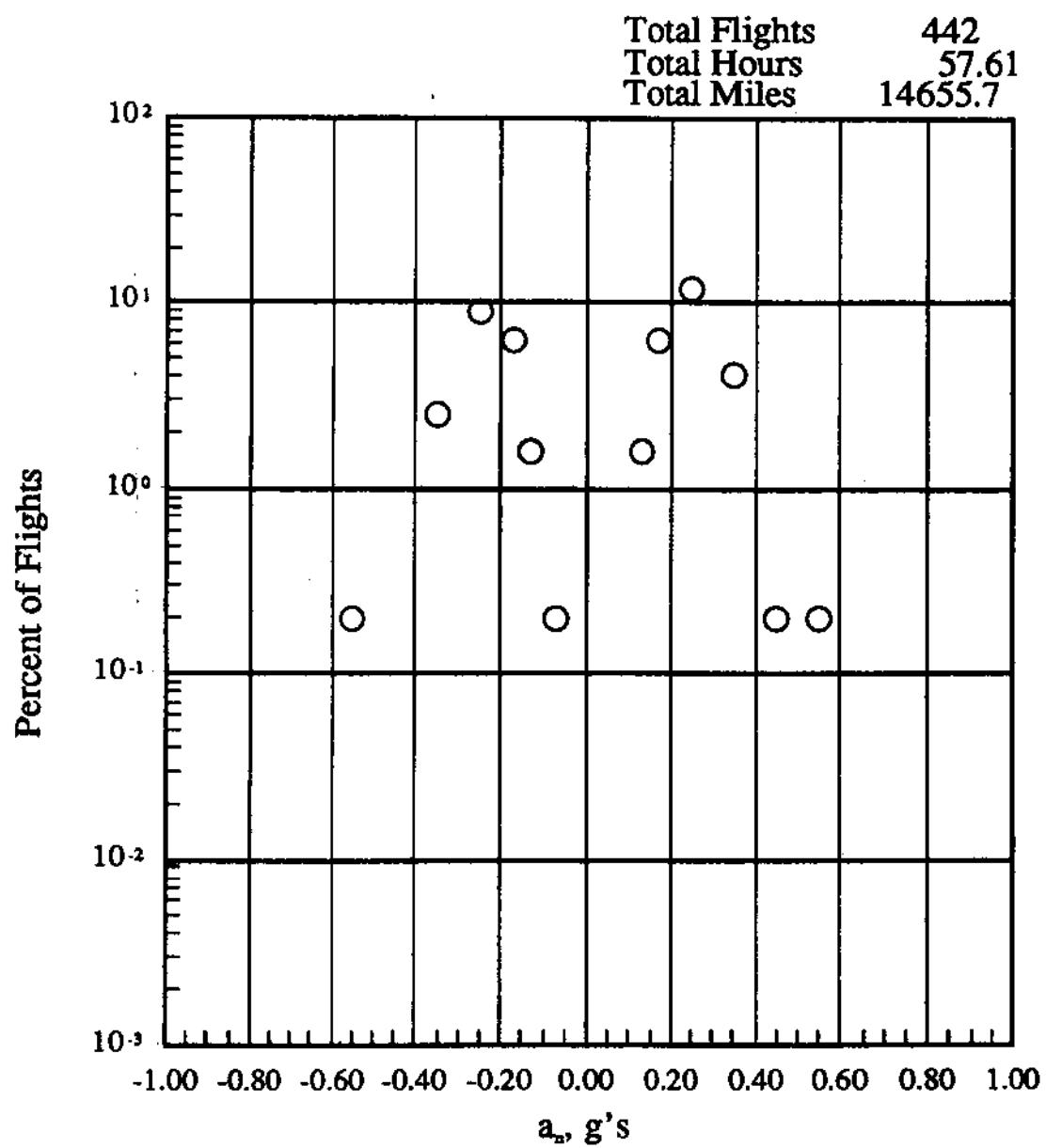
Figure 16.- Peak positive and negative  $a_{ij}$  vs altitude.

(a) Percent of flights where peak positive and negative  $a_1$  per flight occurs within pressure altitude bands, any flap



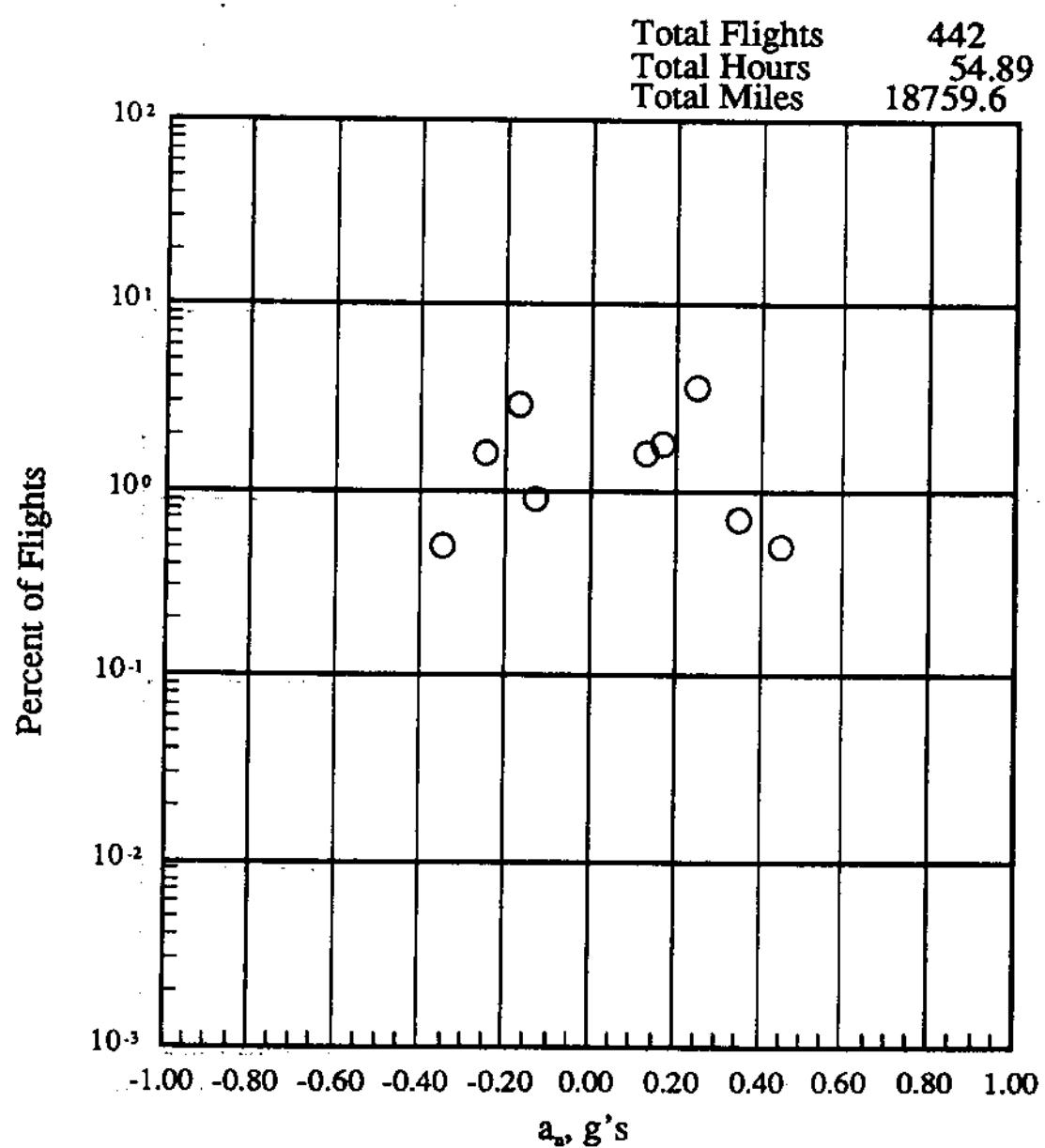
(b) -500 to 4500 feet altitude

Figure 16.- Continued.



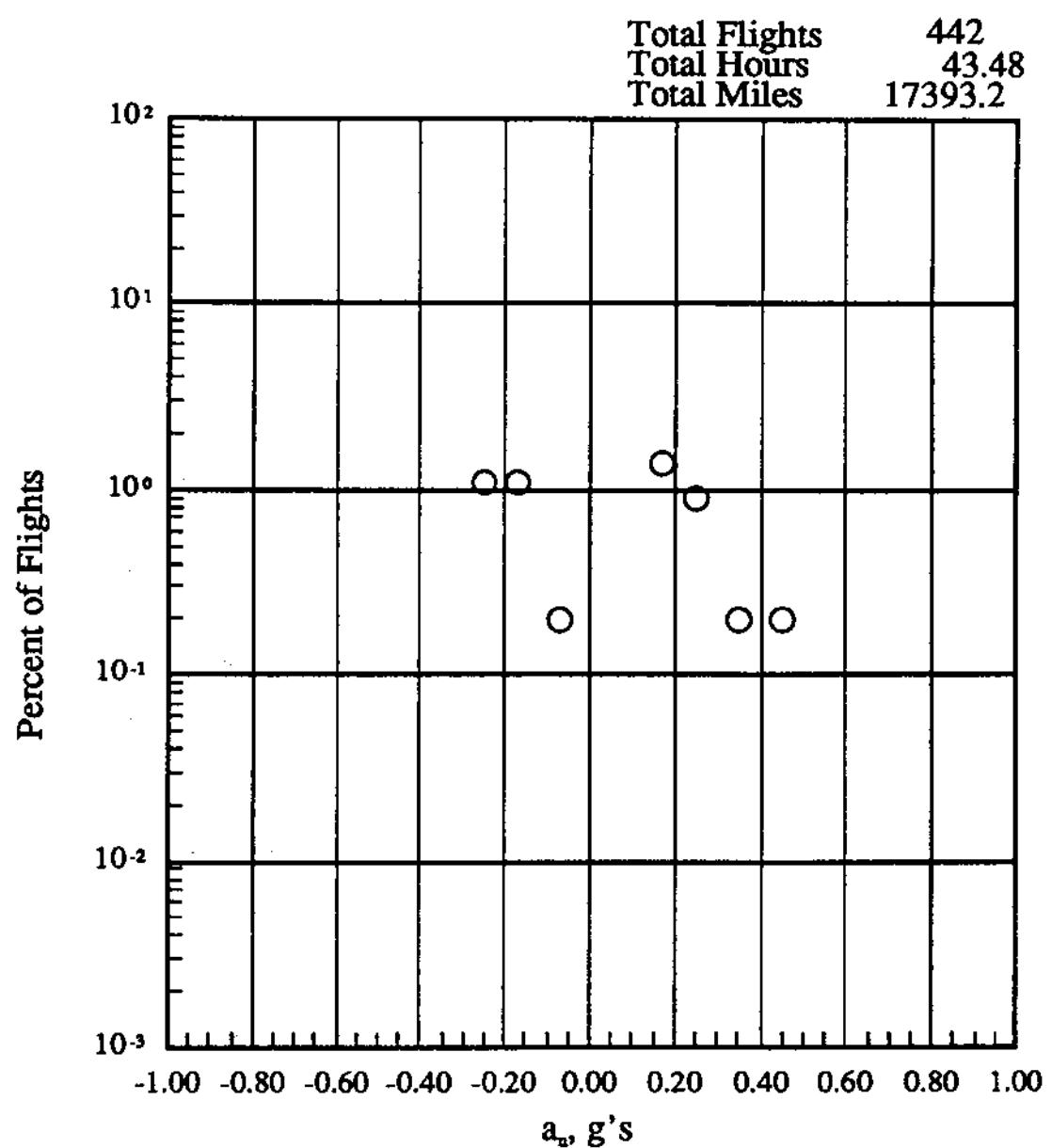
(c) 4500 to 9500 feet altitude

Figure 16.- Continued.



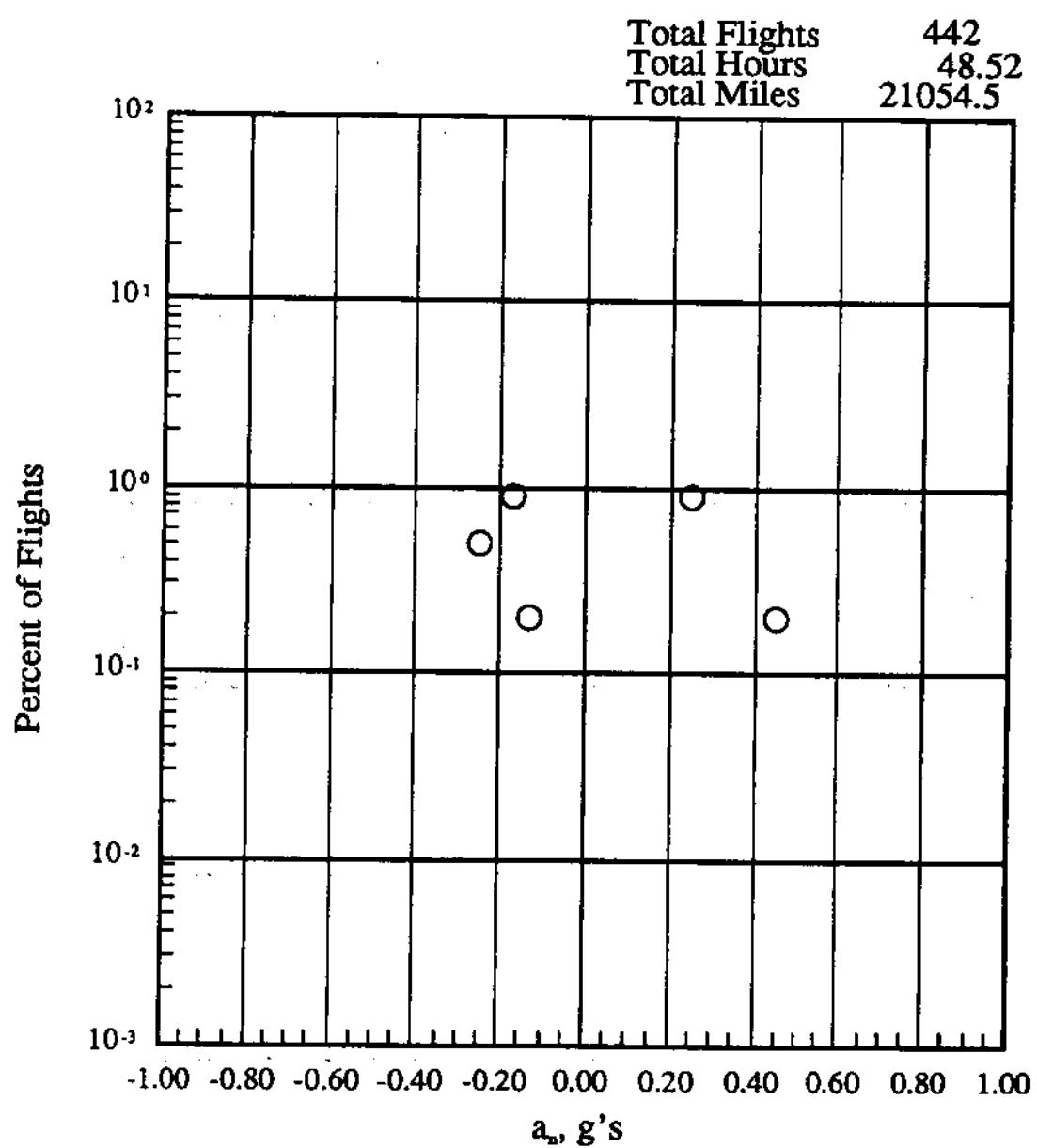
(d) 9500 to 14500 feet altitude

Figure 16.- Continued.



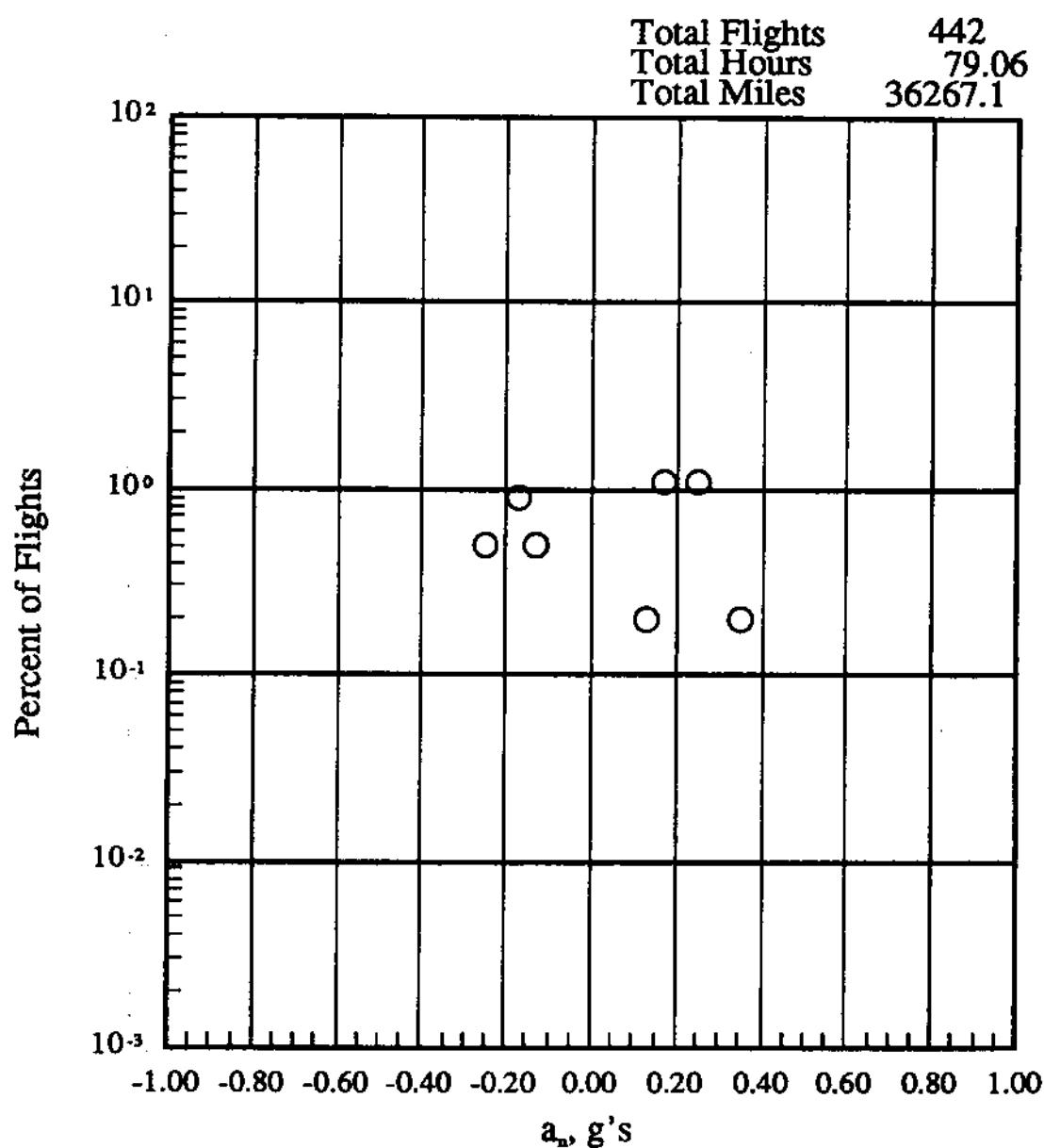
(e) 14500 to 19500 feet altitude

Figure 16.- Continued.



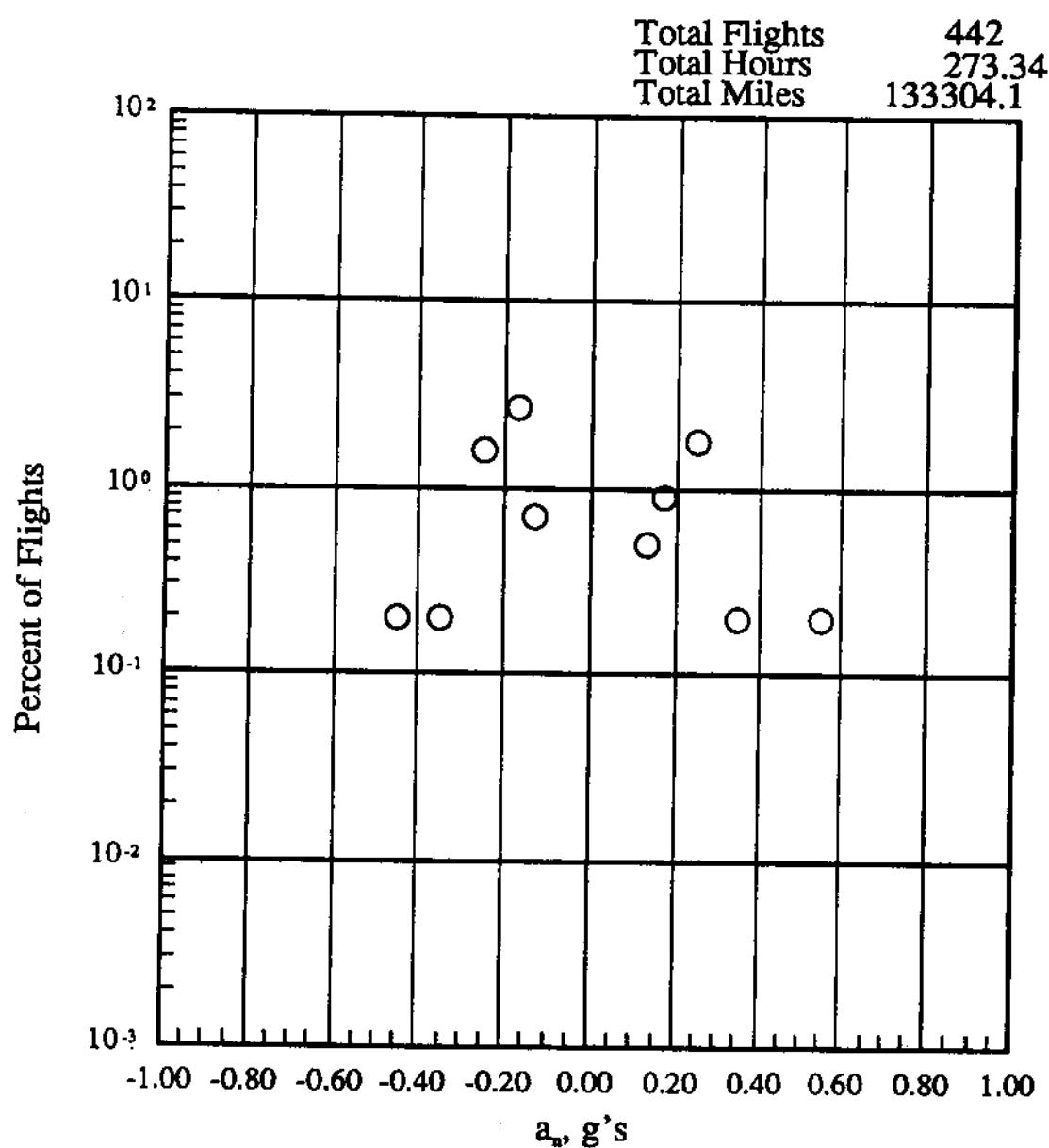
(f) 19500 to 24500 feet altitude

Figure 16.- Continued.



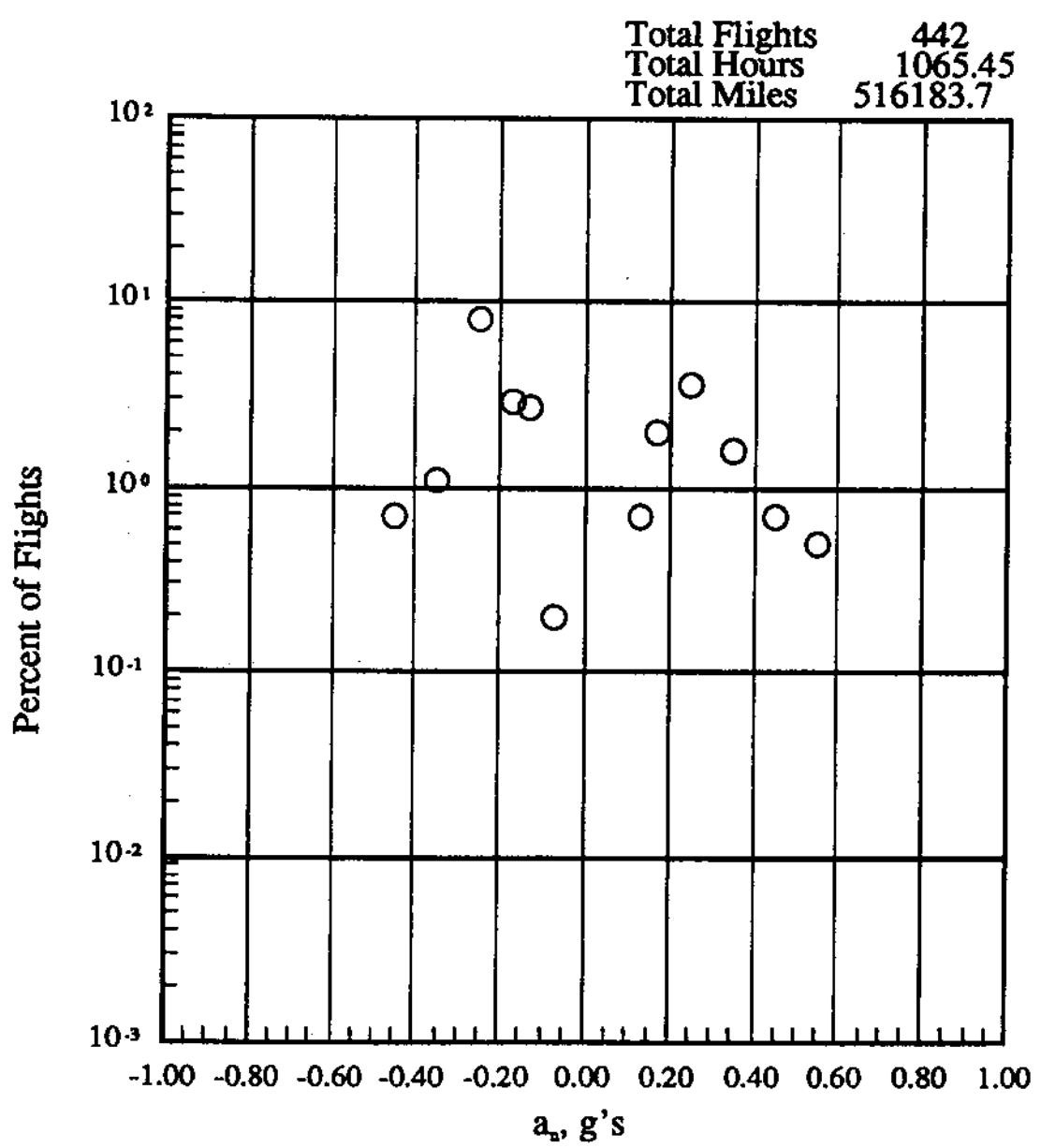
(g) 24500 to 29500 feet altitude

Figure 16.- Continued.



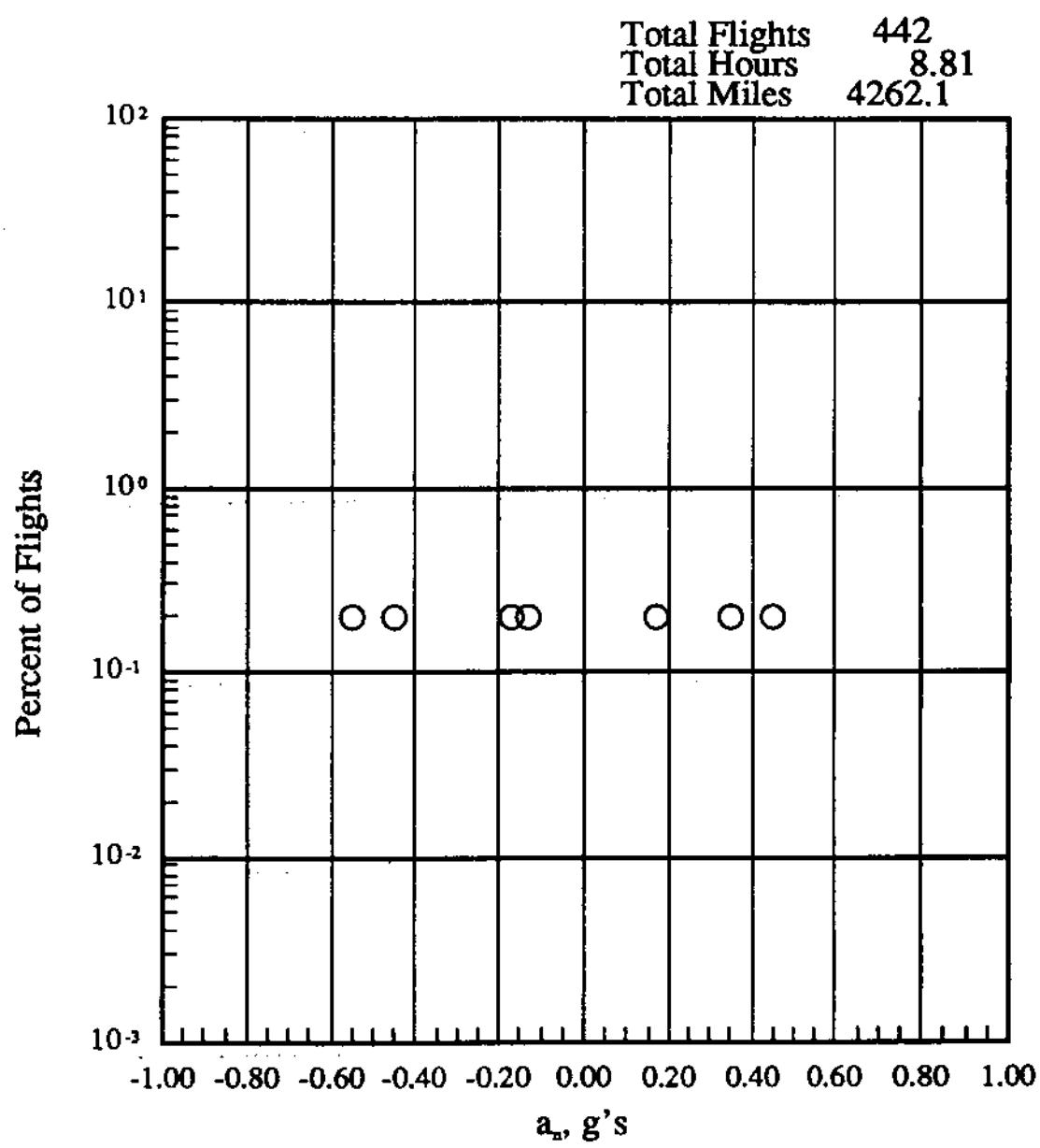
(h) 29500 to 34500 feet altitude

Figure 16.- Continued.



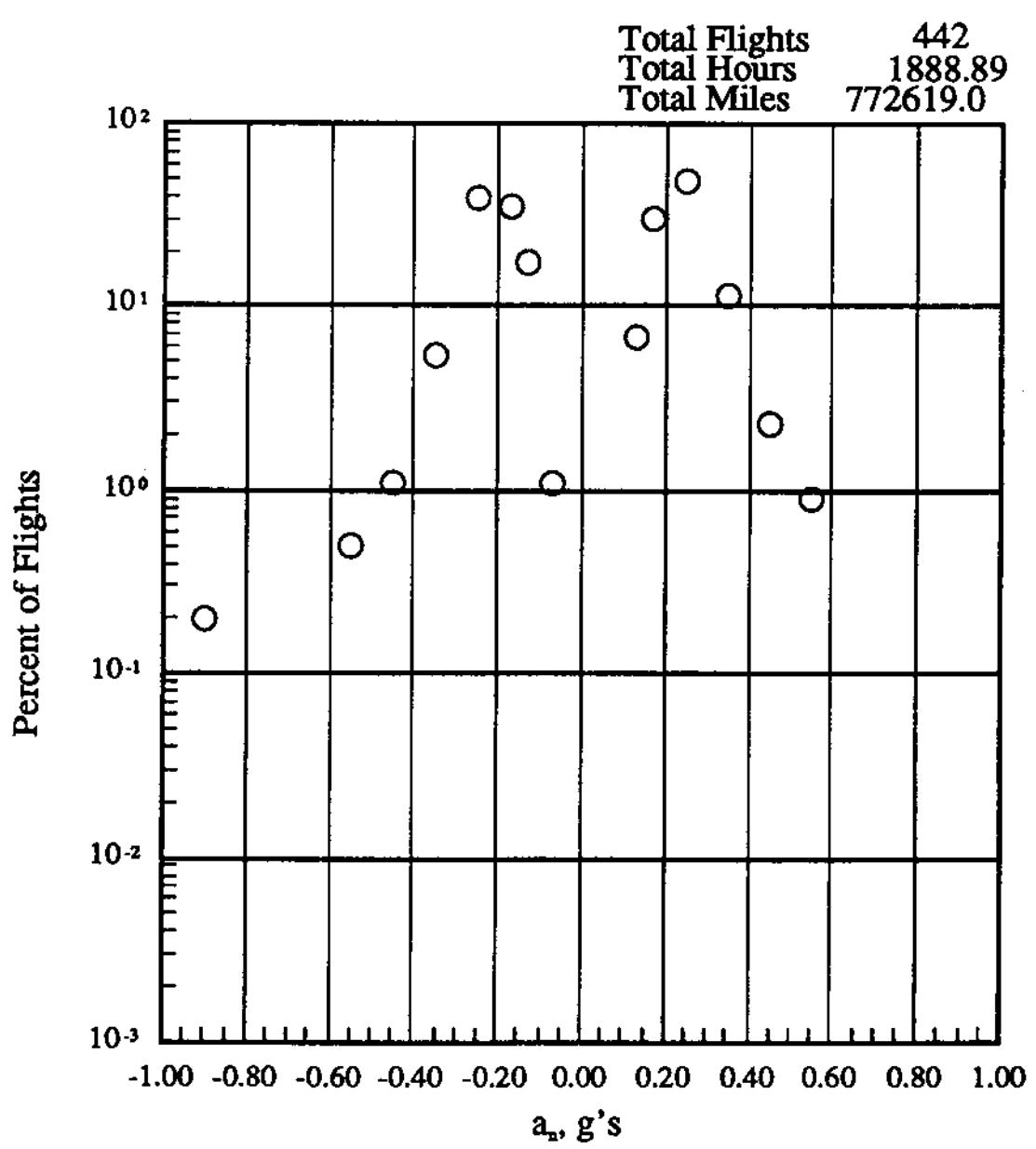
(i) 34500 to 39500 feet altitude

Figure 16.- Continued.



(j) 39500 to 44500 feet altitude

Figure 16.- Continued.



(k) -500 to 44500 feet altitude

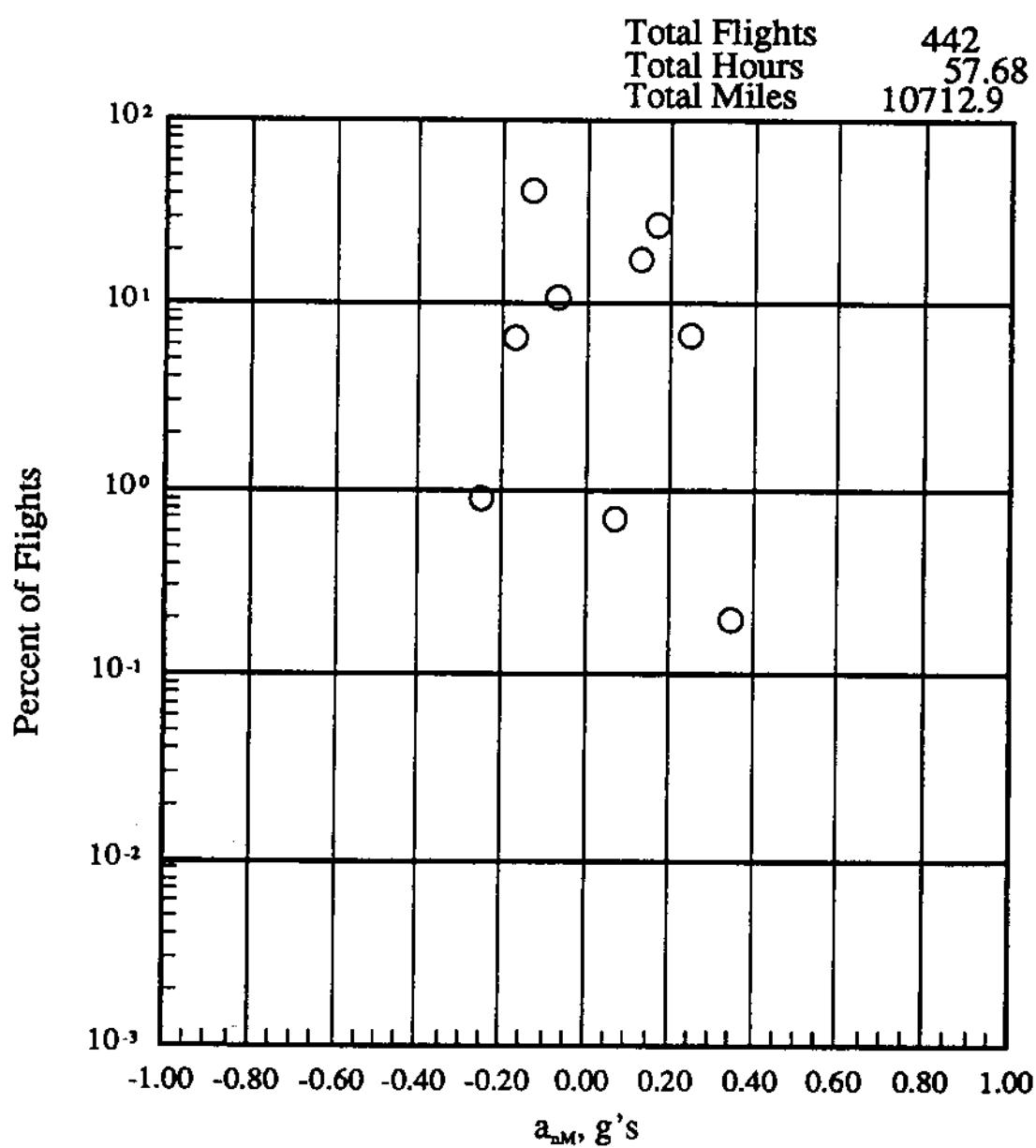
Figure 16.- Concluded.

PRESSURE ALTITUDE BANDS

MAXIMUM $\Delta_{LM}$	LEVEL FOR EACH FLIGHT	PRESSURE ALTITUDE BANDS									
		-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	0.90	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0
.30	0.40	0.2	0.5	0	0	0.2	0	0.2	0	0.2	1.1
.20	0.30	0.6	4.5	1.6	0.2	0.2	0.2	0.2	0	0.2	13.8
.15	0.20	27.1	12.9	1.1	0.9	0.2	0.5	0.2	1.6	0	44.6
.10	0.15	17.6	9.7	4.8	0.9	0.5	0	0.9	1.6	0.2	36.2
.05	0.10	0.7	1.1	0.7	0	0.2	0.2	0.9	0.7	0	4.3
.05	-0.10	10.9	4.1	2.3	0	0.5	0	0.5	2.0	0	20.1
.10	-0.15	41.4	11.1	2.5	1.4	0.9	1.4	2.3	5.0	0.7	66.5
.15	-0.20	6.6	2.7	0	0.2	0	0	0	1.8	0	11.5
.20	-0.30	0.9	0.2	0	0	0	0	0	0.5	0.2	1.8
.30	-0.40	0	0	0	0	0	0	0	0	0	0
.40	-0.50	0	0	0	0	0	0	0	0	0	0
.50	-0.60	0	0	0	0	0	0	0	0	0	0
.60	-0.70	0	0	0	0	0	0	0	0	0	0
.70	-0.80	0	0	0	0	0	0	0	0	0	0
.80	-1.00	0	0	0	0	0	0	0	0	0	0
.90	-1.20	0	0	0	0	0	0	0	0	0	0
.10	-1.40	0	0	0	0	0	0	0	0	0	0
.12	-1.60	0	0	0	0	0	0	0	0	0	0
.14	-1.80	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	40.52	79.06	273.34	1065.45	8.81	1689.83	
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	36267.13	133304.11	516103.66	4282.14	772612.98	
TOTAL FLIGHTS									442		

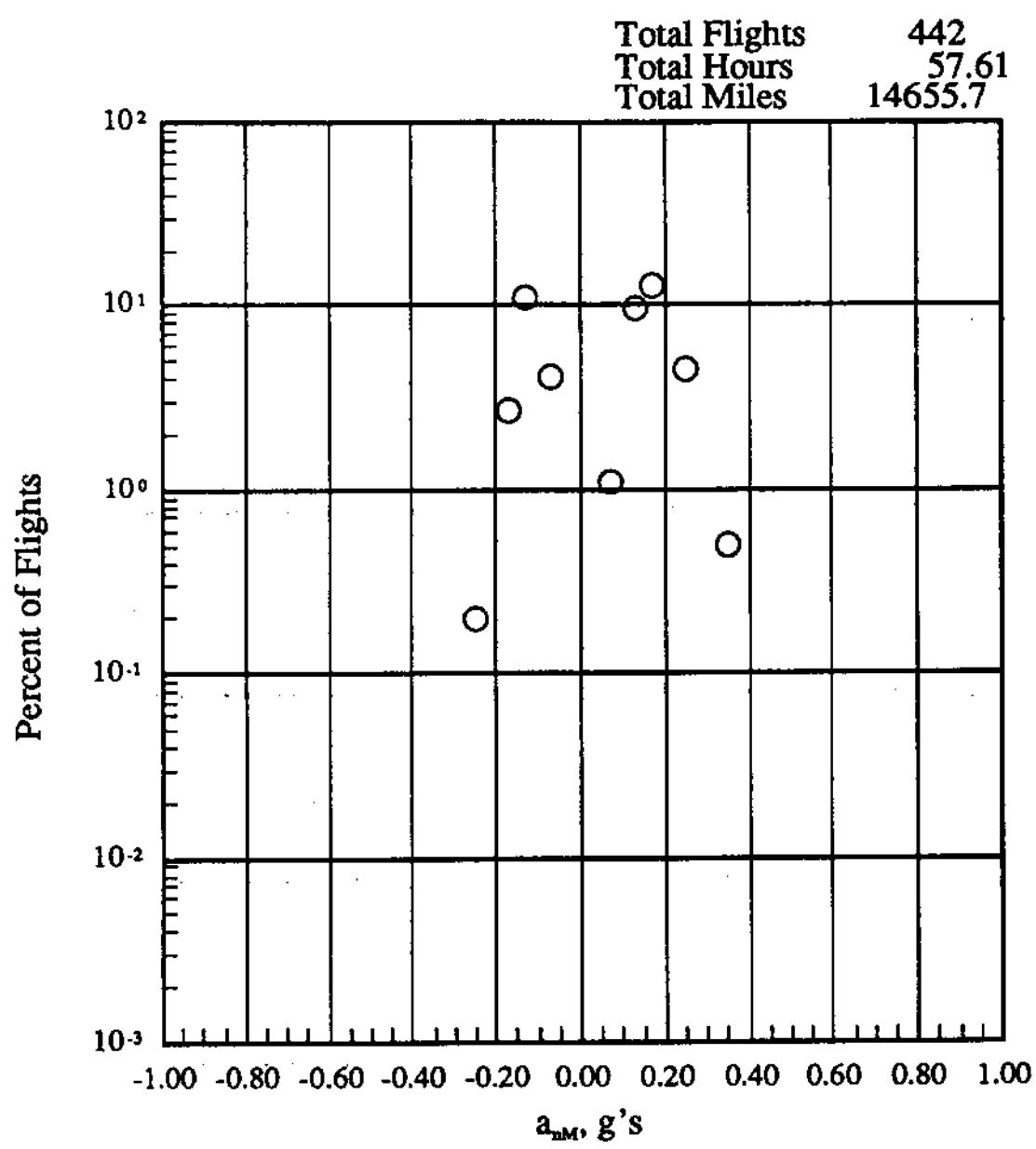
(a) Percent of flights where peak positive and negative  $\Delta_{LM}$  per flight occurs within pressure altitude bands, any flap

Figure 17- Peak positive and negative  $\Delta_{LM}$  vs altitude.



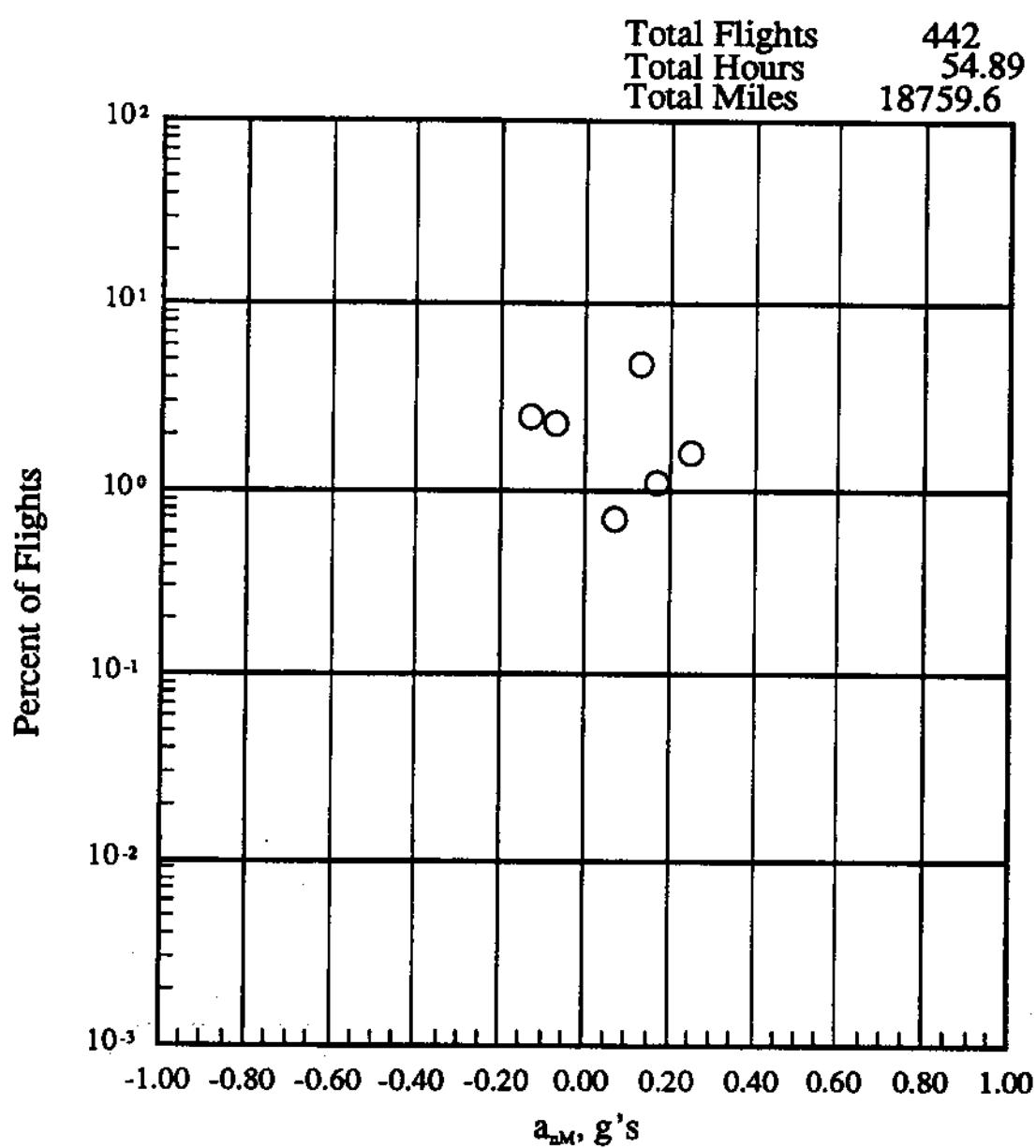
(b) -500 to 4500 feet altitude

Figure 17.- Continued.



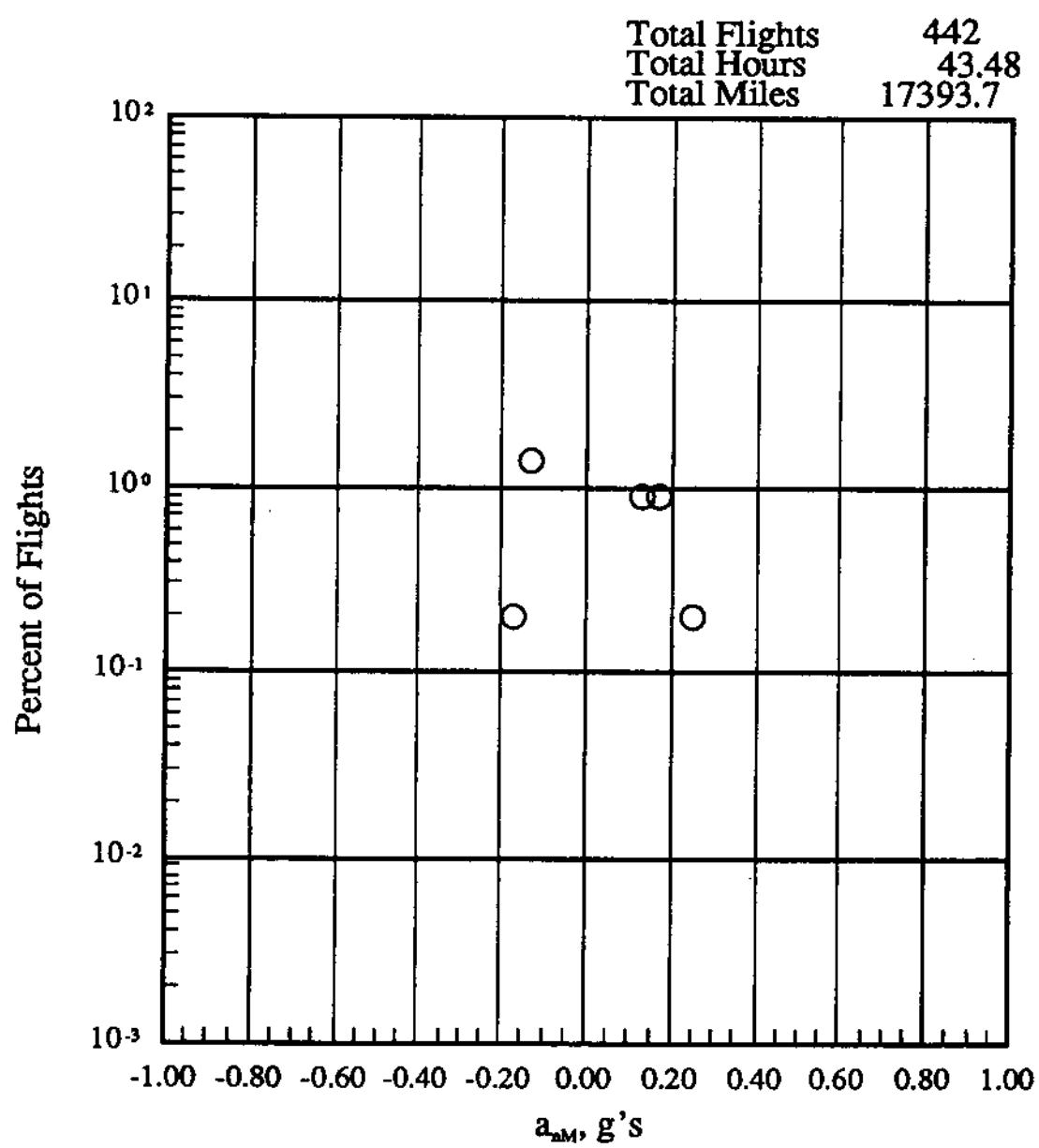
(c) 4500 to 9500 feet altitude

Figure 17.- Continued.



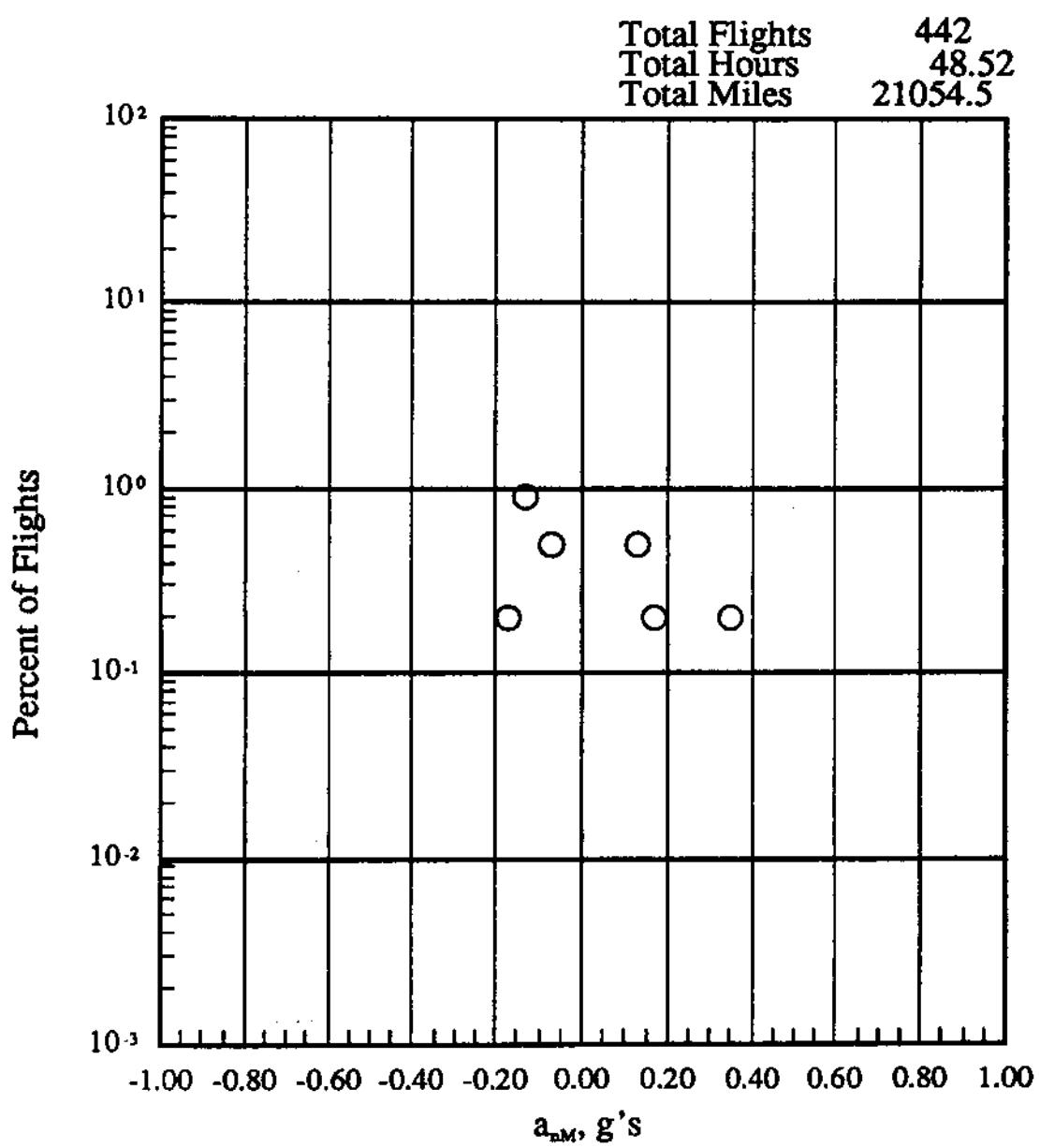
(d) 9500 to 14500 feet altitude

Figure 17.- Continued.



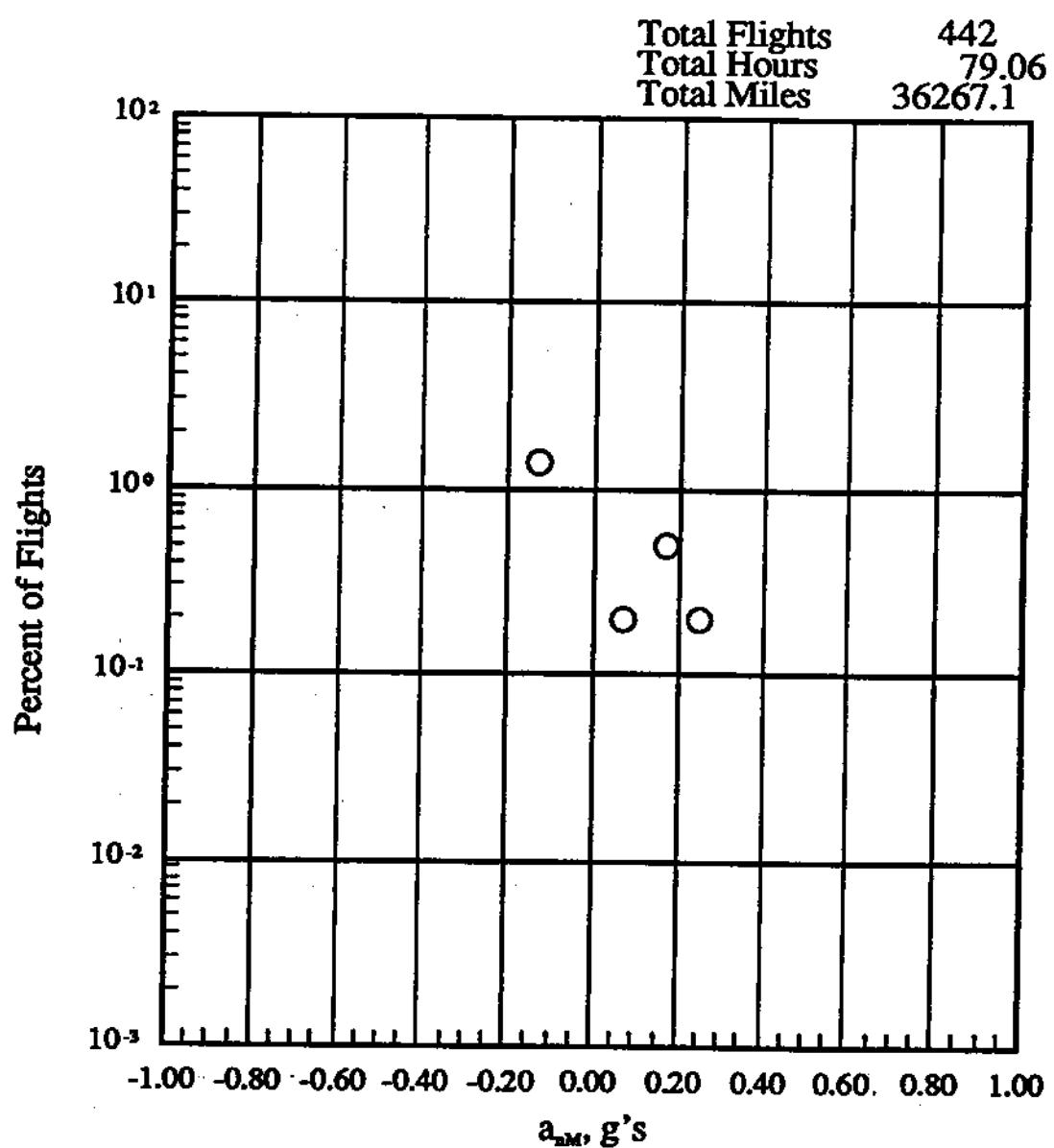
(e) 14500 to 19500 feet altitude

Figure 17.- Continued.



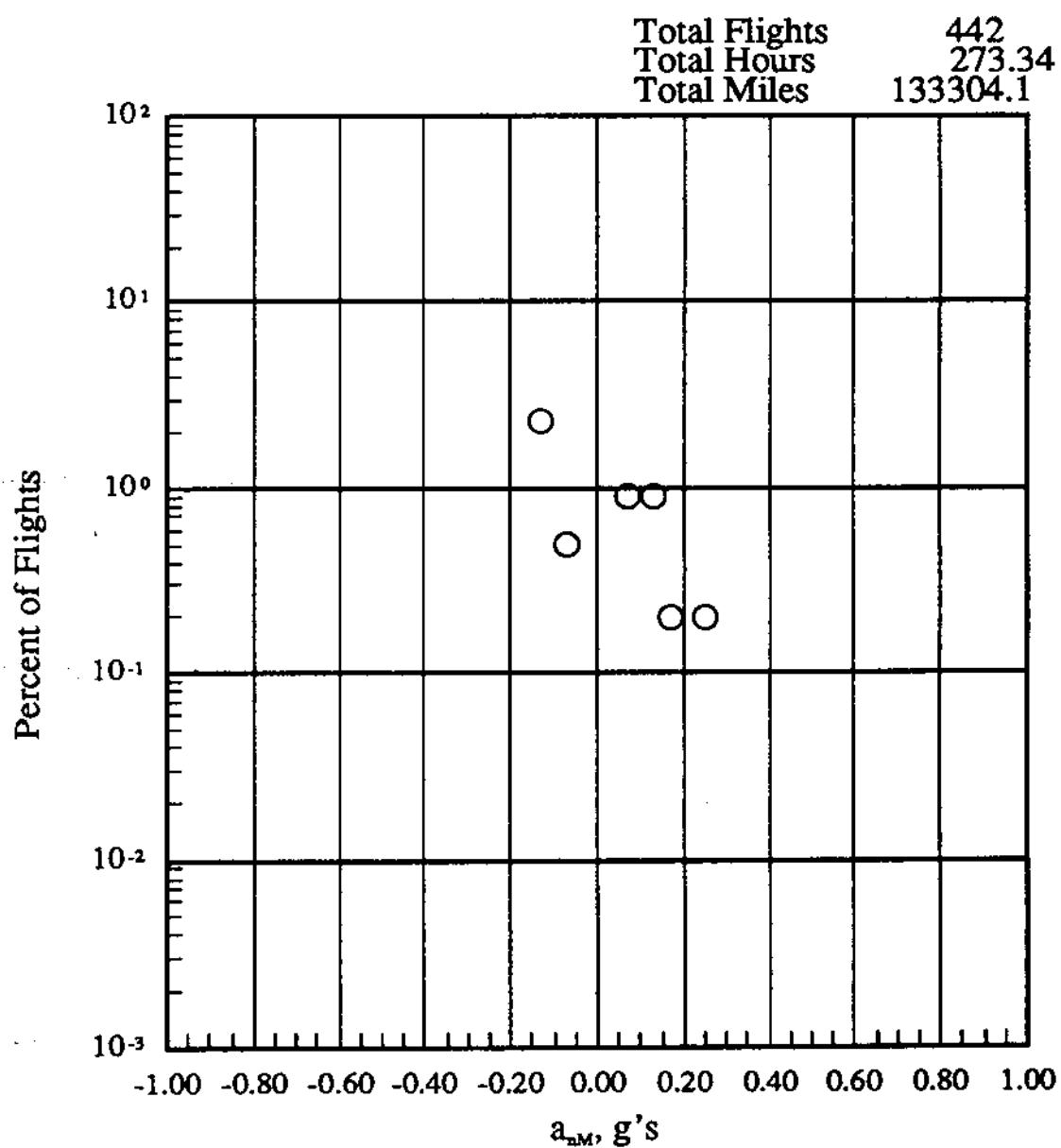
(f) 19500 to 24500 feet altitude

Figure 17.- Continued.



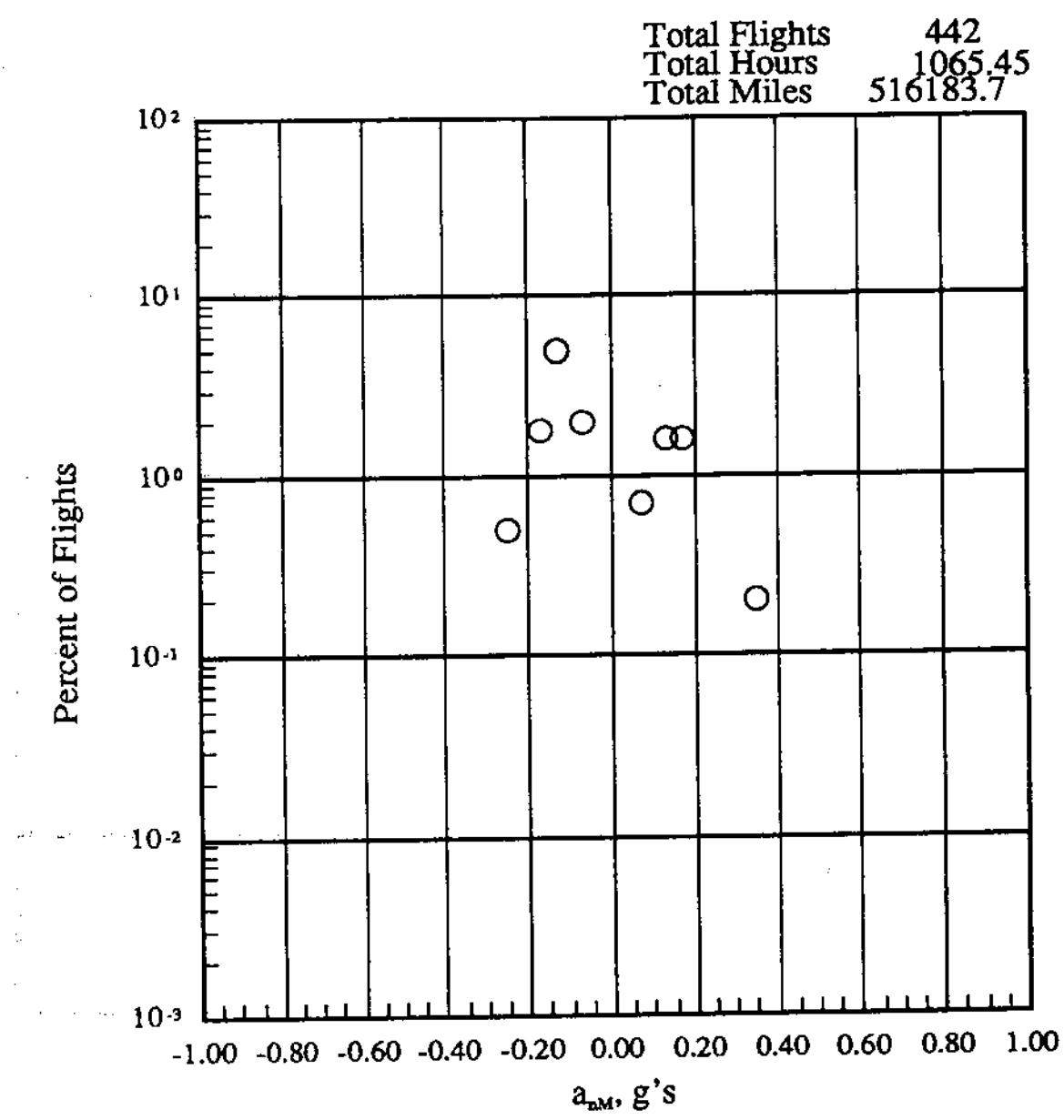
(g) 24500 to 29500 feet altitude

Figure 17.- Continued.



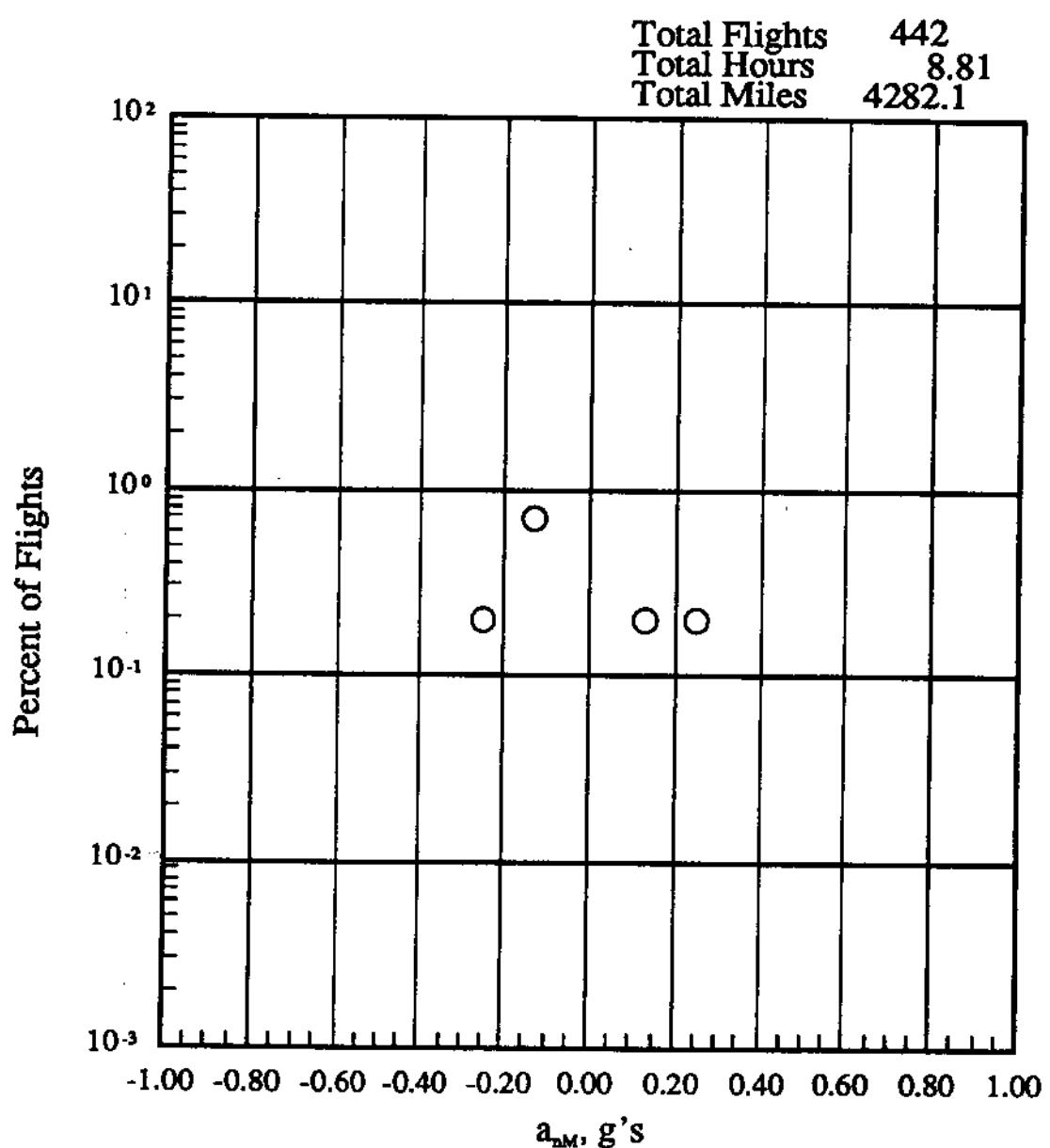
(h) 29500 to 34500 feet altitude

Figure 17.- Continued.



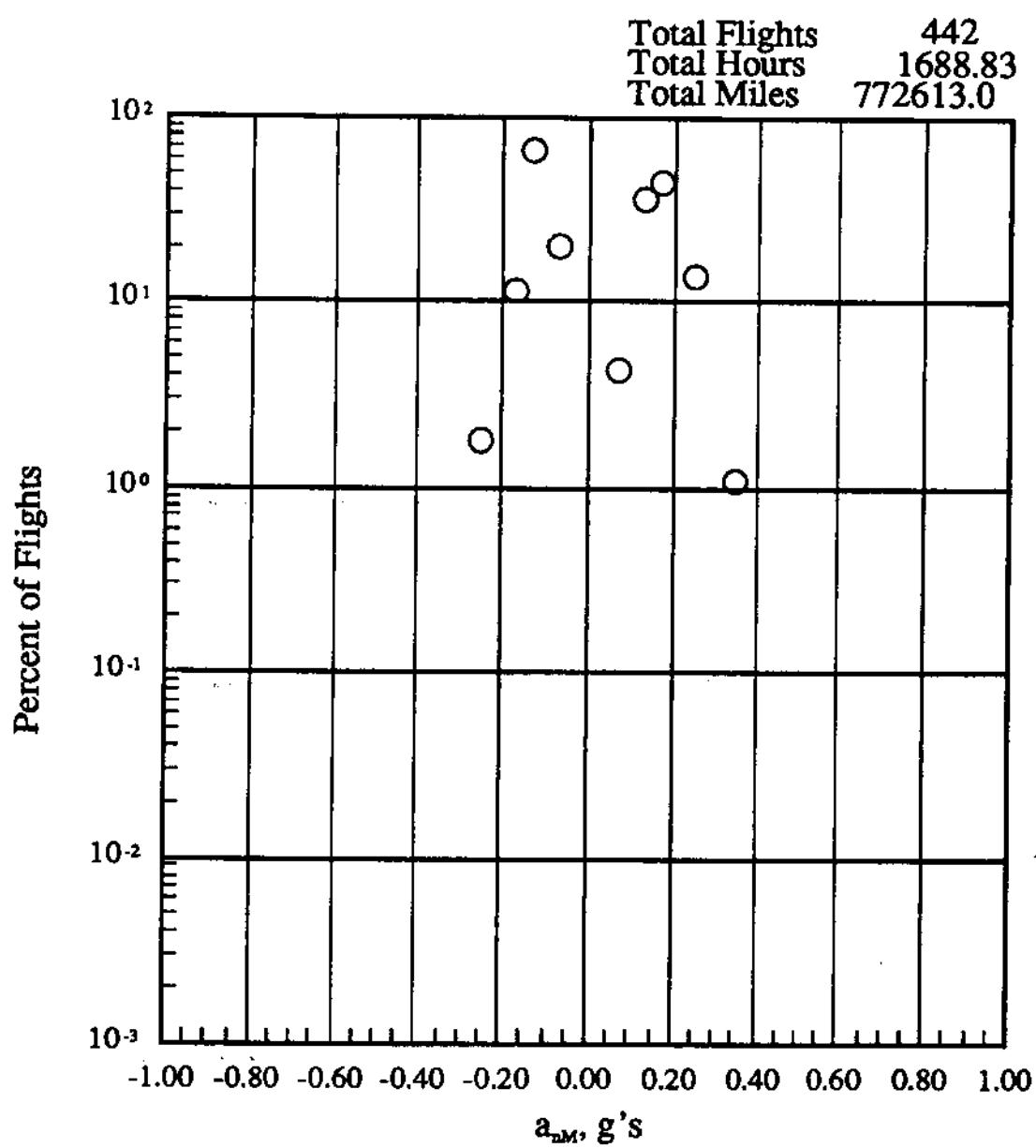
(i) 34500 to 39500 feet altitude

Figure 17.- Continued.



(j) 39500 to 44500 feet altitude

Figure 17.- Continued.

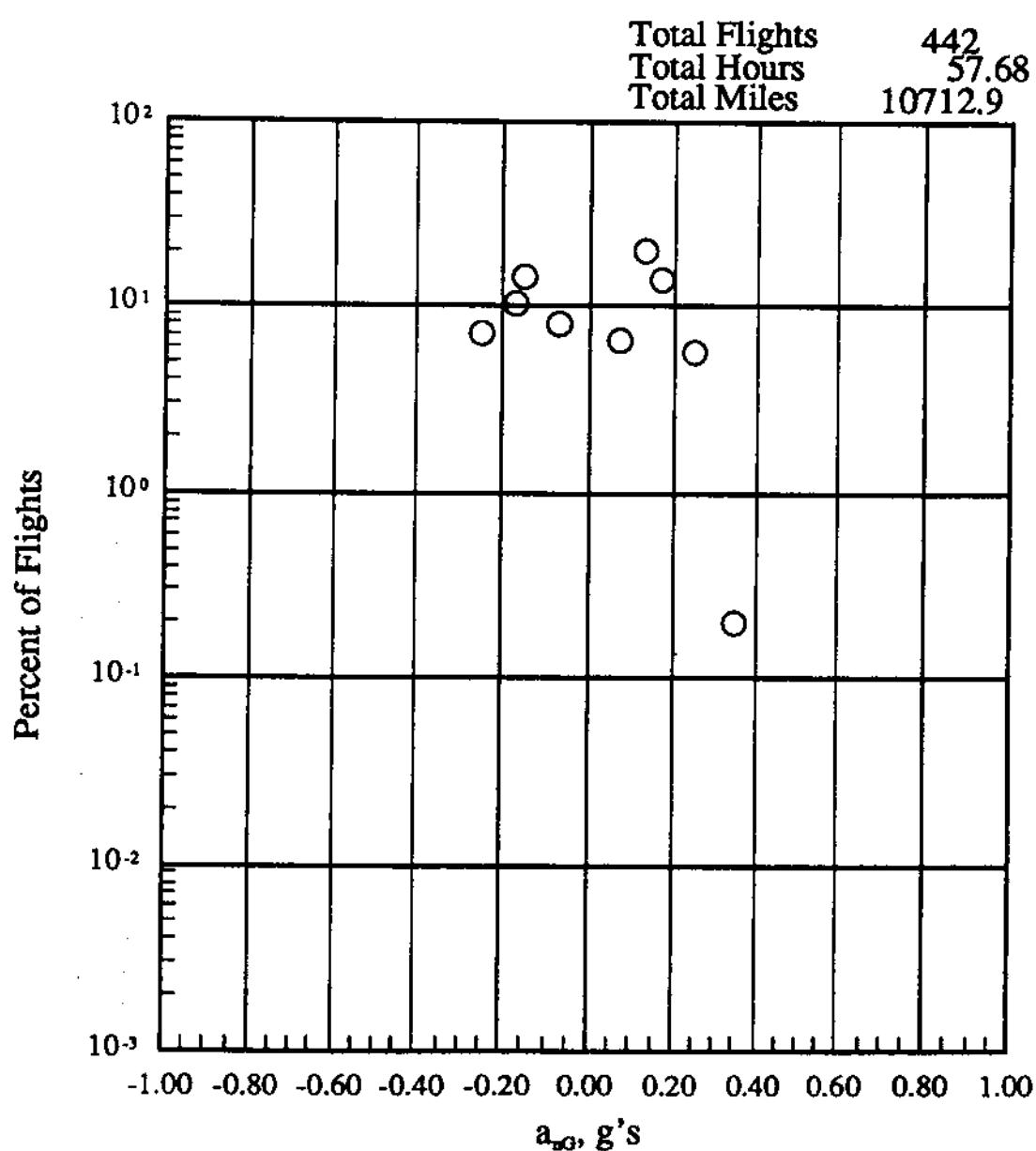


(k) -500 to 44500 feet altitude

Figure 17.- Concluded.

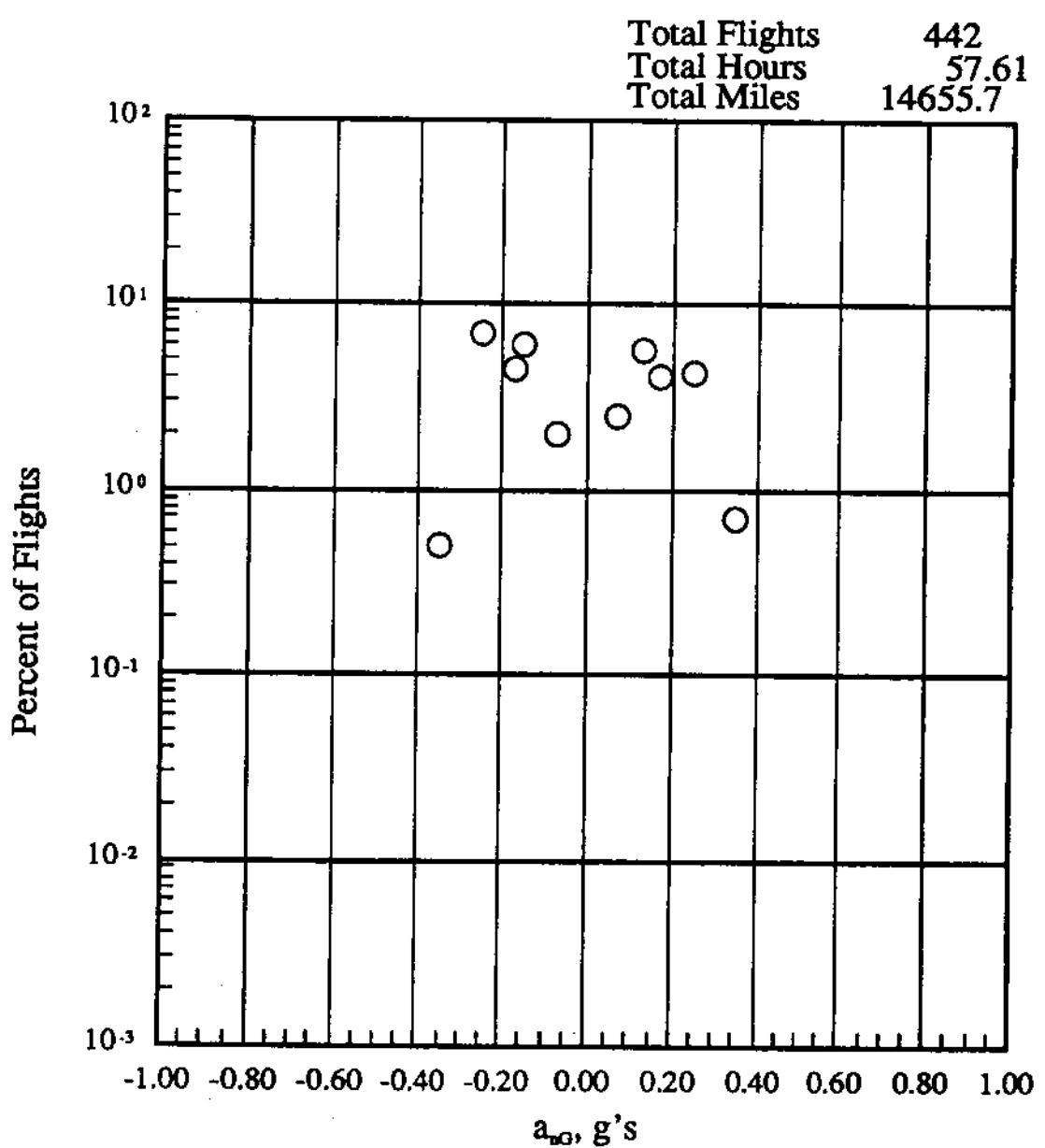
(a) Percent of flights where peak positive and negative  $a_{\text{LG}}$  per flight occurs within pressure altitude bands, any flap

Figure 18.- Peak positive and negative  $a_{\text{ng}}$  vs altitude.



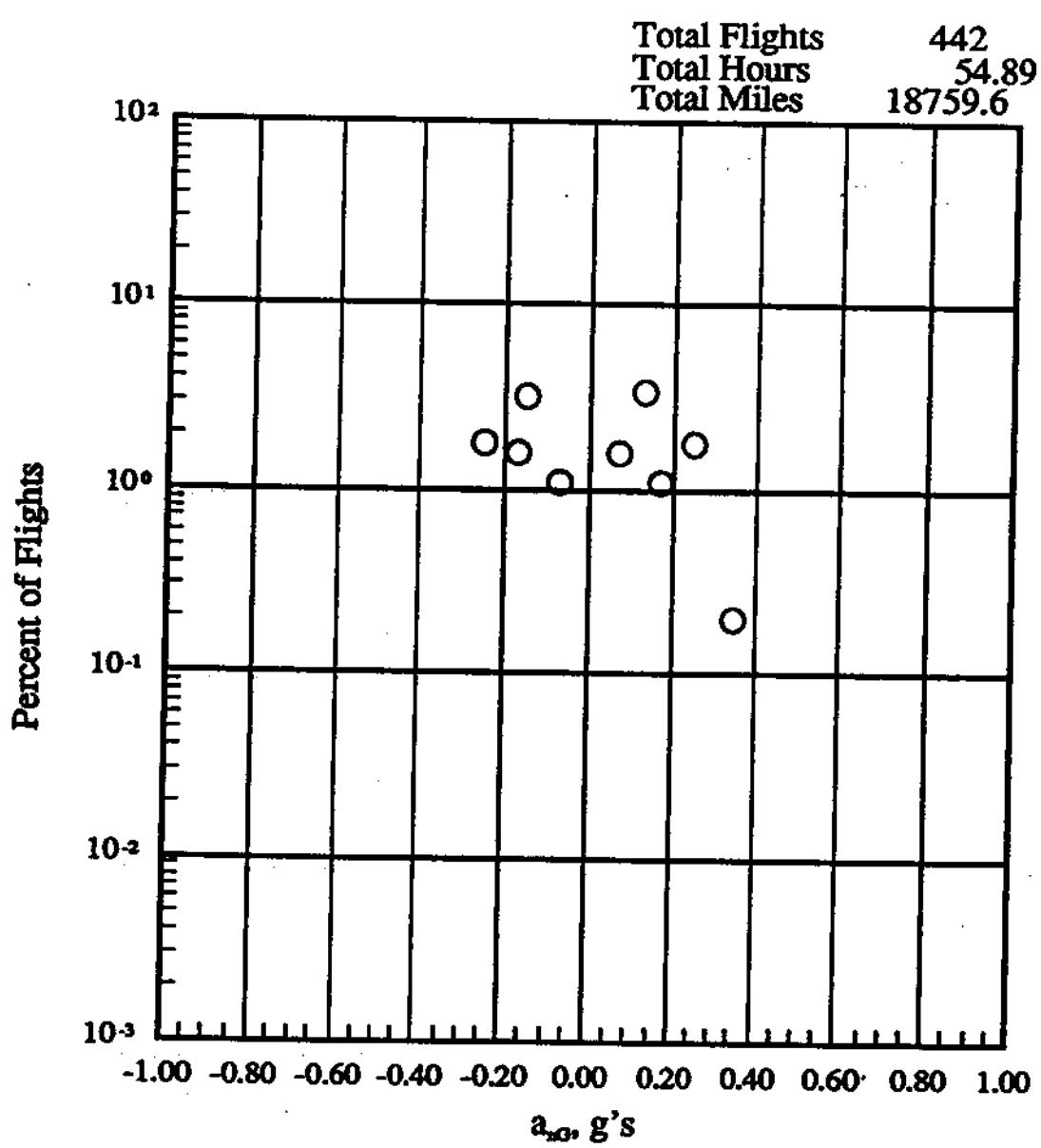
(b) -500 to 4500 feet altitude

Figure 18.- Continued.



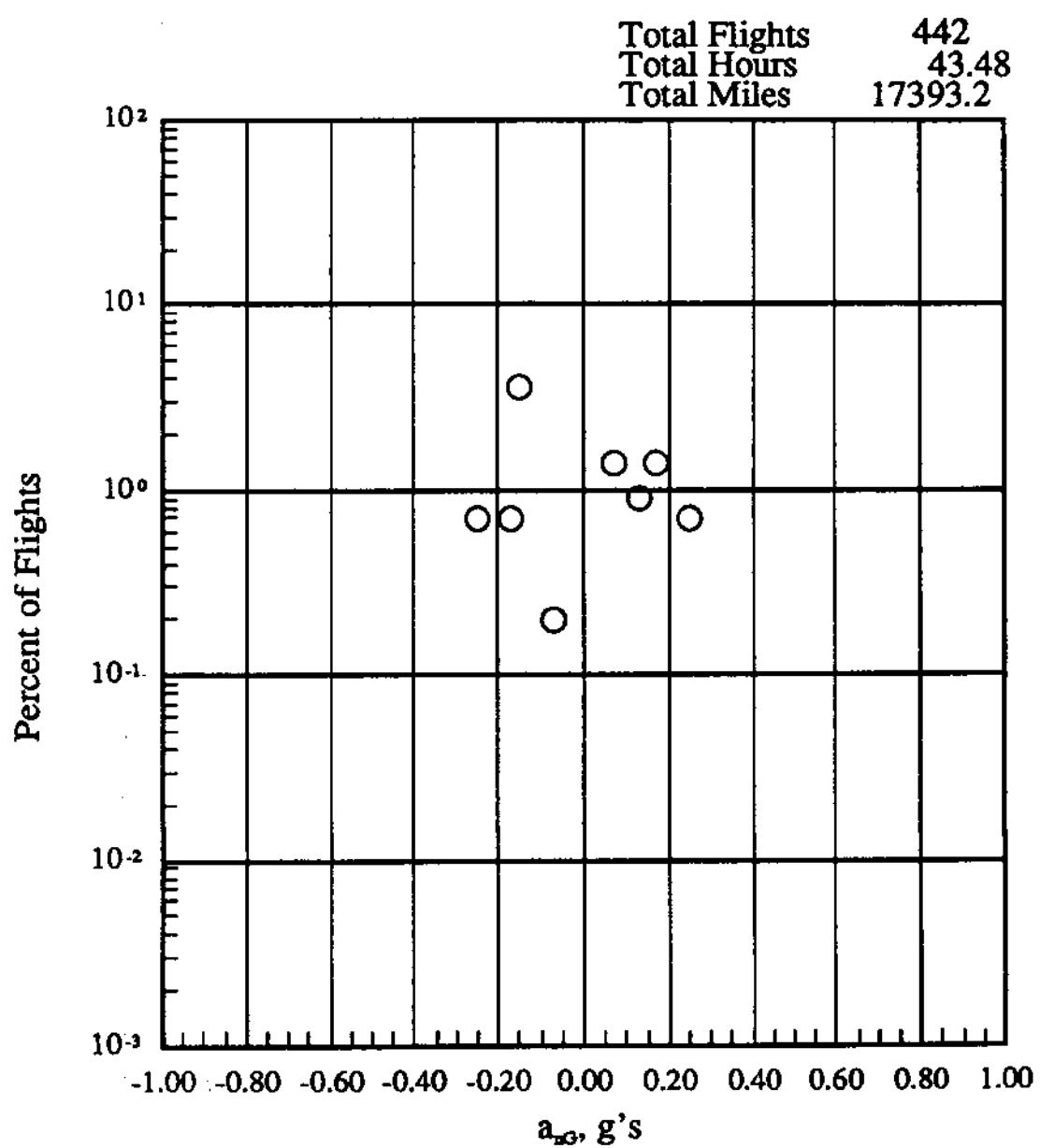
(c) 4500 to 9500 feet altitude

Figure 18.- Continued.



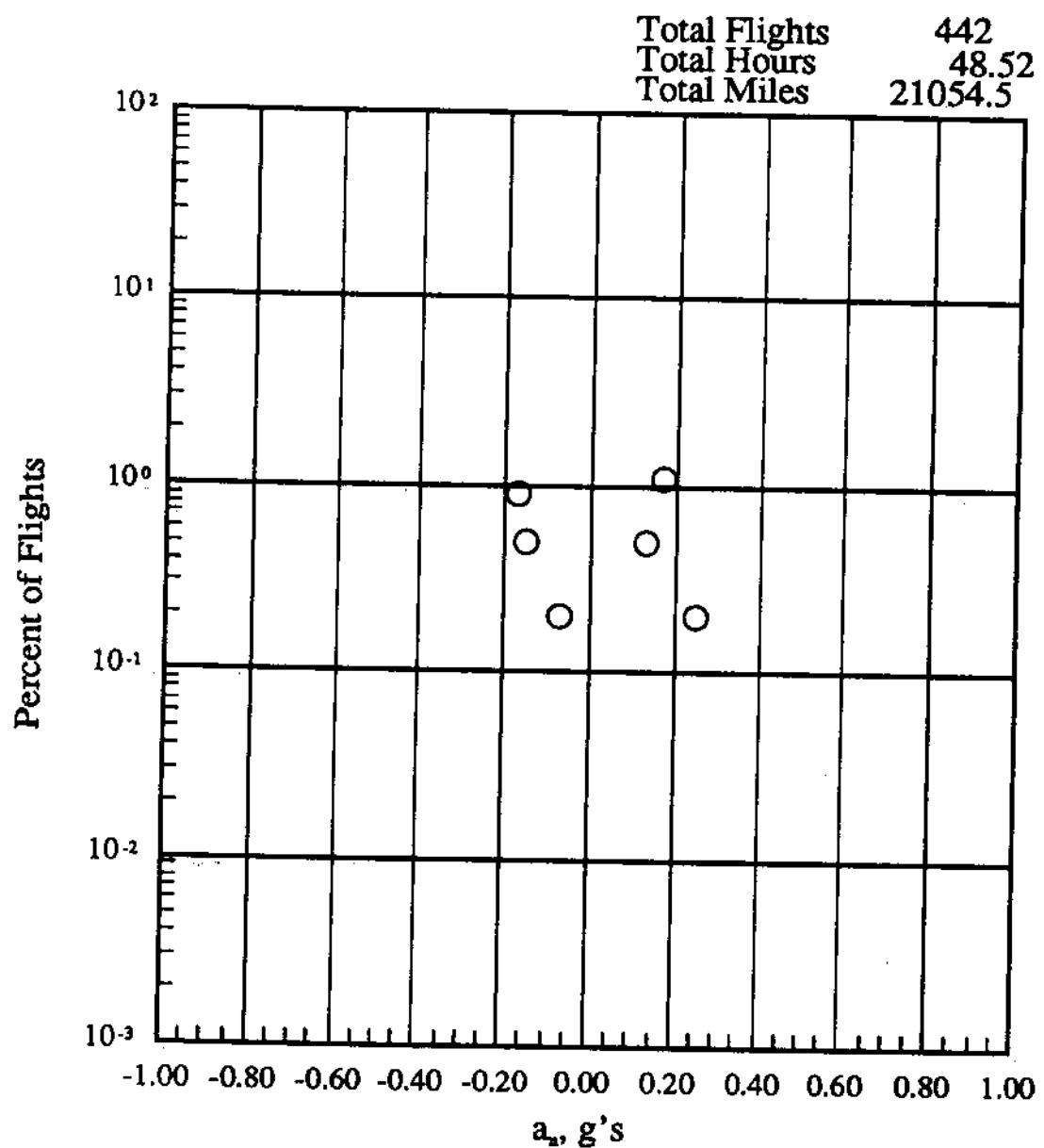
(d) 9500 to 14500 feet altitude

Figure 18.- Continued.



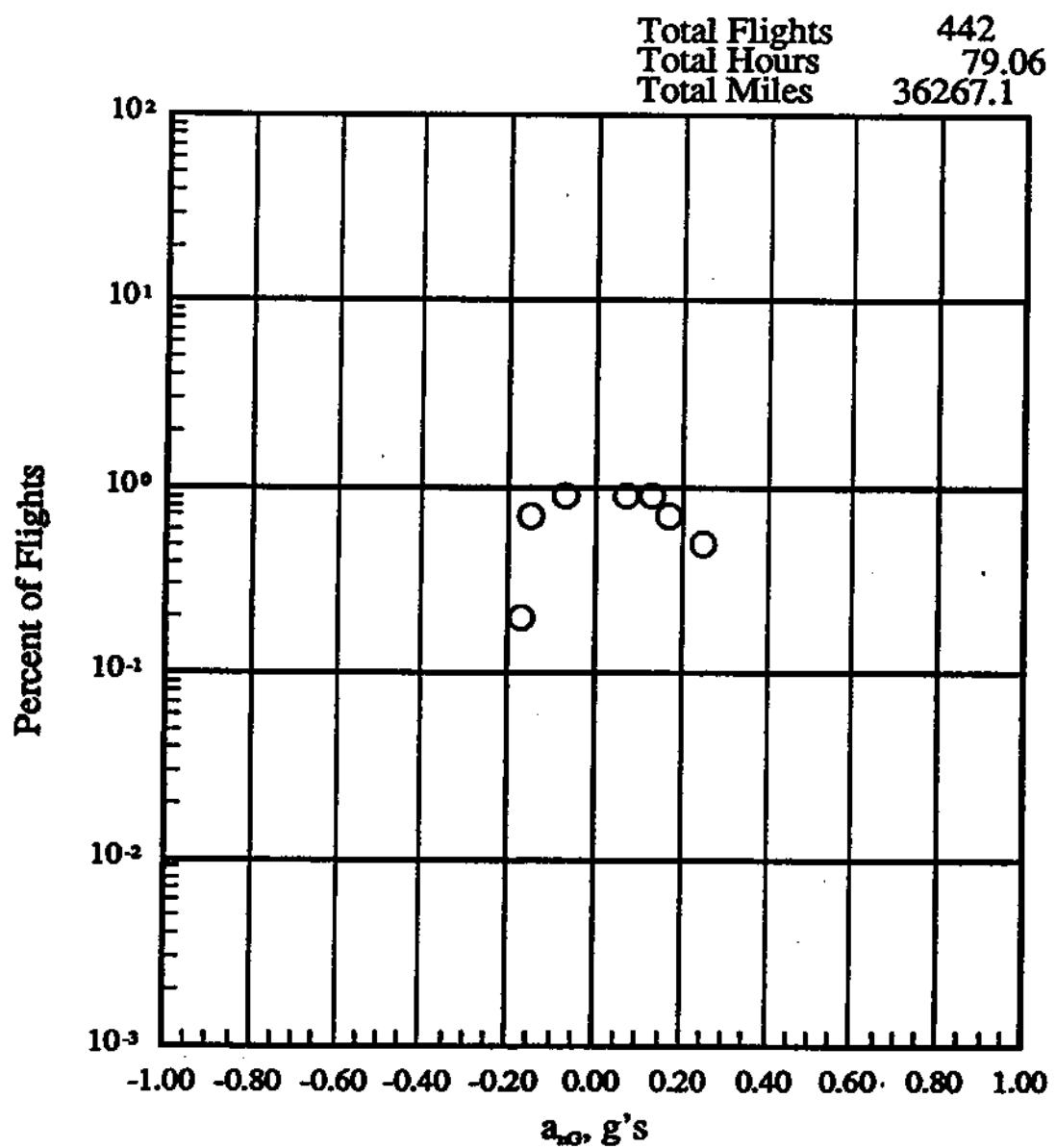
(e) 14500 to 19500 feet altitude

Figure 18.- Continued.



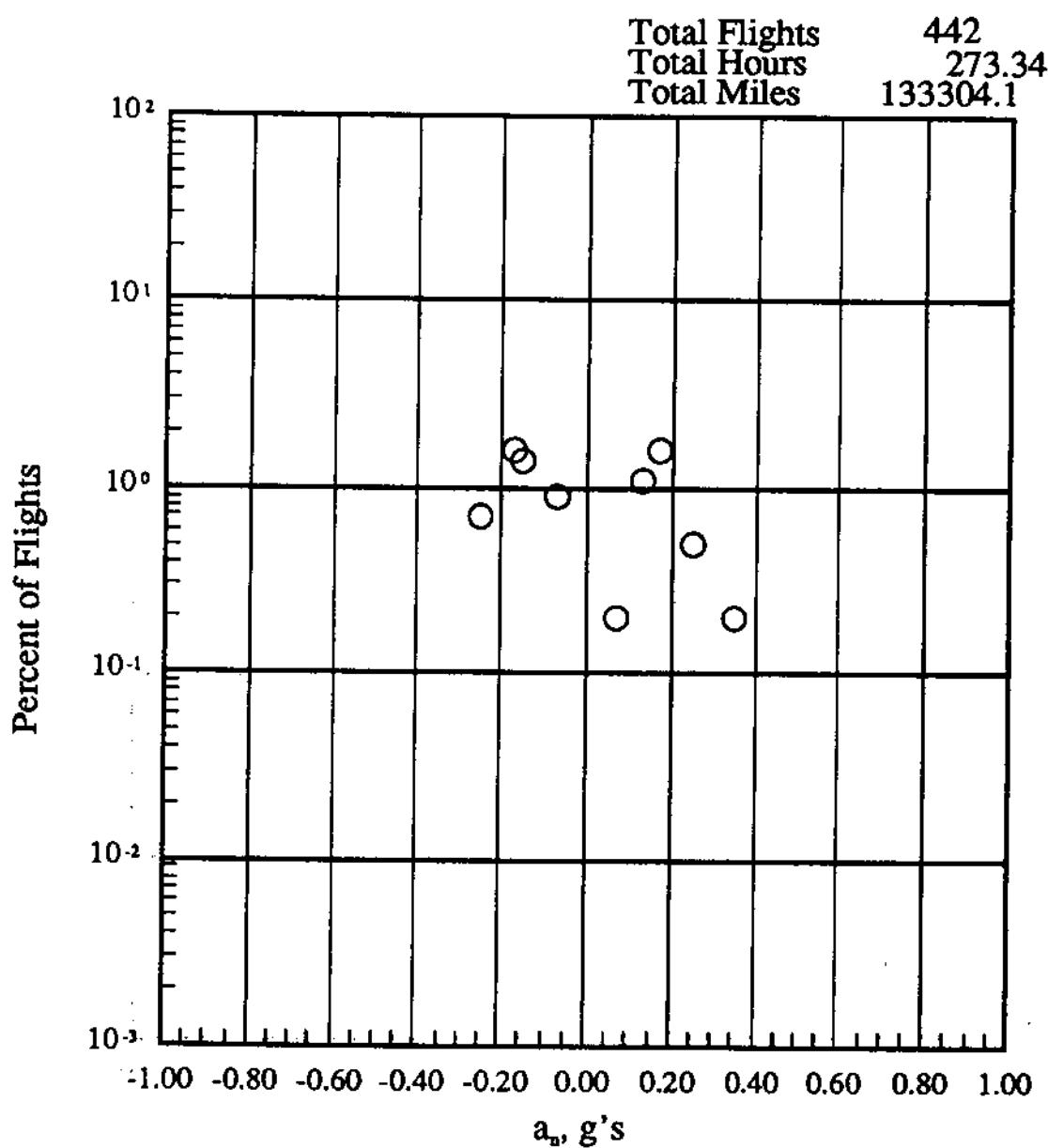
(f) 19500 to 24500 feet altitude

Figure 18.- Continued.



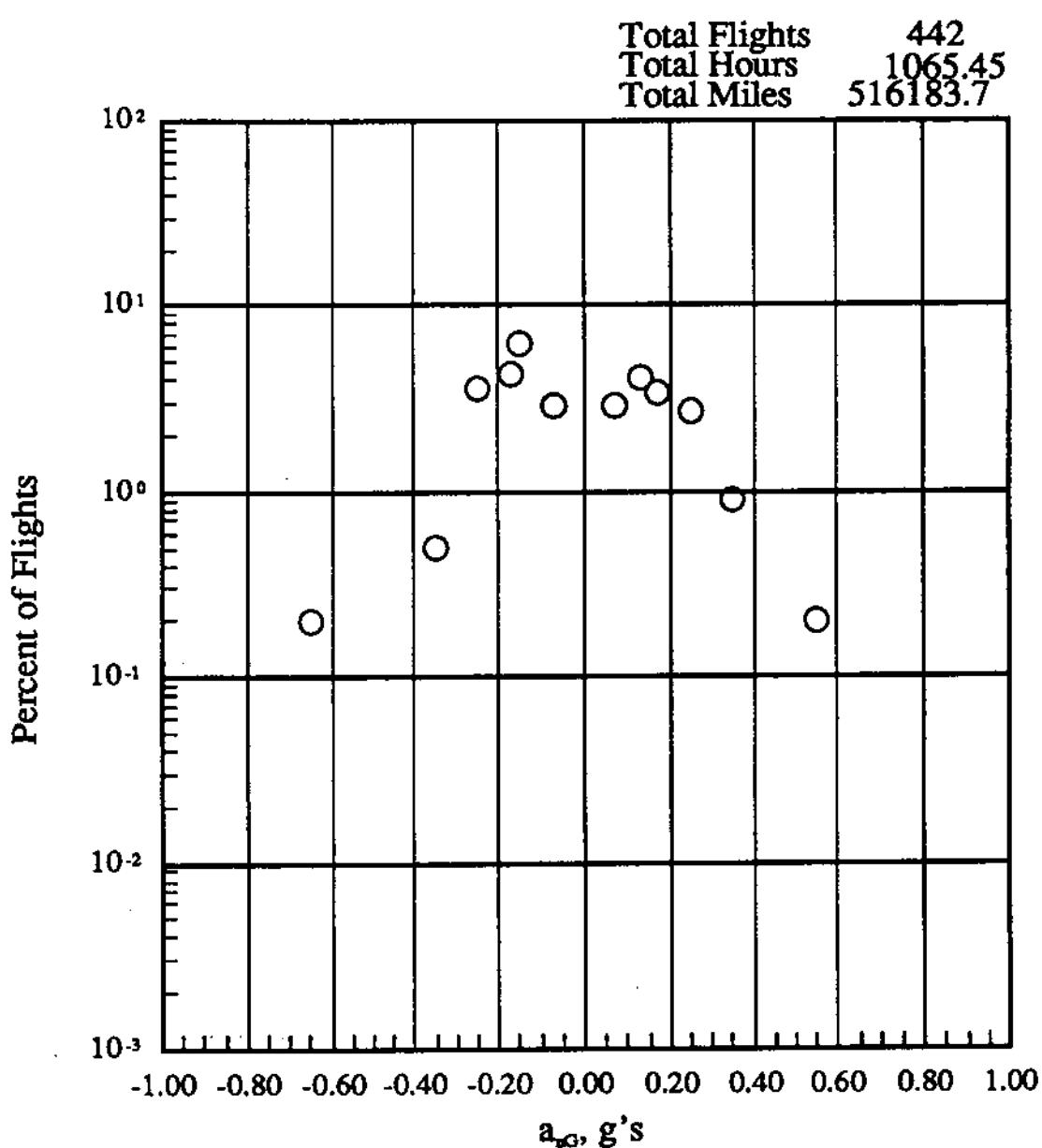
(g) 24500 to 29500 feet altitude

Figure 18.- Continued.



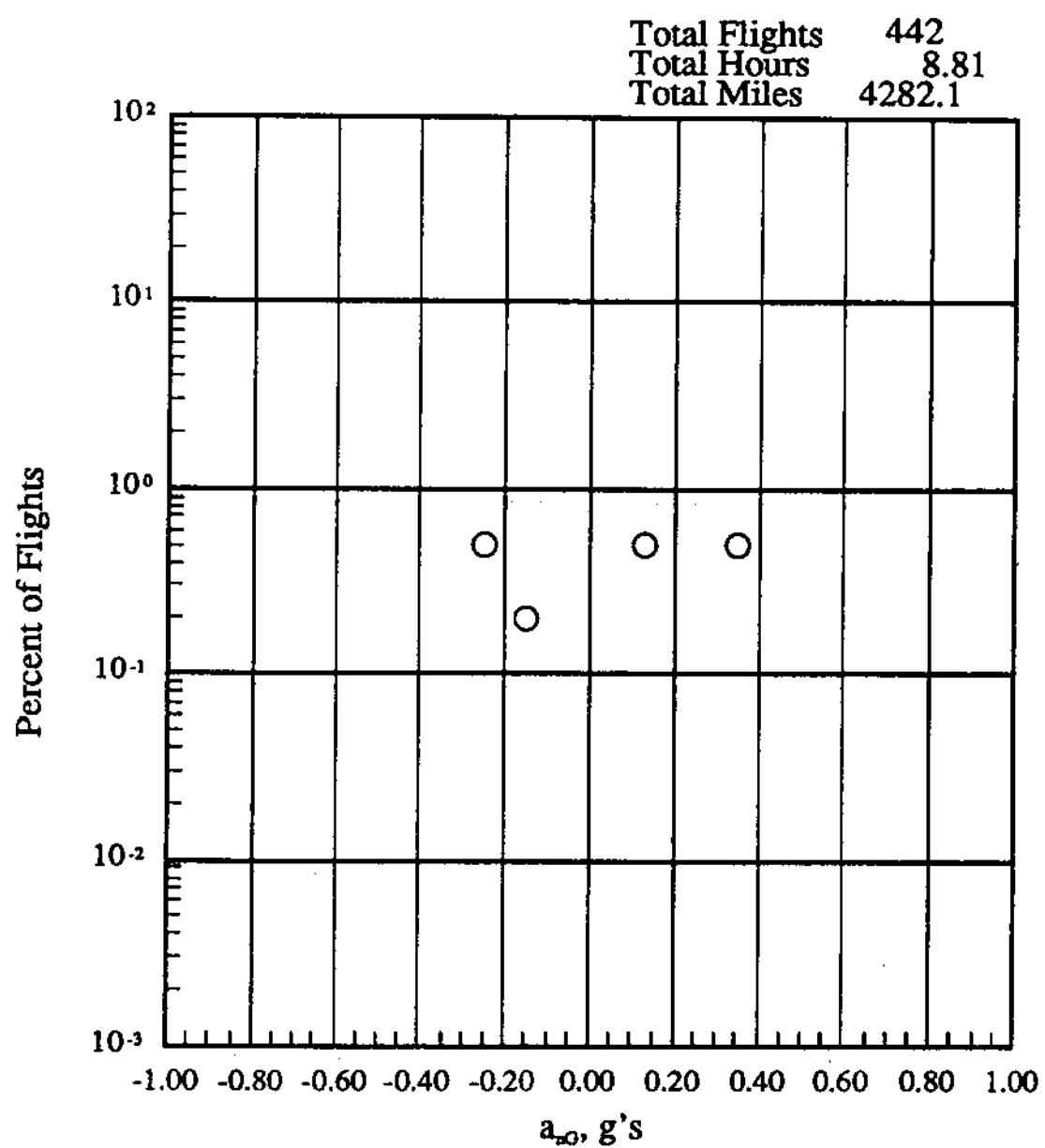
(h) 29500 to 34500 feet altitude

Figure 18.- Continued.



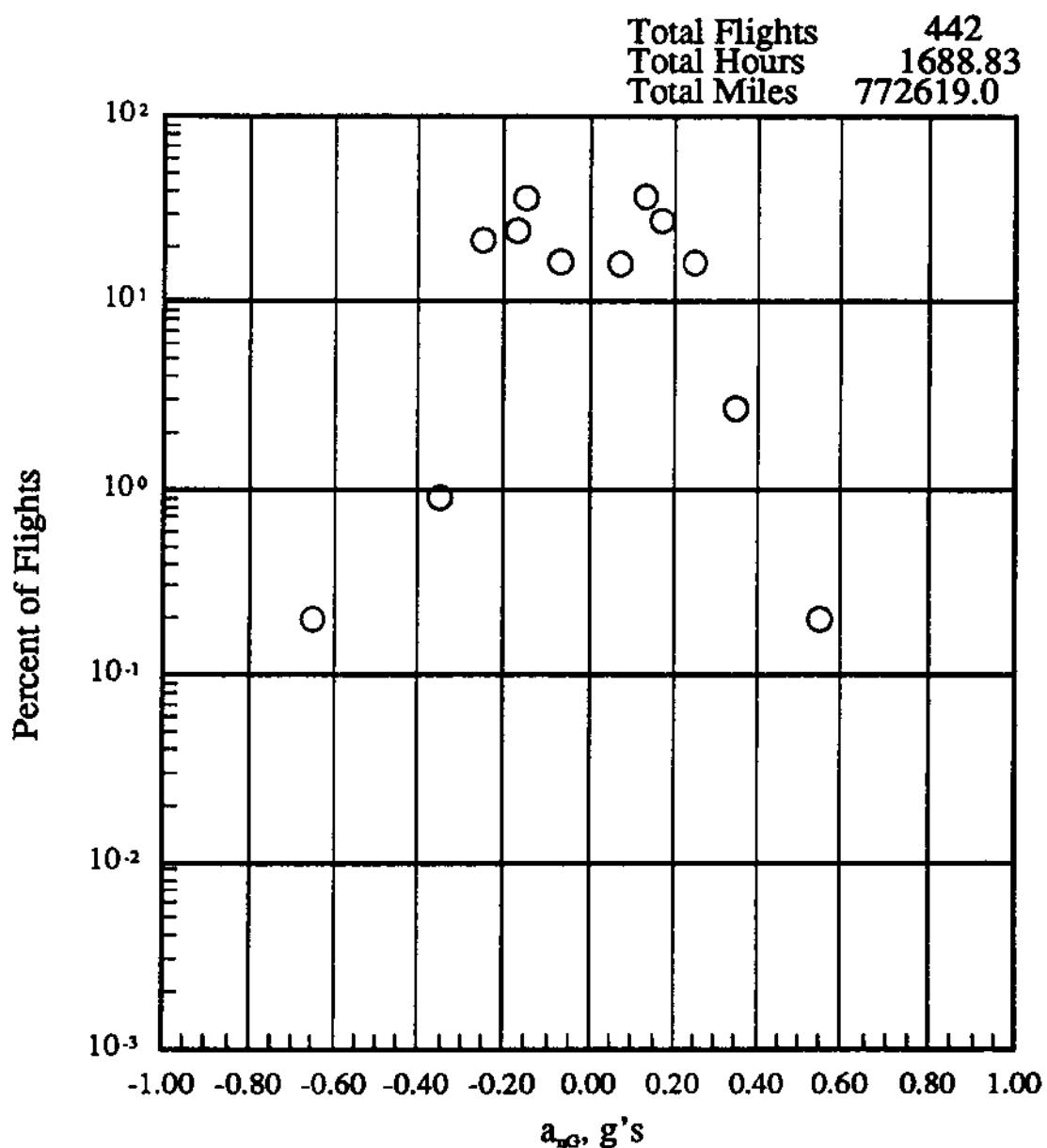
(i) 34500 to 39500 feet altitude

Figure 18.- Continued.



(j) 39500 to 44500 feet altitude

Figure 18.- Continued.



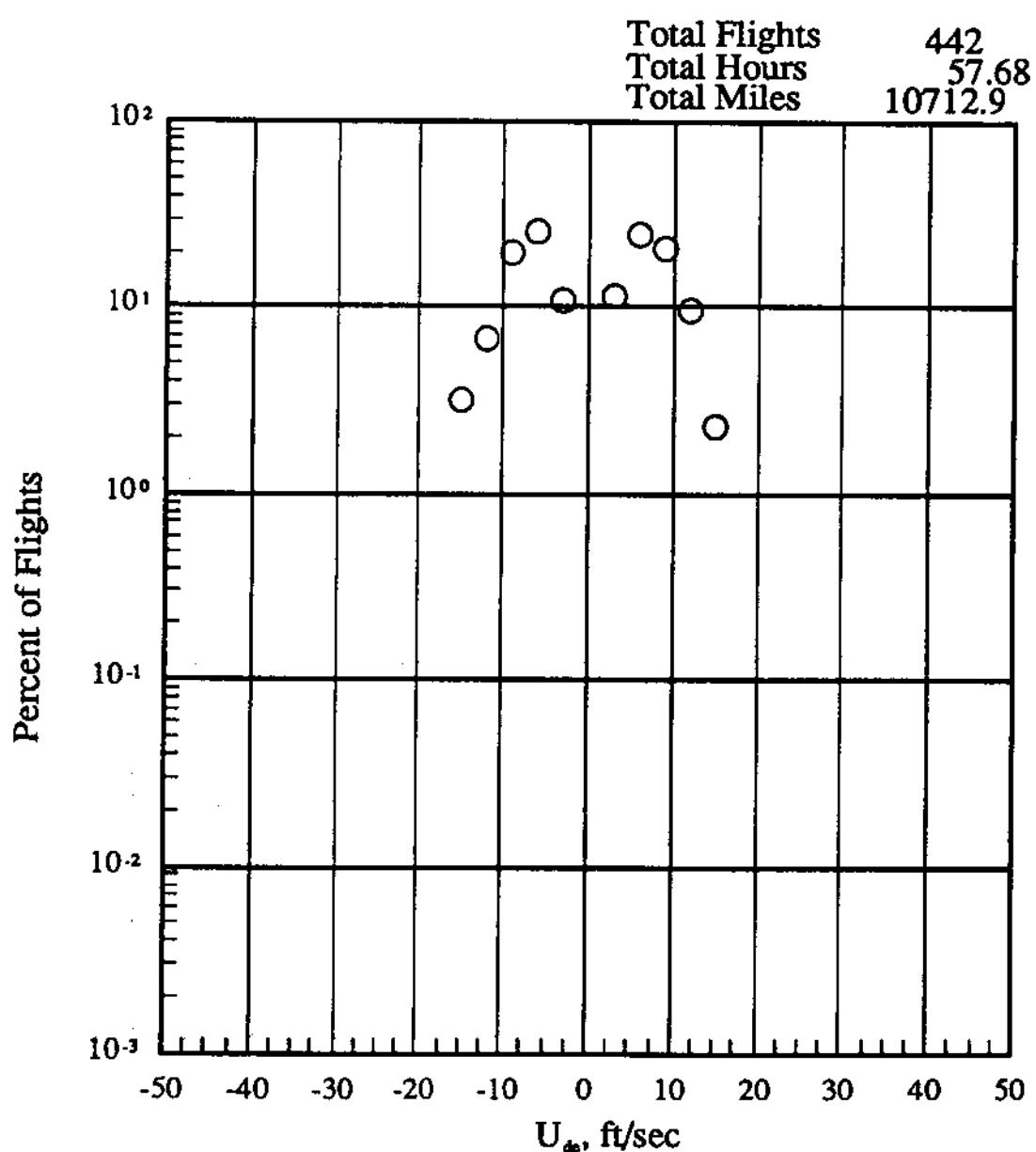
(k) -500 to 44500 feet altitude

Figure 18.- Concluded.

MAXIMUM $U_{de}$ , LEVEL FT/SEC	FOR EACH FLIGHT										TOTAL FLIGHTS
	-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	0
90	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0.2	0	0.2	0
15	2.3	0.9	0.9	0	0	0	0	0.2	0.5	0.5	3.6
12	9.7	2.3	0.5	0.2	0	0	0.2	0	0.5	0.5	13.8
9	20.4	4.5	0.7	0.5	0	0	0.2	0.2	2.0	0	28.7
6	24.7	3.4	1.9	0.5	0.5	0	1.1	2.0	0	0	33.9
3	11.5	2.0	1.4	0.2	0.2	0.5	0.2	2.5	0.2	0.2	18.6
-3	10.9	1.8	2.0	0.5	0.2	0	0.2	1.4	0.2	0.2	17.2
-6	25.6	4.5	0.9	0.5	0.5	0	1.6	3.2	0	0	36.7
-9	19.7	5.0	1.1	0.2	0	0	0.5	2.3	0.5	0.5	29.2
-12	6.6	3.6	0.2	0	0	0	0	0.2	0	0	10.9
-15	3.2	1.4	0	0	0	0	0	0.2	0	0	4.8
-20	0	0.2	0	0	0	0	0.2	0	0	0	0.5
-30	0	0	0	0	0	0	0	0	0	0	0
-40	0	0	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS & ALT	57.68	57.61	54.89	43.43	48.52	79.06	273.34	1065.45	6.31	1688.63	
FLIGHT MILES & ALT	10712.91	14655.73	20759.60	17393.17	21054.53	36267.13	133304.11	516183.65	4282.14	772612.98	
TOTAL FLIGHTS									442		

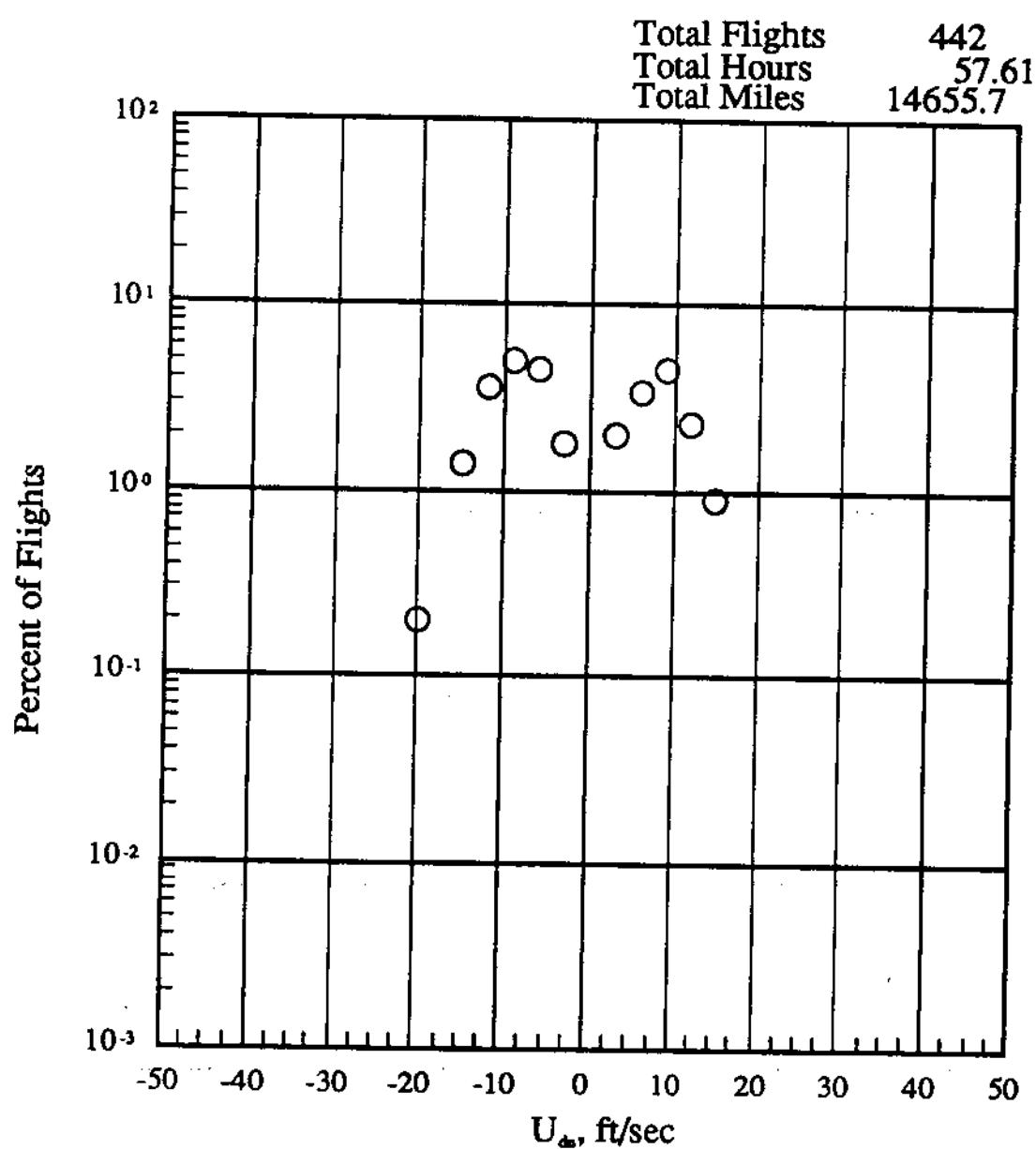
(a) Percent of flights where peak positive and negative  $U_{de}$  per flight occurs within pressure altitude bands, any flap

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



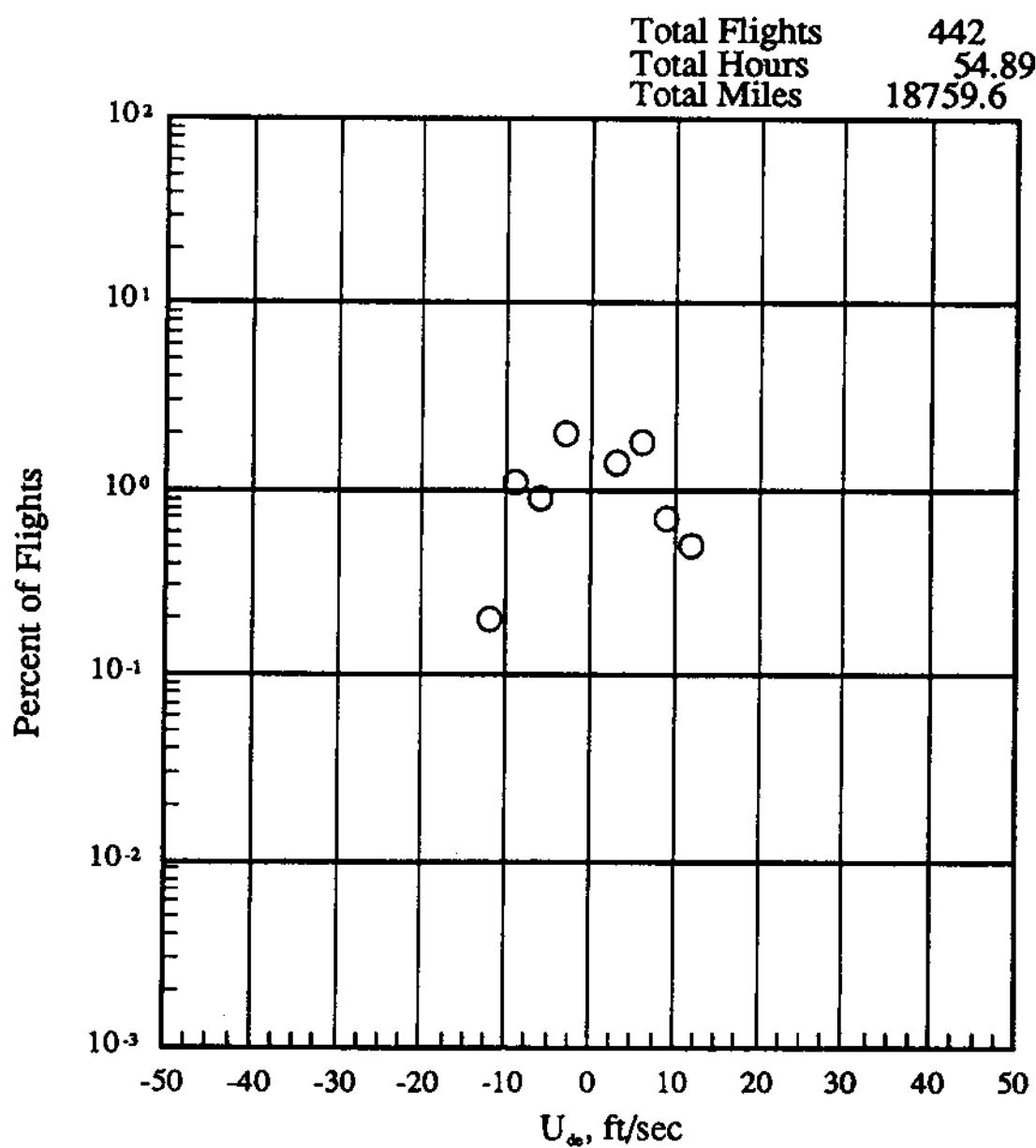
(b) -500 to 4500 feet altitude

Figure 19.- Continued.



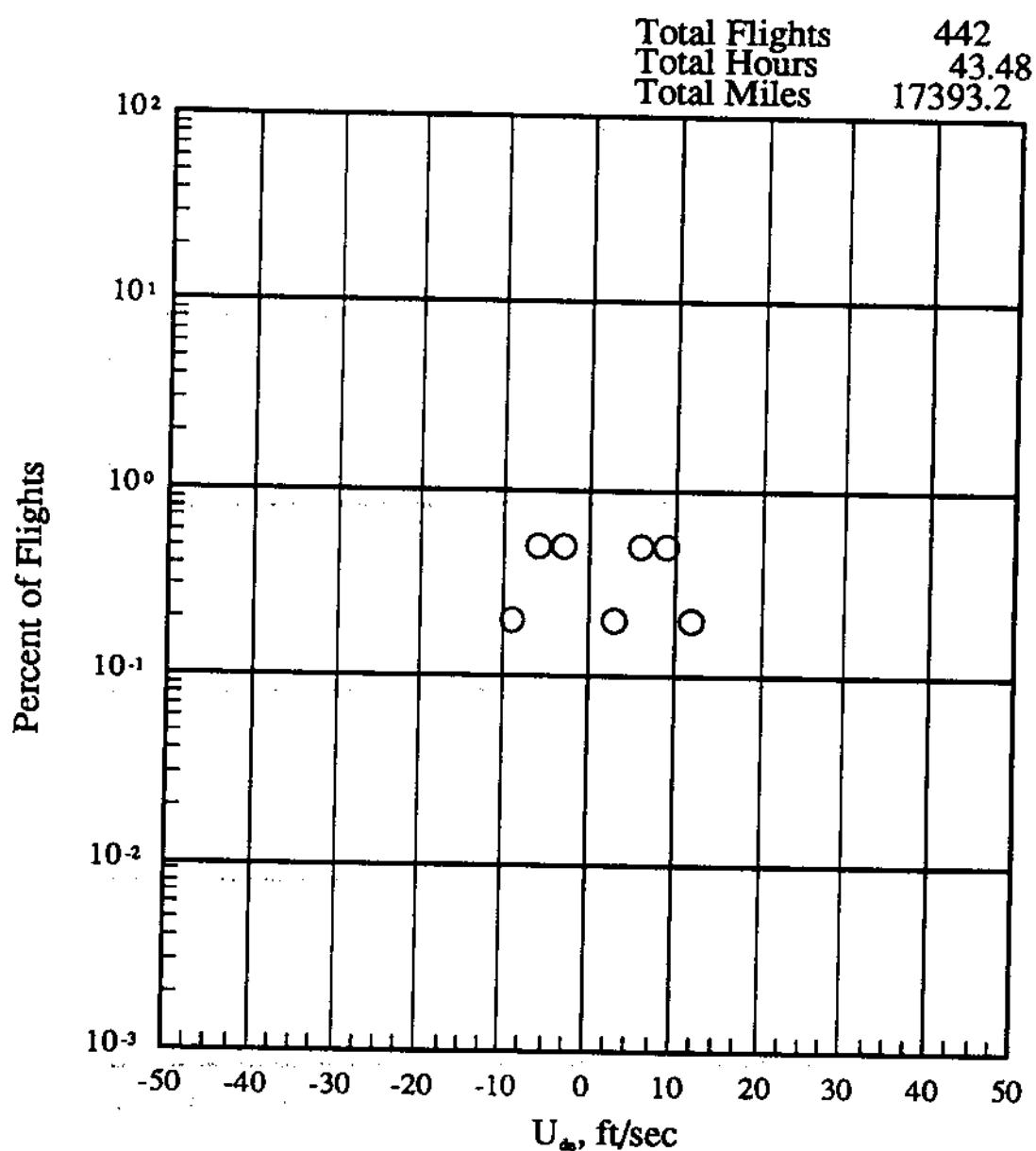
(c) 4500 to 9500 feet altitude

Figure 19.- Continued.



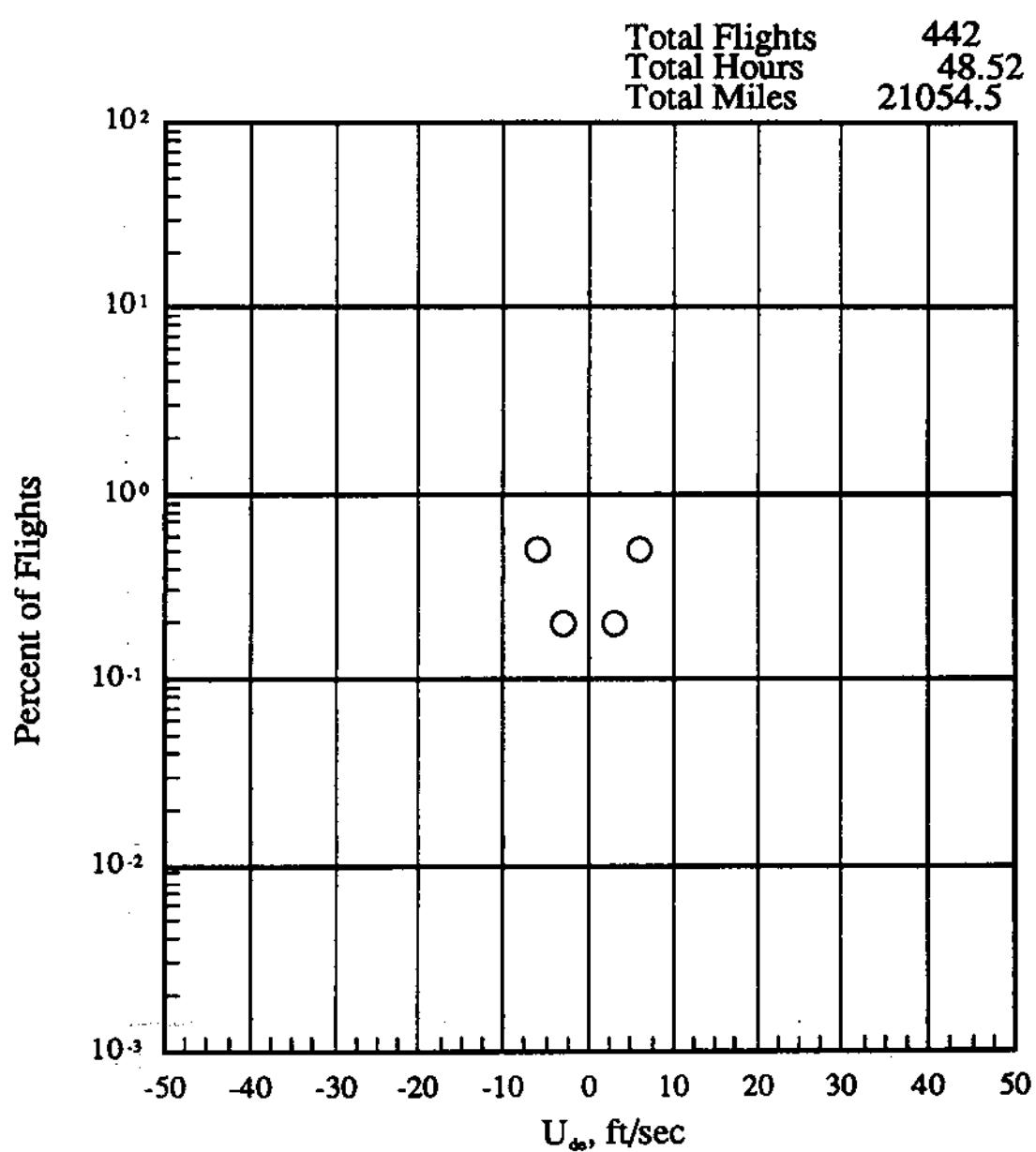
(d) 9500 to 14500 feet altitude

Figure 19.- Continued.



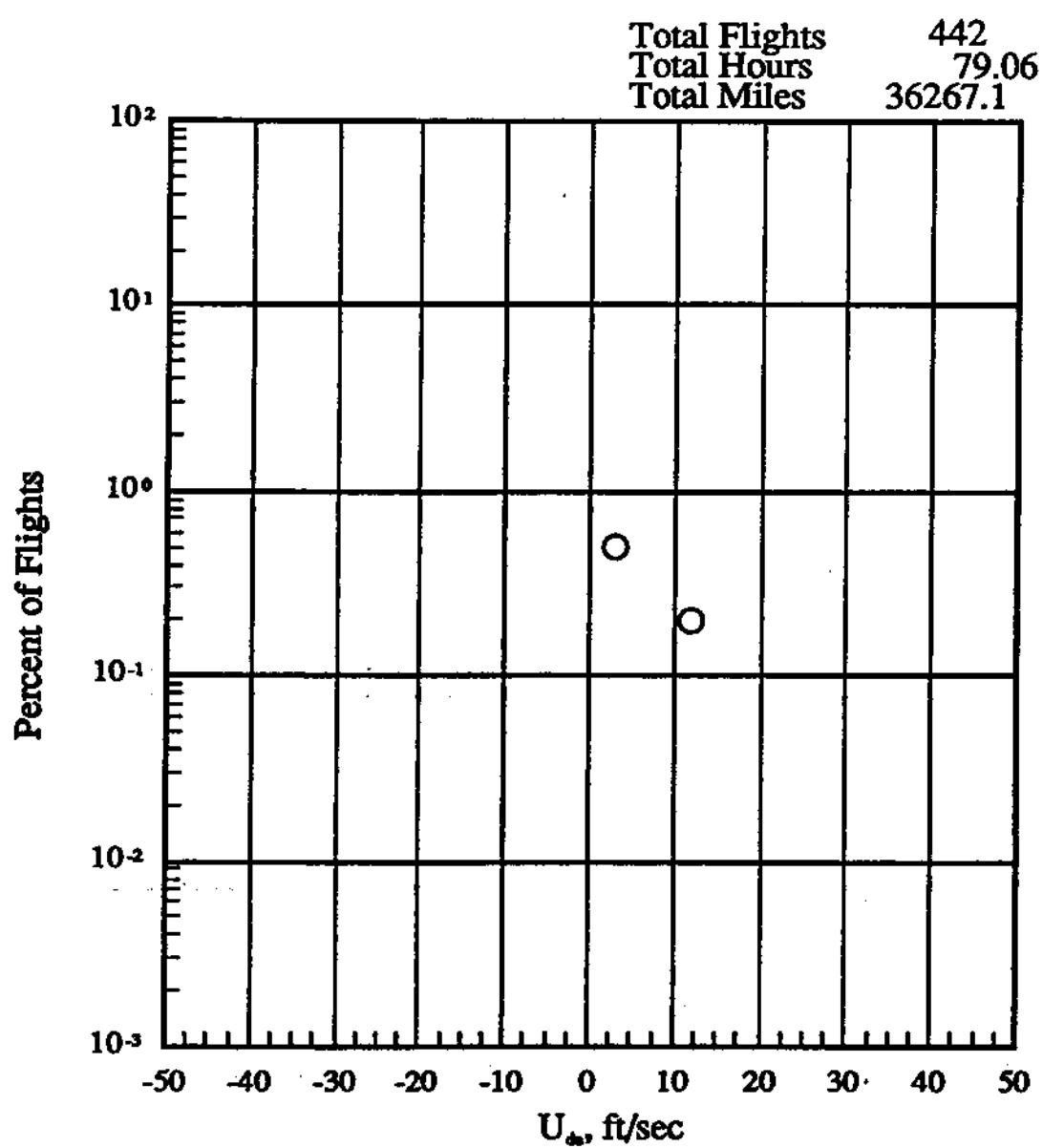
(e) 14500 to 19500 feet altitude

Figure 19.- Continued.



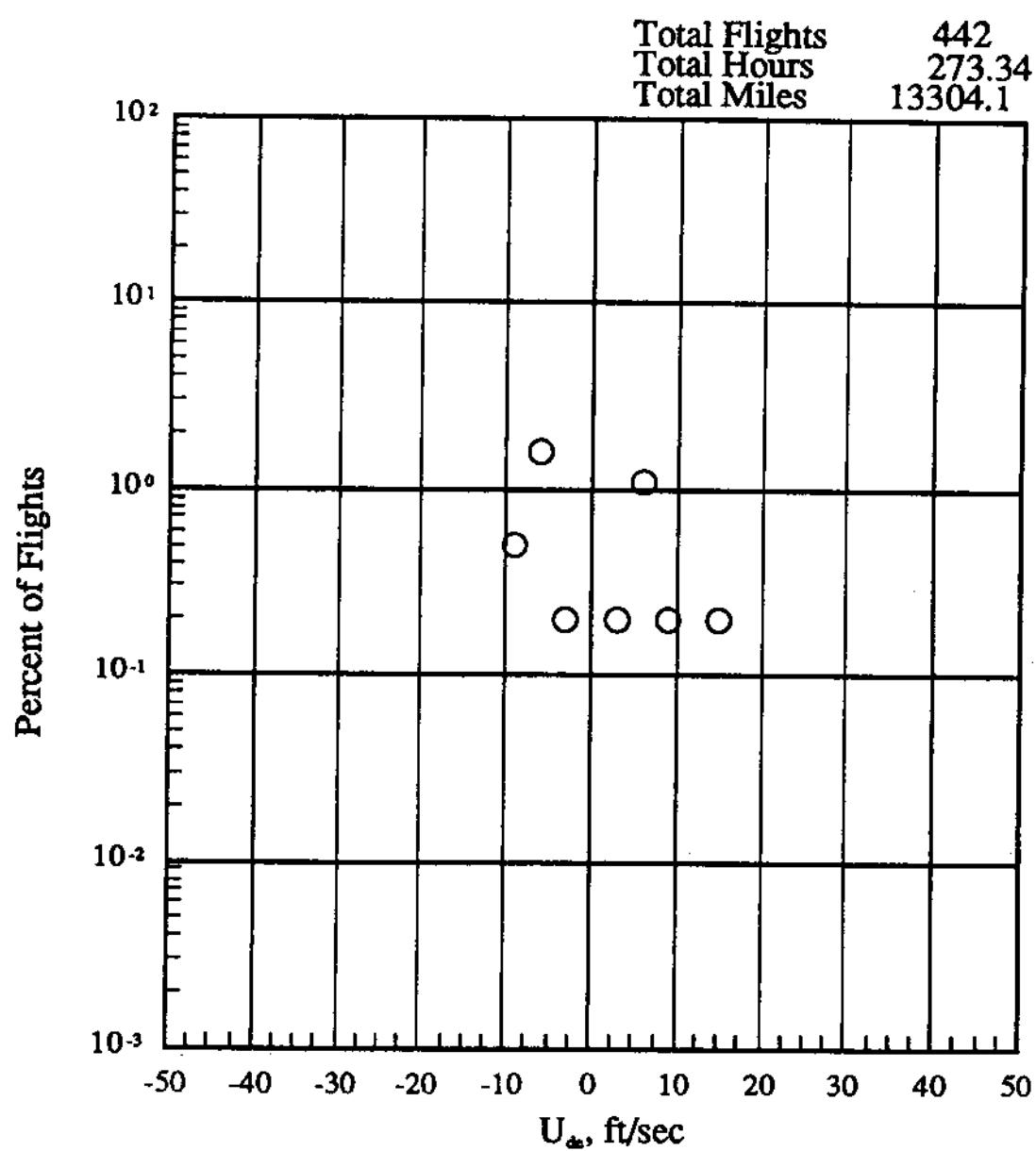
(f) 19500 to 24500 feet altitude

Figure 19.- Continued.



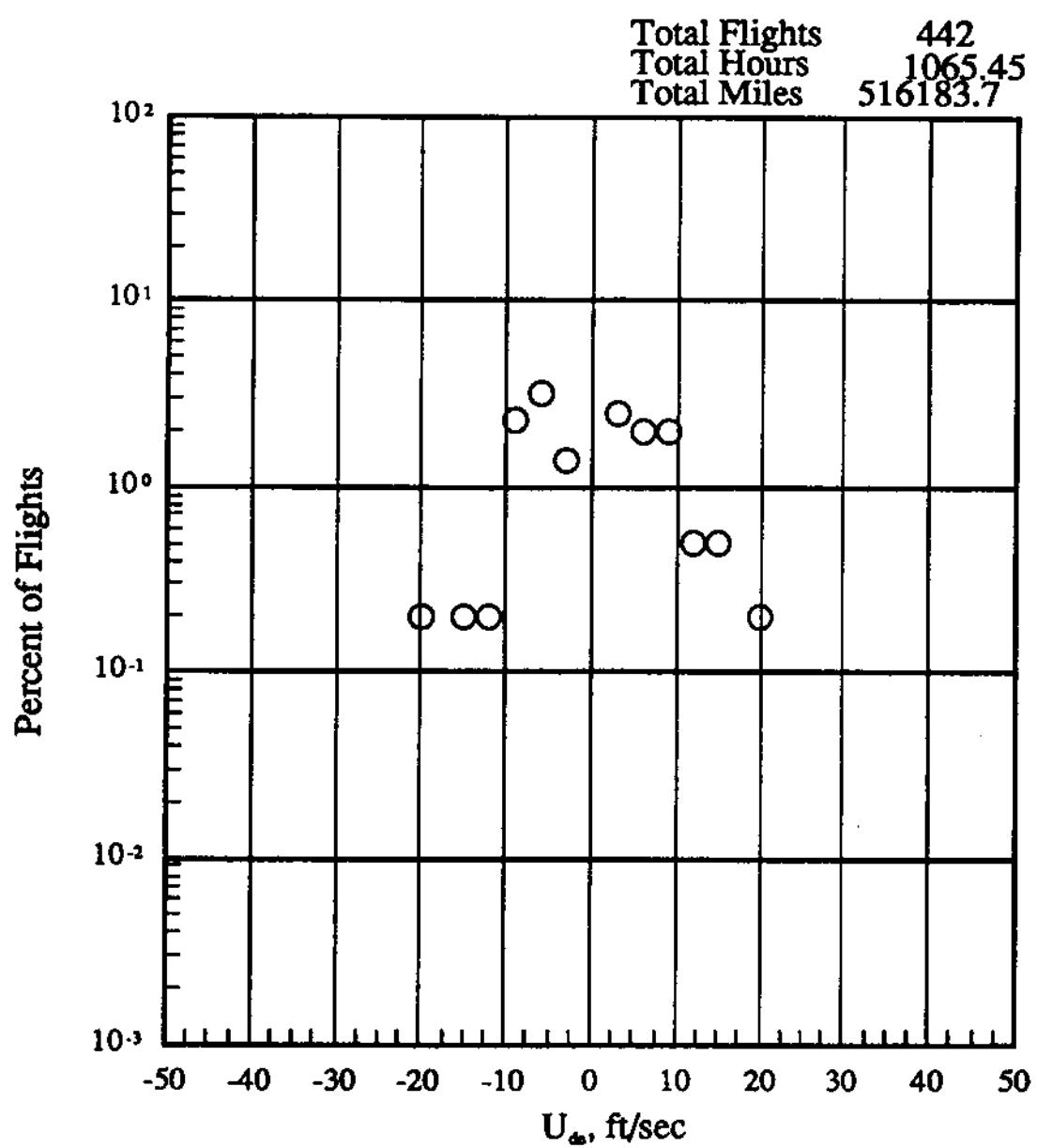
(g) 24500 to 29500 feet altitude

Figure 19.- Continued.



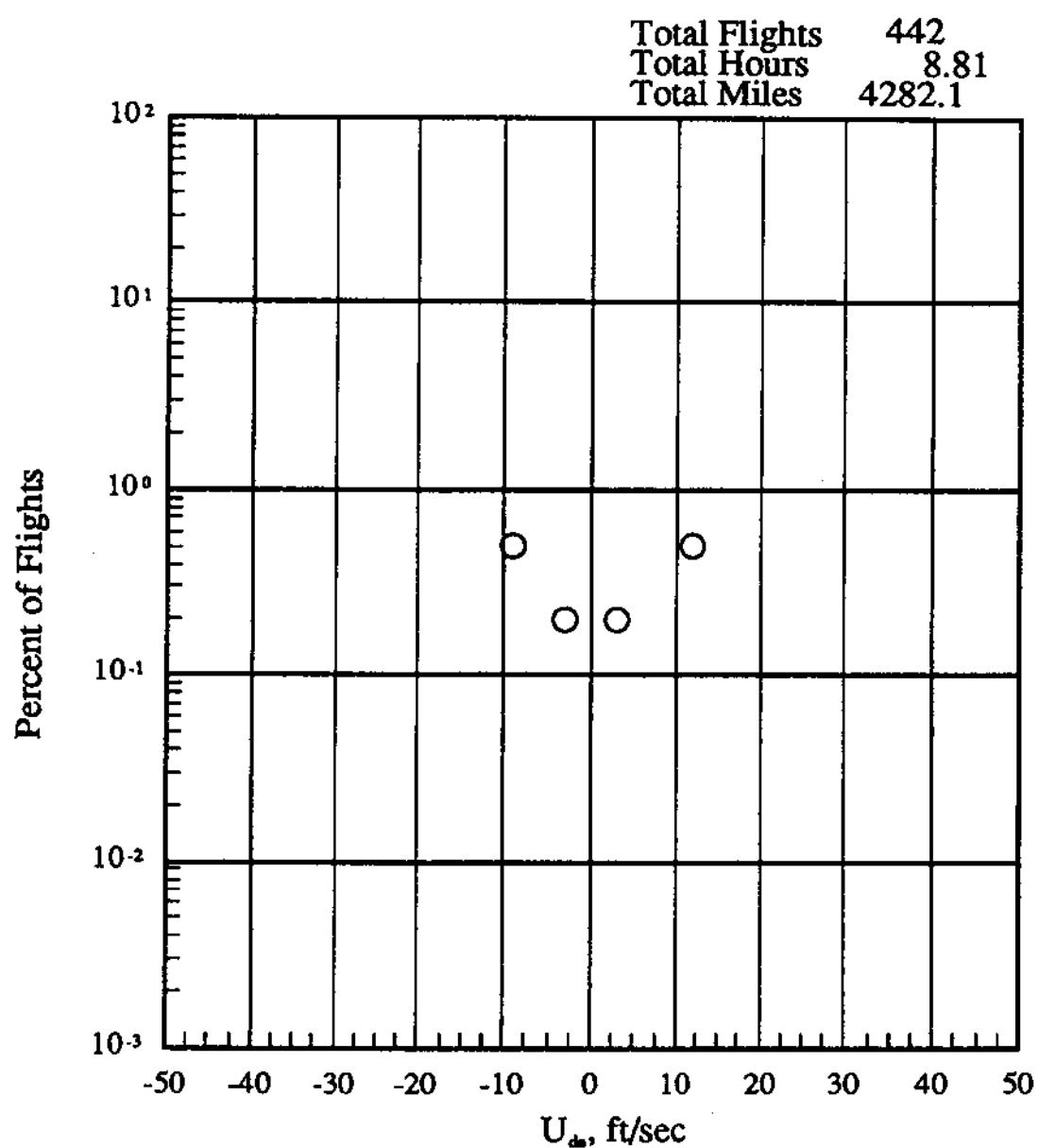
(h) 29500 to 34500 feet altitude

Figure 19.- Continued.



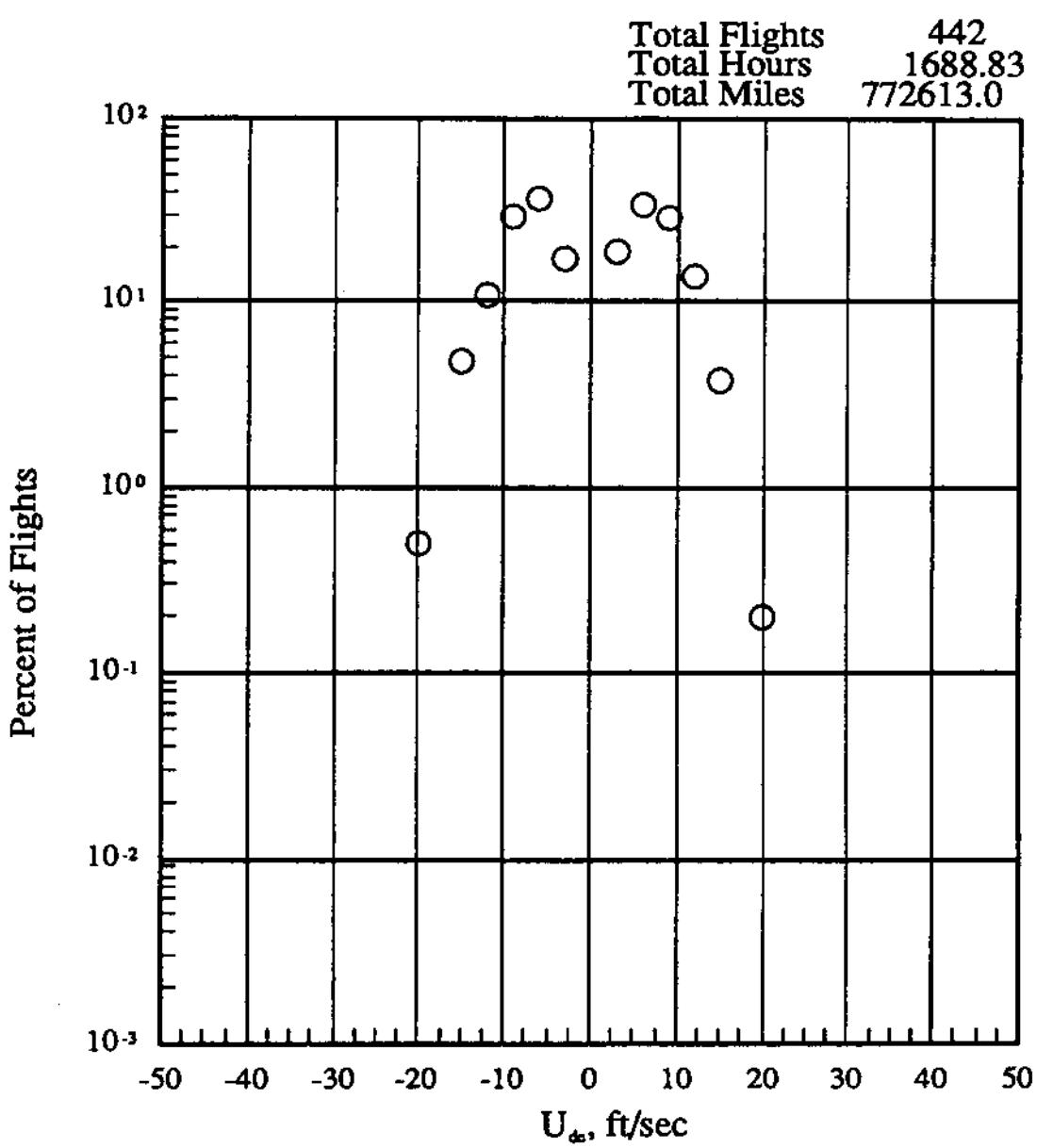
(i) 34500 to 39500 feet altitude

Figure 19.- Continued.



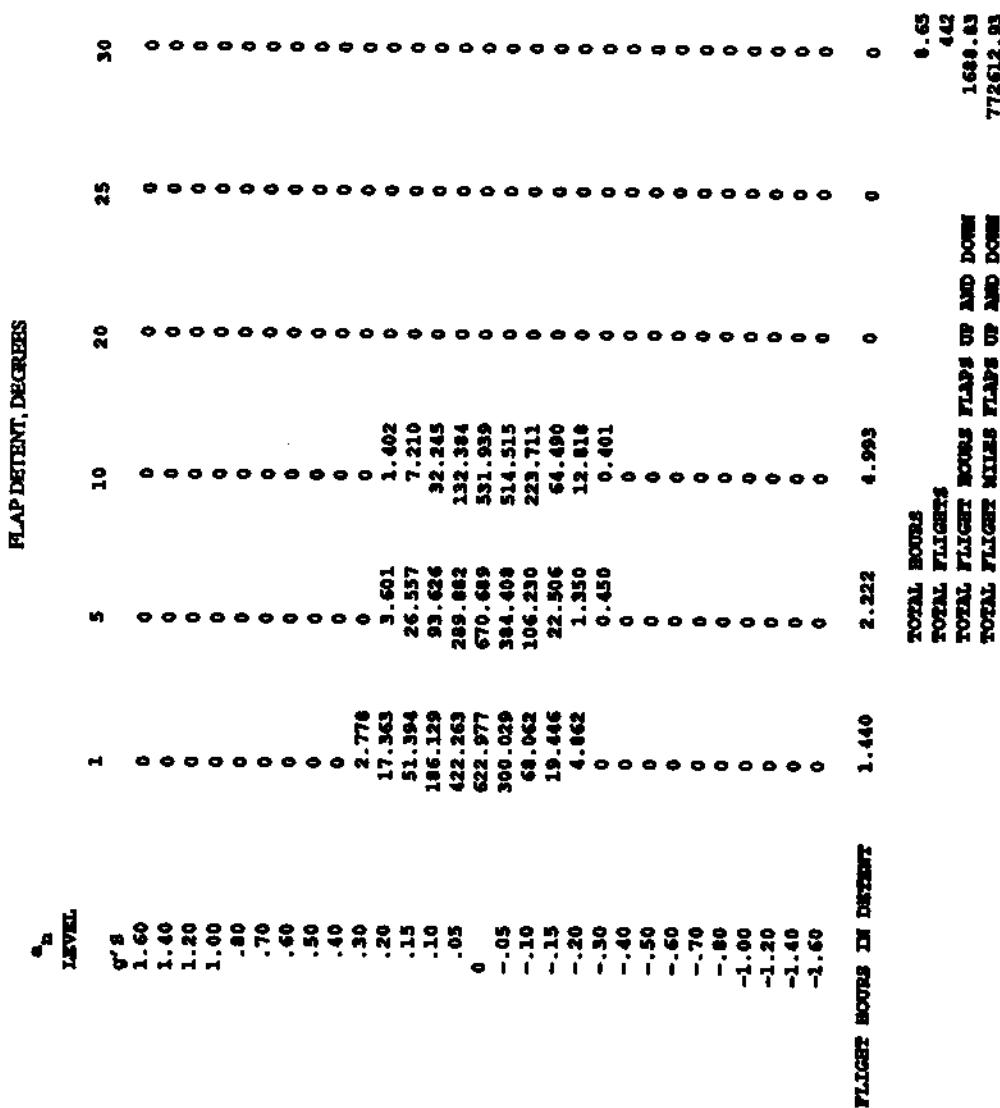
(j) 39500 to 44500 feet altitude

Figure 19.- Continued.



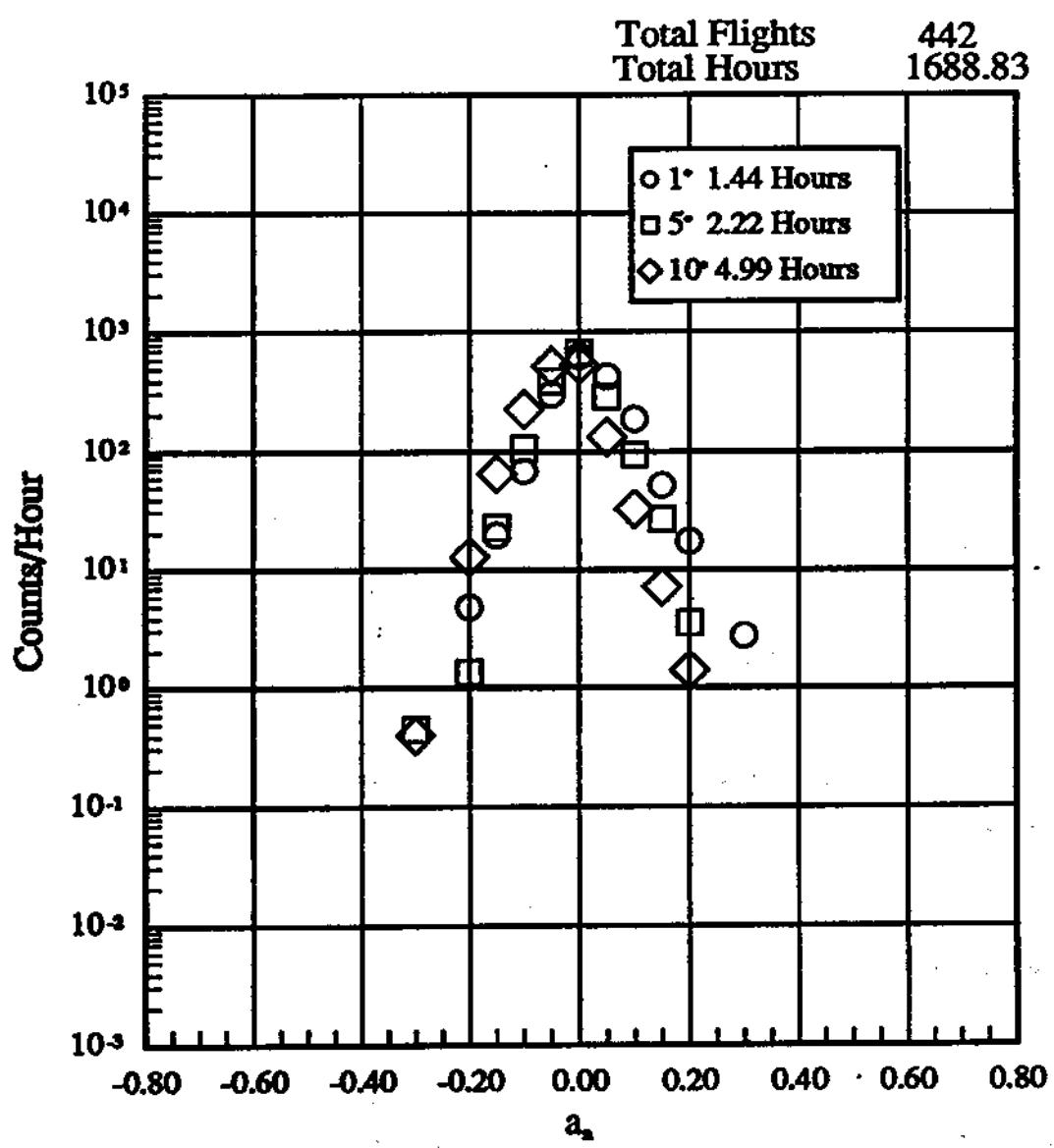
(k) -500 to 44500 feet altitude

Figure 19.- Concluded.



(a) Take off

Figure 20.-  $\alpha_n$  exceedances with flaps deflected.

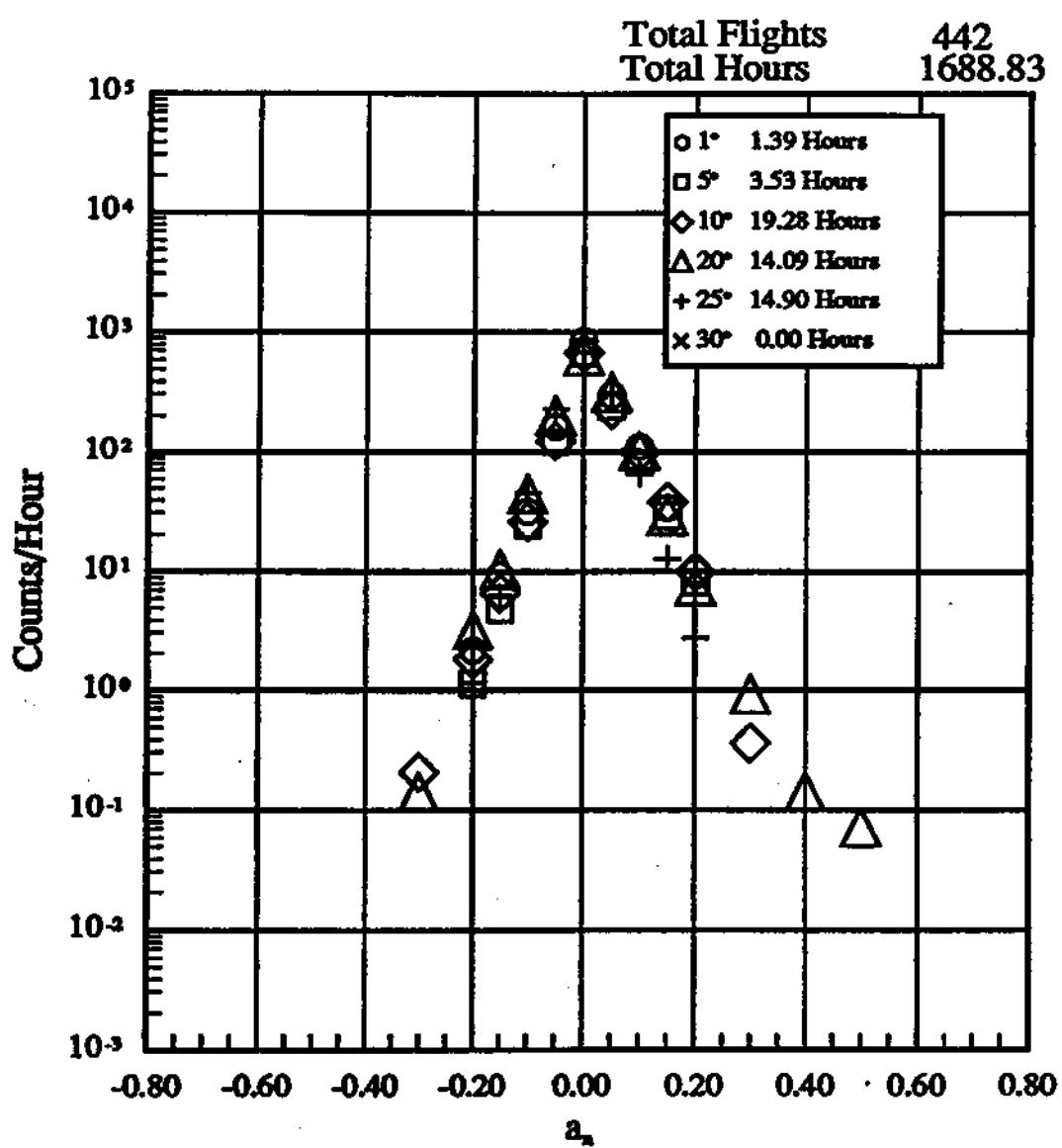


(b) Take off

Figure 20.- Continued.

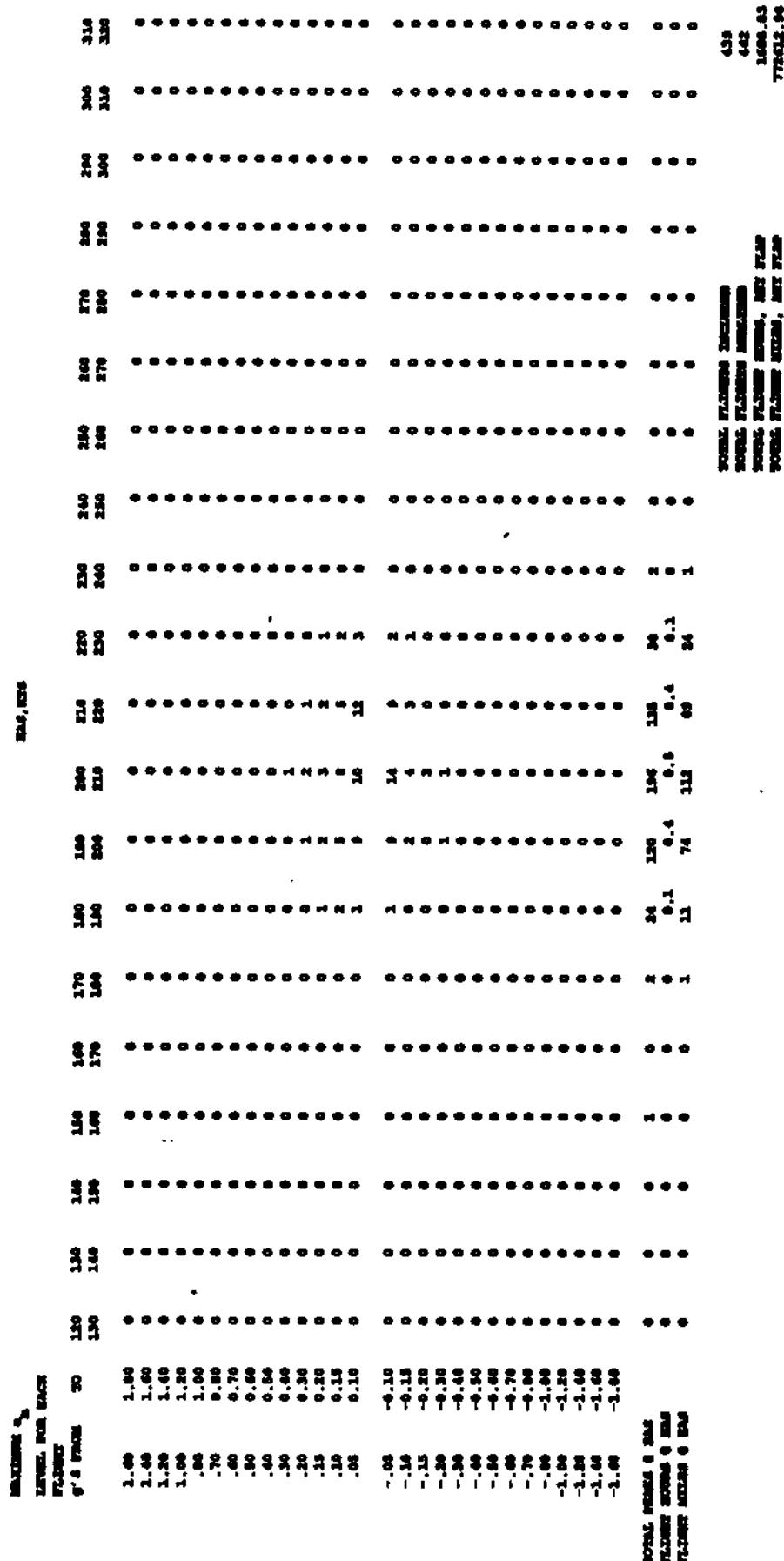
Figure 20.- Continued.

(c) Lanting



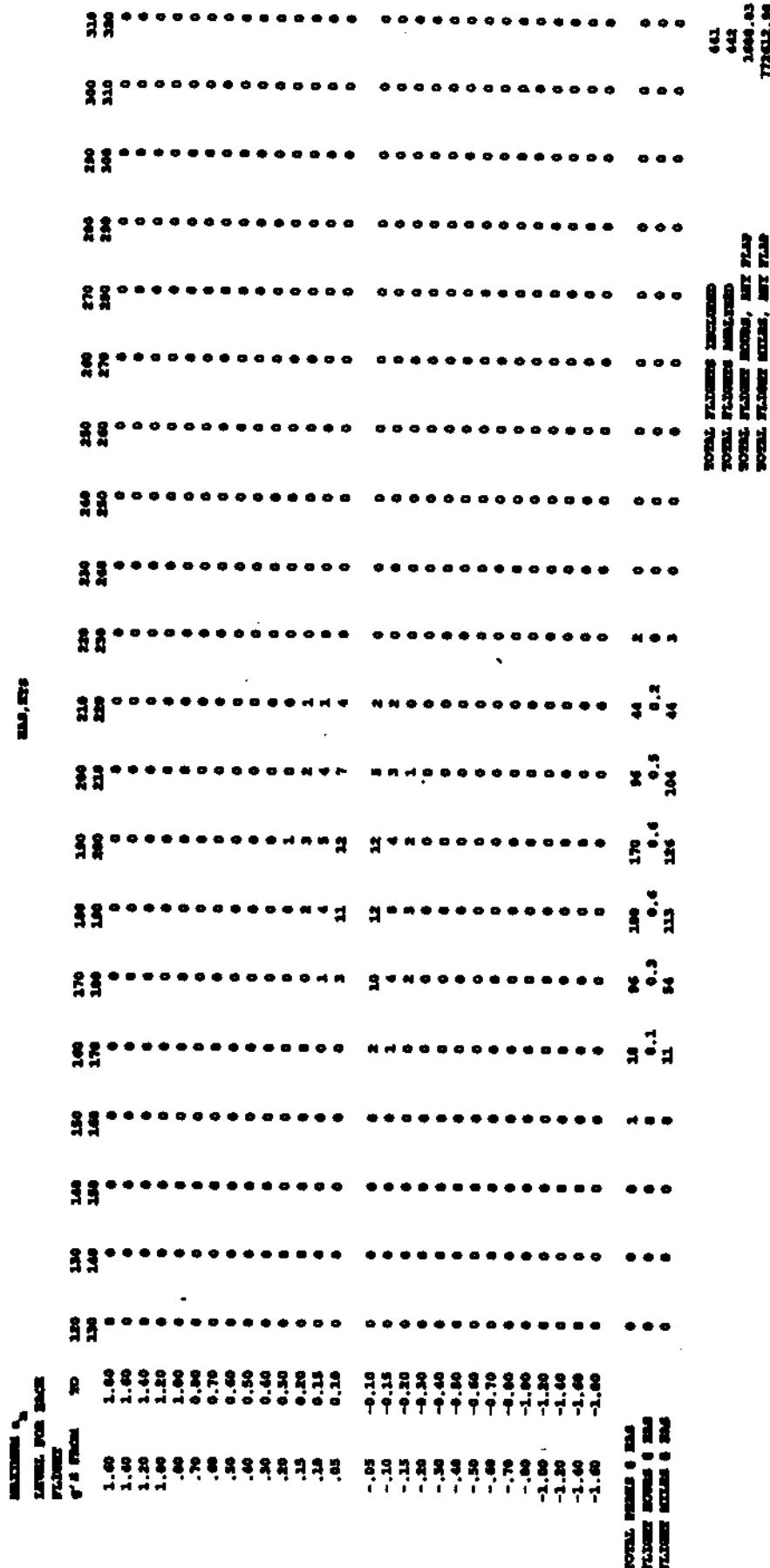
(d) Landing.

Figure 20.- Concluded.



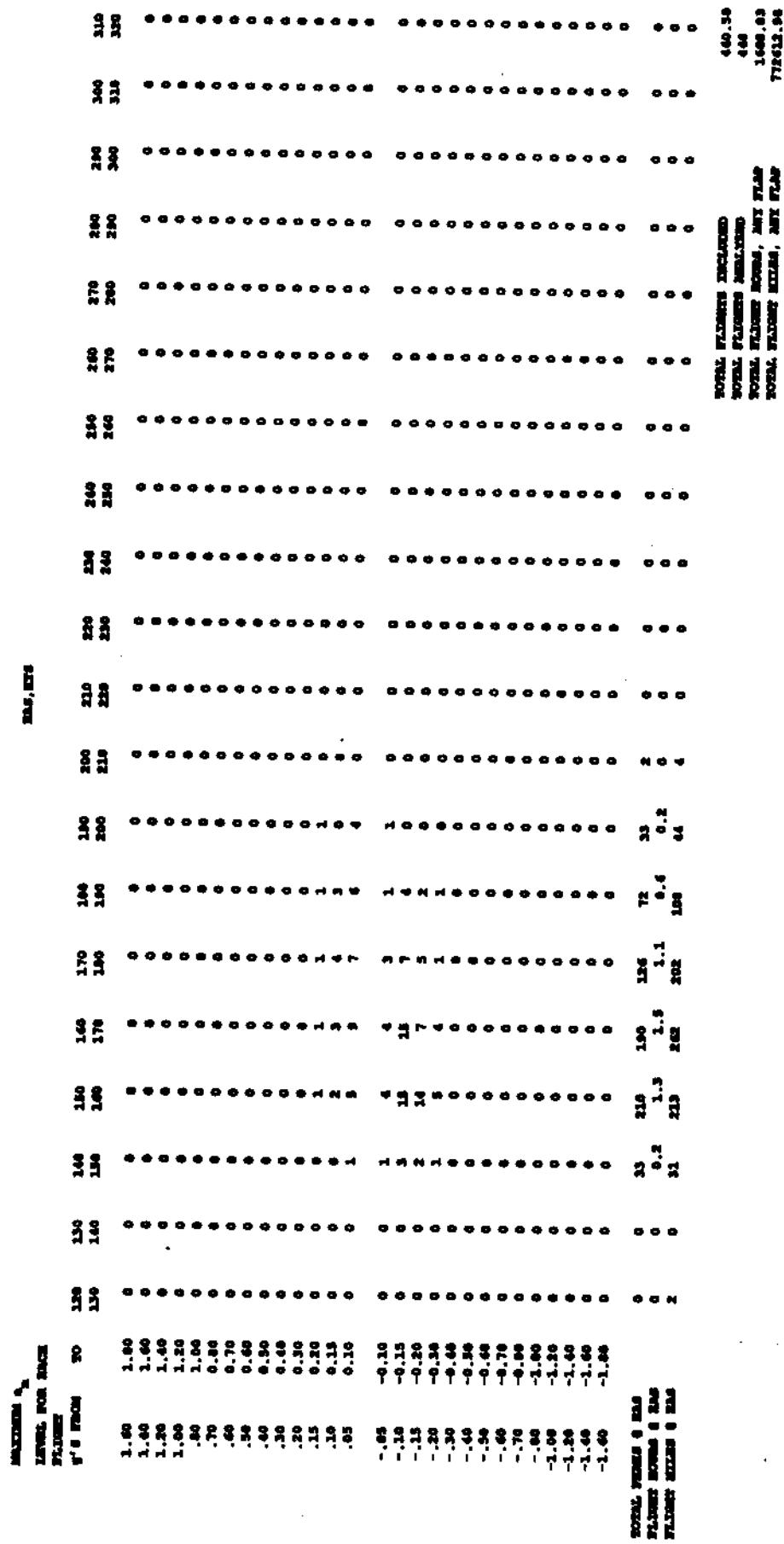
(a) Take off; flaps 1 degree detent

Figure 21.- Peak positive and negative  $r_p$  and  $r_n$  per flight vs EAS bands; percent of flights.



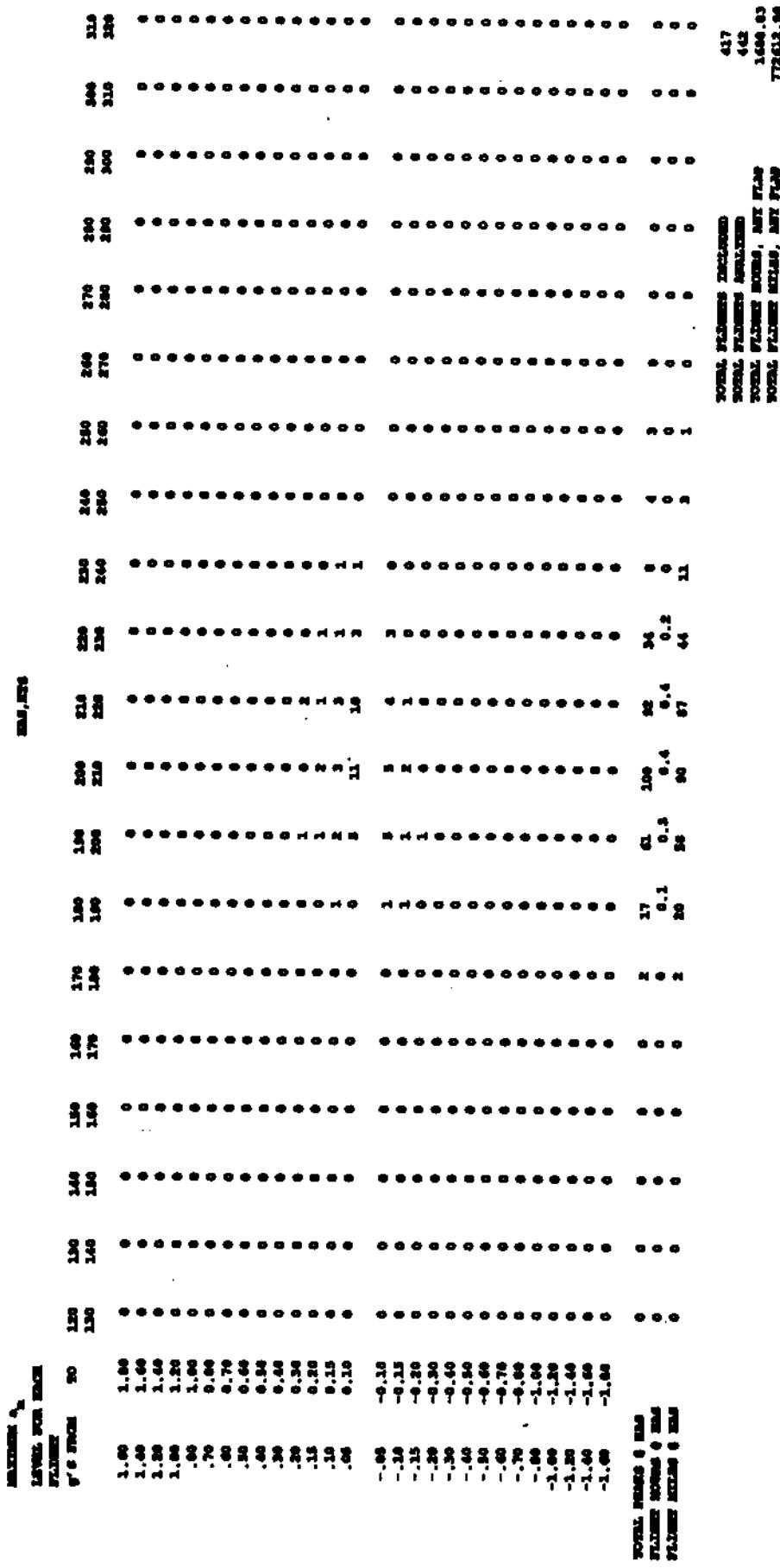
(b) Take off, flaps 5 degree defent

Figure 21.- Continued.



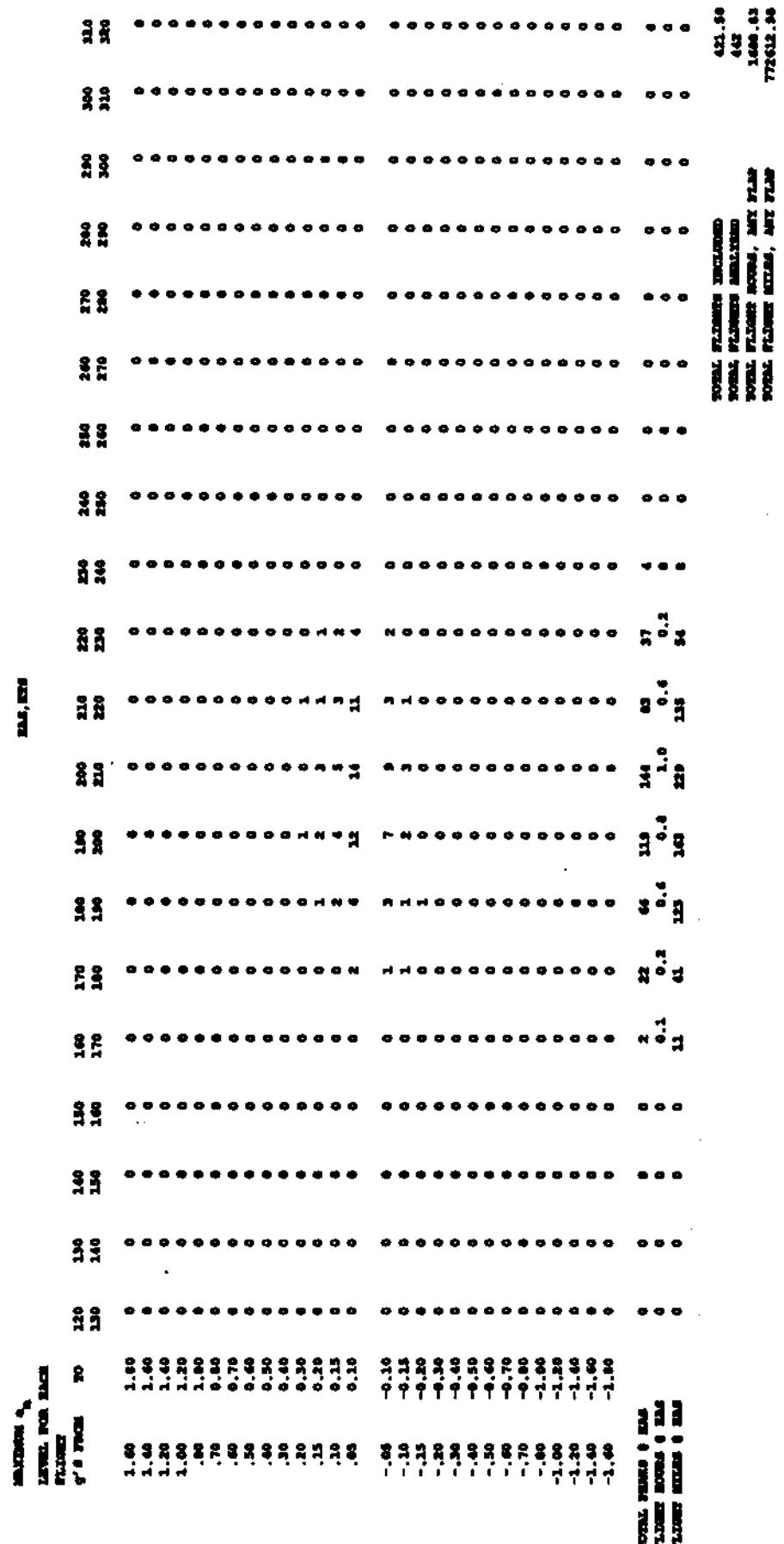
(c) Take off; flaps 10 degree detent

Figure 21.- Continued.



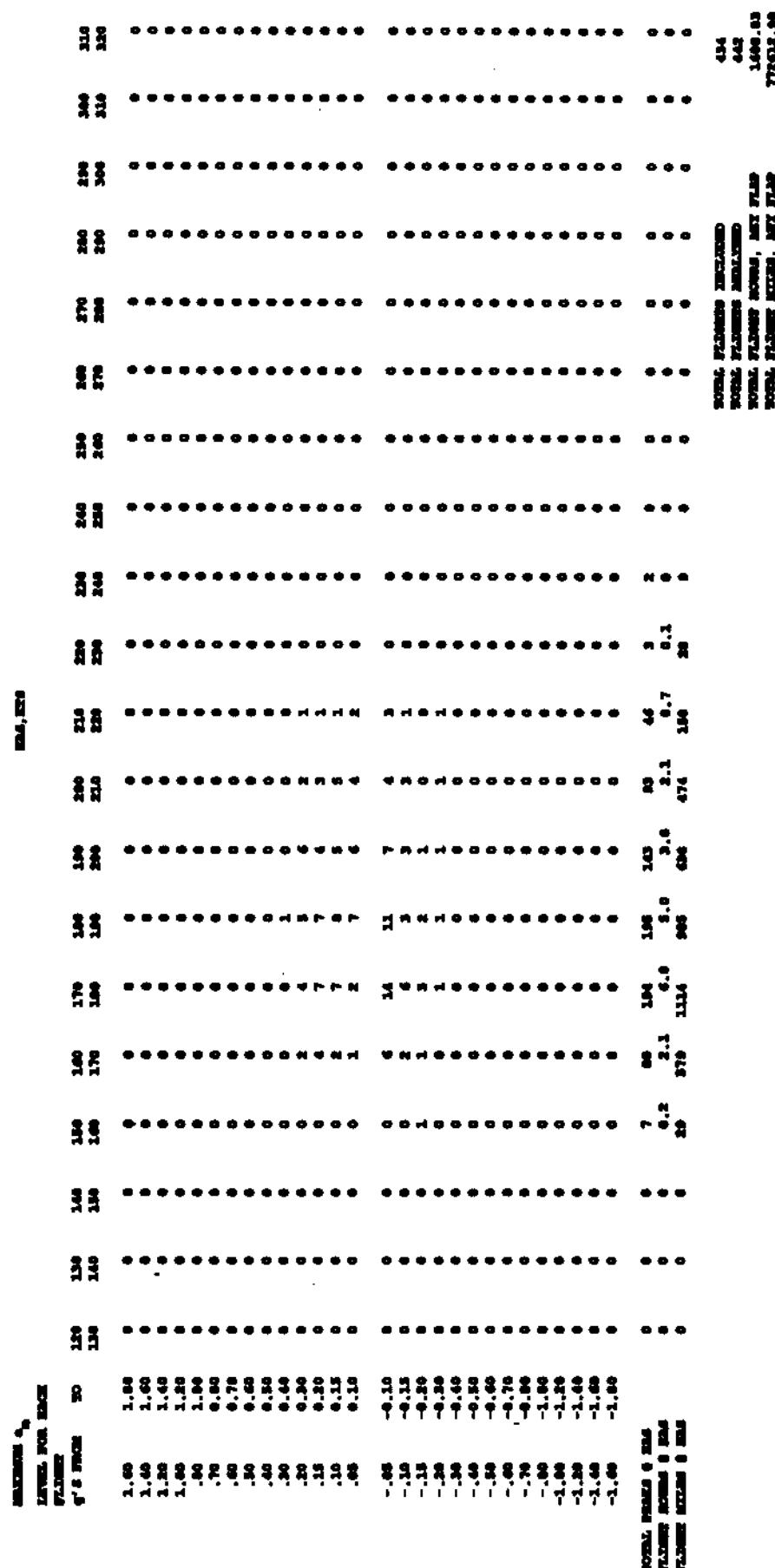
(d) Landing; flaps 1 degree detent

Figure 21. Continued.



**Figure 21.-** Continued.

**(c) Landing: flaps 5 degree detent**



(f) Landing: flaps 15 degree defent

Figure 21.- Continued.

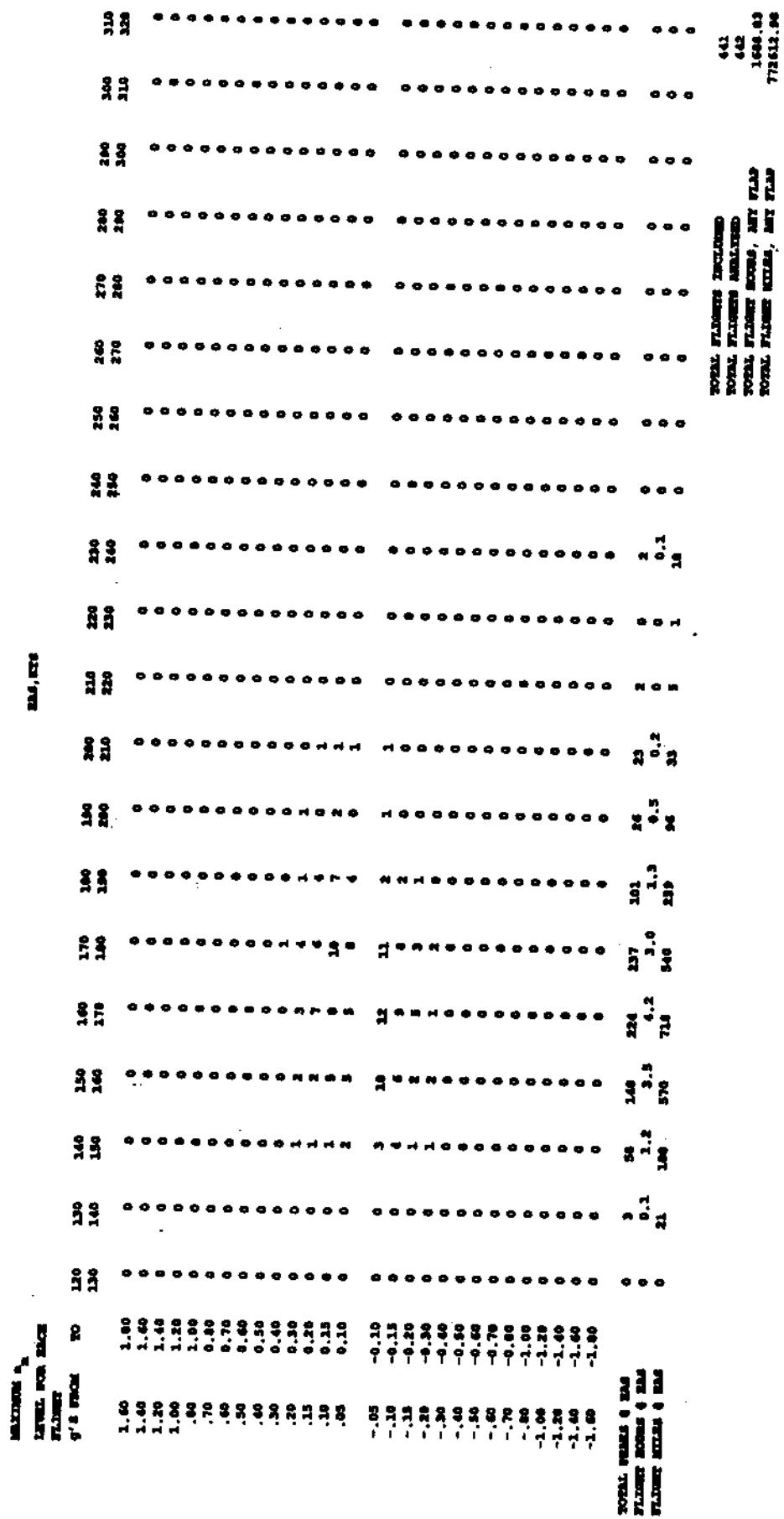
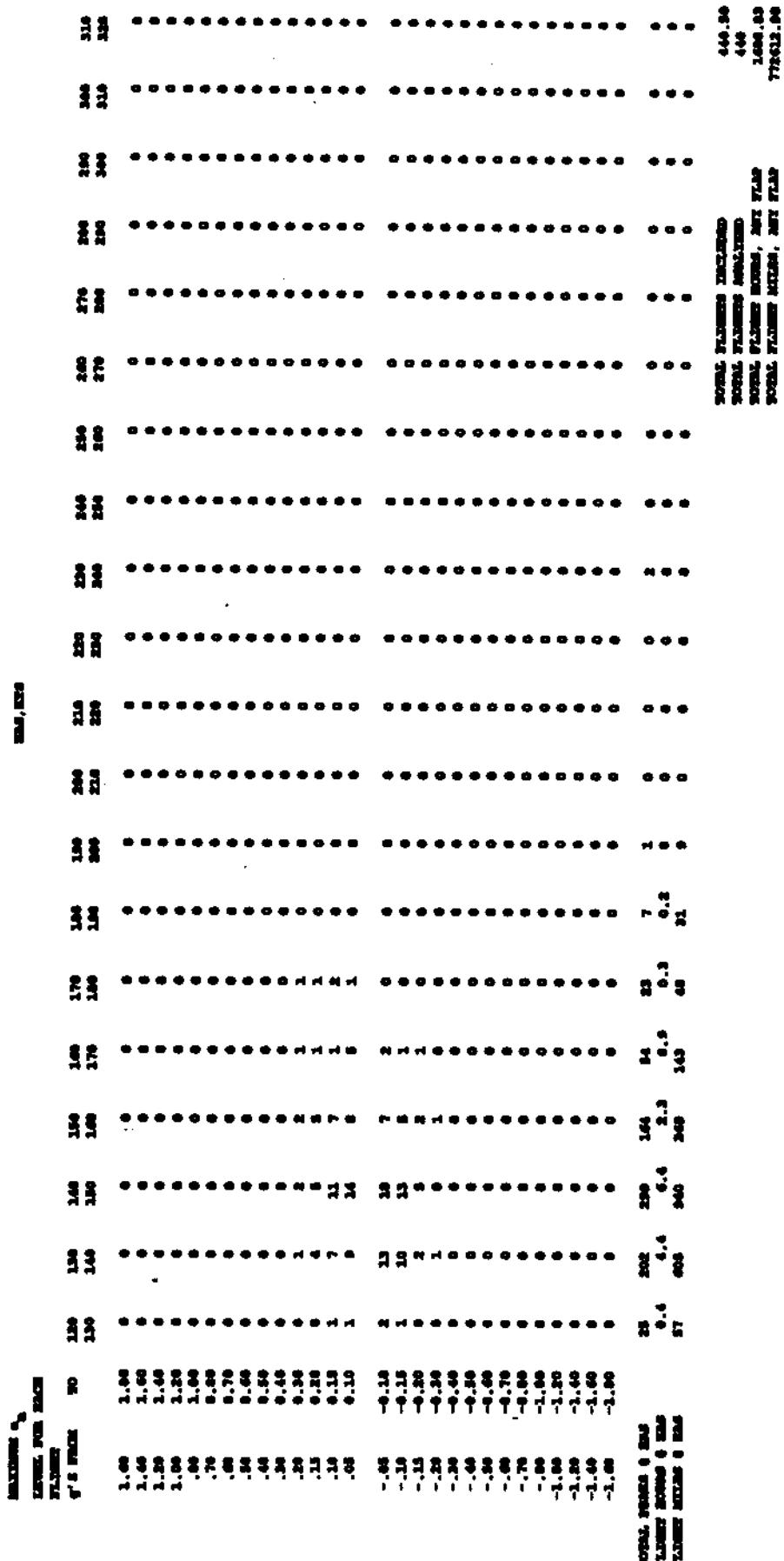


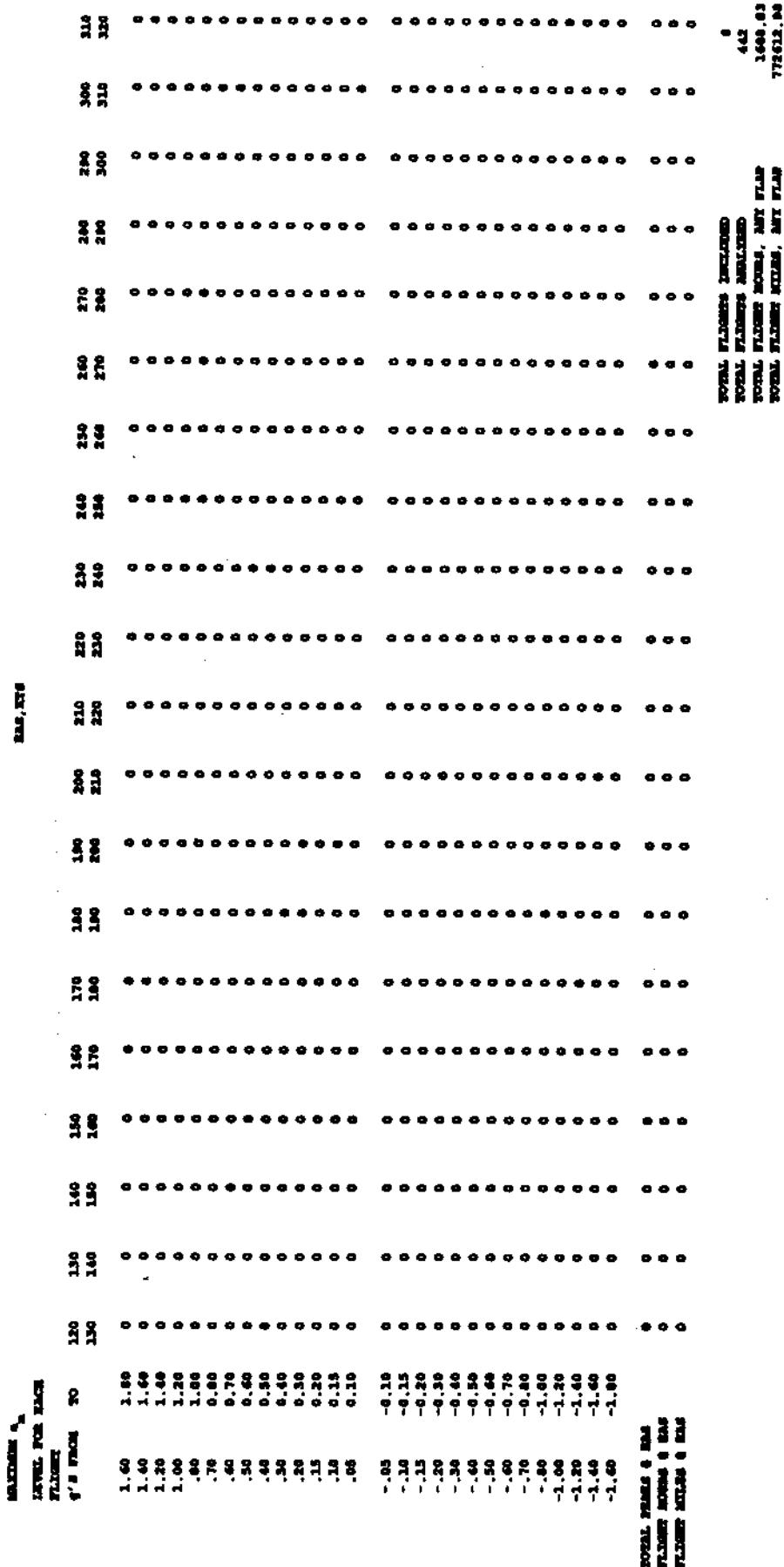
Figure 21.-Continued.

(g) Landing; flaps 20 degree detent



(b) Landing: flaps 25 degree detent

Figure 21.- Continued.



(i) Landing; flaps 30 degree defent

Figure 21.- Concluded.

$a_n$	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS 7604.77
	-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 4500 FT	
9.8	0	0	0	0	0	0	0	0	0	0	0
1.60	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0
.40	0.20	0.96	0	0	0	0	0.93	0.79	0.29	0.17	1.03
.30	1.76	1.91	0	0	0	0	0	0	0	0	0
.20	36.54	11.47	3.24	1.47	0	0	2.80	0.79	0.14	17.03	49.16
.15	105.10	20.07	8.91	1.47	2.81	7.48	5.52	0.58	0	114.96	238.15
.10	244.45	52.56	31.59	4.41	8.43	10.28	19.69	3.60	0	864.17	207.88
.05	461.34	177.75	126.34	52.88	51.99	34.58	90.55	33.71	0	71.19	26.89
0	777.20	556.20	744.30	934.15	781.26	1016.82	885.83	1034.29	0	0	0
-.05	410.83	124.24	106.53	86.46	61.63	46.73	62.99	17.14	0	0	0
-.10	151.63	27.71	16.20	7.34	5.62	8.41	8.66	3.03	0	0	0
-.15	54.81	11.47	10.53	1.47	0	7.48	2.36	1.01	0	0	0
-.20	19.34	0	3.24	0	0	5.61	2.36	0.49	0	0	0
-.30	1.56	0	0	0	0	0	0	0.14	0	0	0
-.40	0.10	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS & AVG	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19	73
FLIGHT MILES & AVG	1814.48	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	7604.77	23.19
TOTAL FLIGHTS											
TOTAL FLIGHTS NOADS FLAPS UP AND DOWN											
TOTAL FLIGHTS NOADS FLAPS UP AND DOWN											

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

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

LEVEL G's	PRESSURE ALTITUDE BANDS										-500 TO 44500 FT	
	-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	-500 TO 44500 FT	
.95	0	0	0	0	0	0	0	0	0	0	0	0
1.60	0	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0	0
.20	2.34	2.87	0	1.47	0	0	0	0	0	0	0	0
.15	12.11	4.78	0.81	1.47	0	0	1.87	1.57	0	0	0	0
.10	36.54	10.51	5.67	2.94	0	0	2.80	2.36	0	0	0	0
.05	71.13	37.27	30.78	13.22	5.62	0	9.35	15.75	4.18	0	0	0
0	170.29	122.33	123.91	138.07	119.44	151.40	169.29	143.76	0	0	0	0
-.05	55.98	23.89	19.44	15.22	7.03	12.15	7.87	2.74	0	0	0	0
-.10	11.33	5.73	3.24	2.94	1.41	3.74	0	0	0	0	0	0
-.15	2.74	0.96	0	1.67	0	1.87	0	0	0	0	0	0
-.20	0.98	0	0	0	0	0	0.93	0	0	0	0	0
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.100	0	0	0	0	0	0	0	0	0	0	0	0
-.120	0	0	0	0	0	0	0	0	0	0	0	0
-.140	0	0	0	0	0	0	0	0	0	0	0	0
-.160	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19	73	
FLIGHT MILES @ ALT	1814.48	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	23.19		
TOTAL FLIGHTS										7604.77		
TOTAL FLIGHT HOURS FLAPS UP AND DOWN												
TOTAL FLIGHT MILES FLAPS UP AND DOWN												

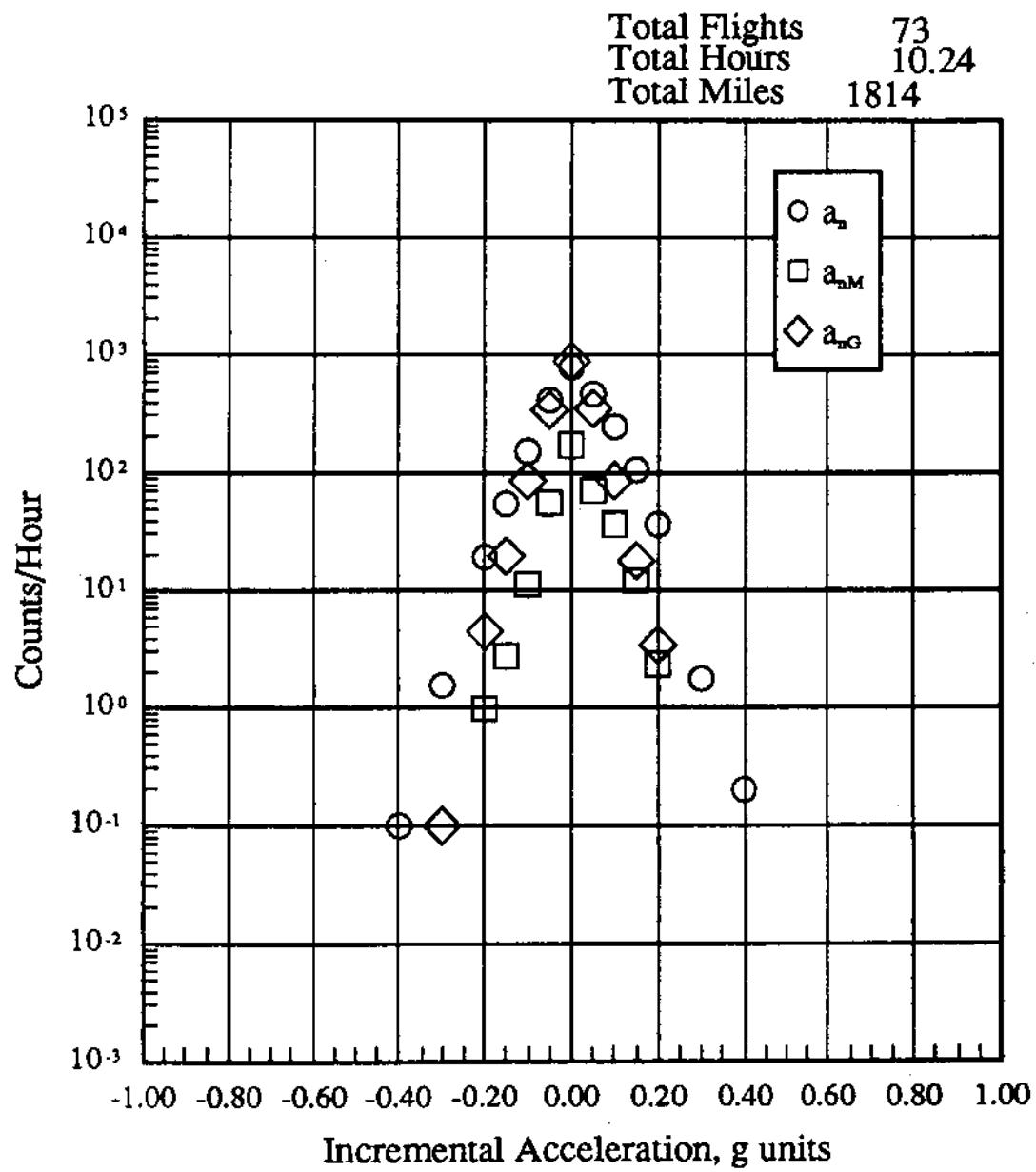
(b)  $a_{nM}$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Continued.

LEVEL	$a_{HG}$	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS	TOTAL FLIGHTS FLIES UP AND DOWN	TOTAL FLIGHTS ACROSS FLIES UP AND DOWN
		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	44500 TO 49500 FT	-500 TO 4500 FT	-500 TO 9500 FT			
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	3.42	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	17.88	0	2.43	0	0	0	0	0	0	0	0	0	0	1.64
.10	85.96	2.87	3.24	0	0	0	0	2.80	0	0	0	0	0	0.37
.05	349.59	11.47	8.10	0	0	4.22	0	3.74	3.15	0	0	0	0	39.58
0	880.96	69.76	26.73	19.09	0	9.84	21.50	24.41	7.78	0	0	0	0	163.94
-.05	338.24	820.92	989.46	987.03	2001.87	1074.77	981.89	1122.45	972.23	0	0	0	0	0
-.10	85.88	64.03	29.16	13.22	15.46	17.76	23.62	5.76	0	0	0	0	0	158.42
-.15	19.64	9.55	8.10	0	0	7.48	3.94	0	0	0	0	0	0	39.50
-.20	4.49	0.96	6.44	0	0	3.74	0.79	0	0	0	0	0	0	9.31
-.30	0.10	0.96	3.24	0	0	1.87	0	0	0	0	0	0	0	2.29
-.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04
-.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ AVG	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19	0	0	0	0
FLIGHT MILES @ AVG	1614.46	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	7604.77	0	0	0	0
TOTAL FLIGHTS										73				
TOTAL FLIGHTS FLIES UP AND DOWN										23.19				
TOTAL FLIGHTS ACROSS FLIES UP AND DOWN										7604.77				

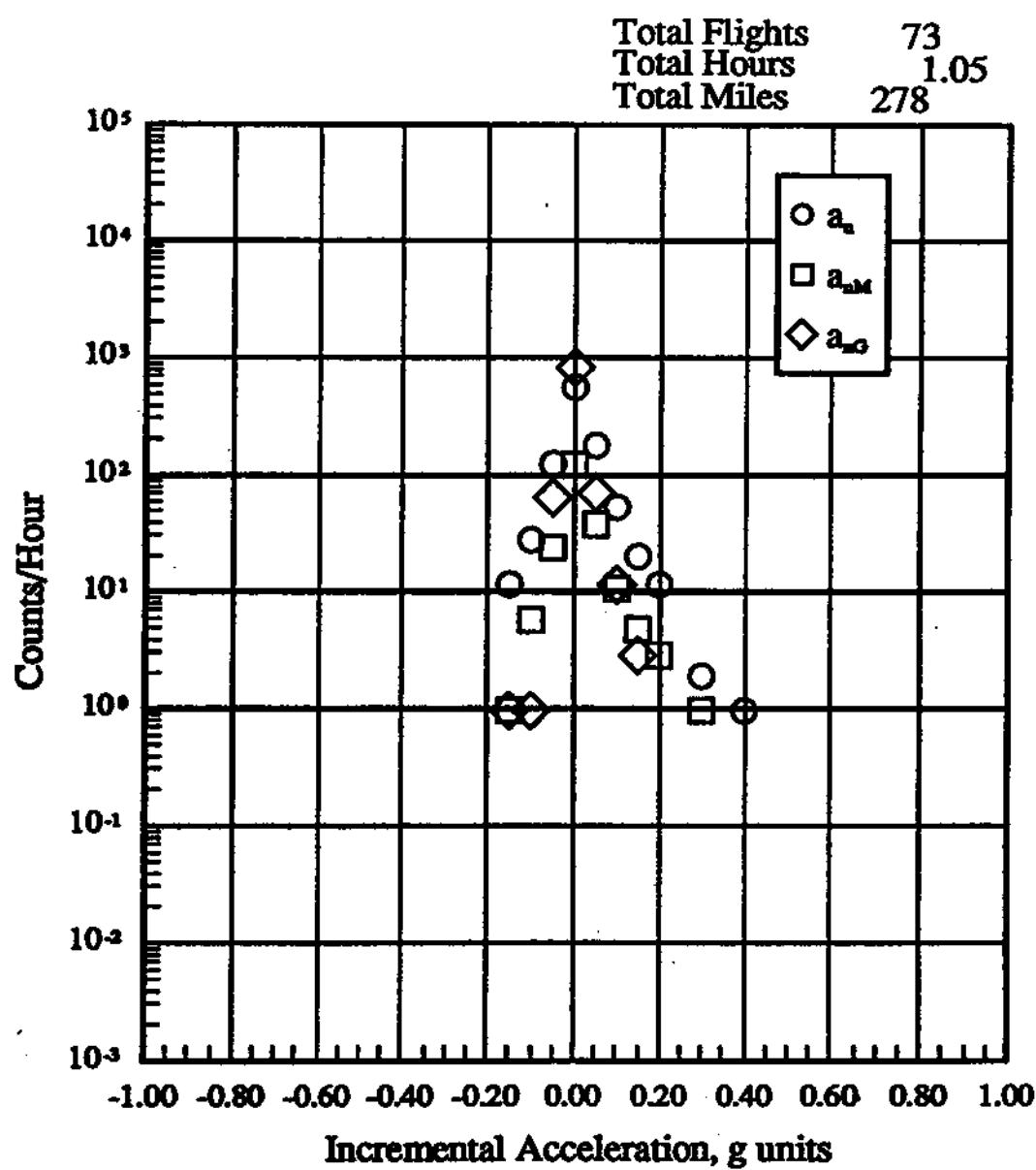
(c)  $a_{HG}$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Continued.



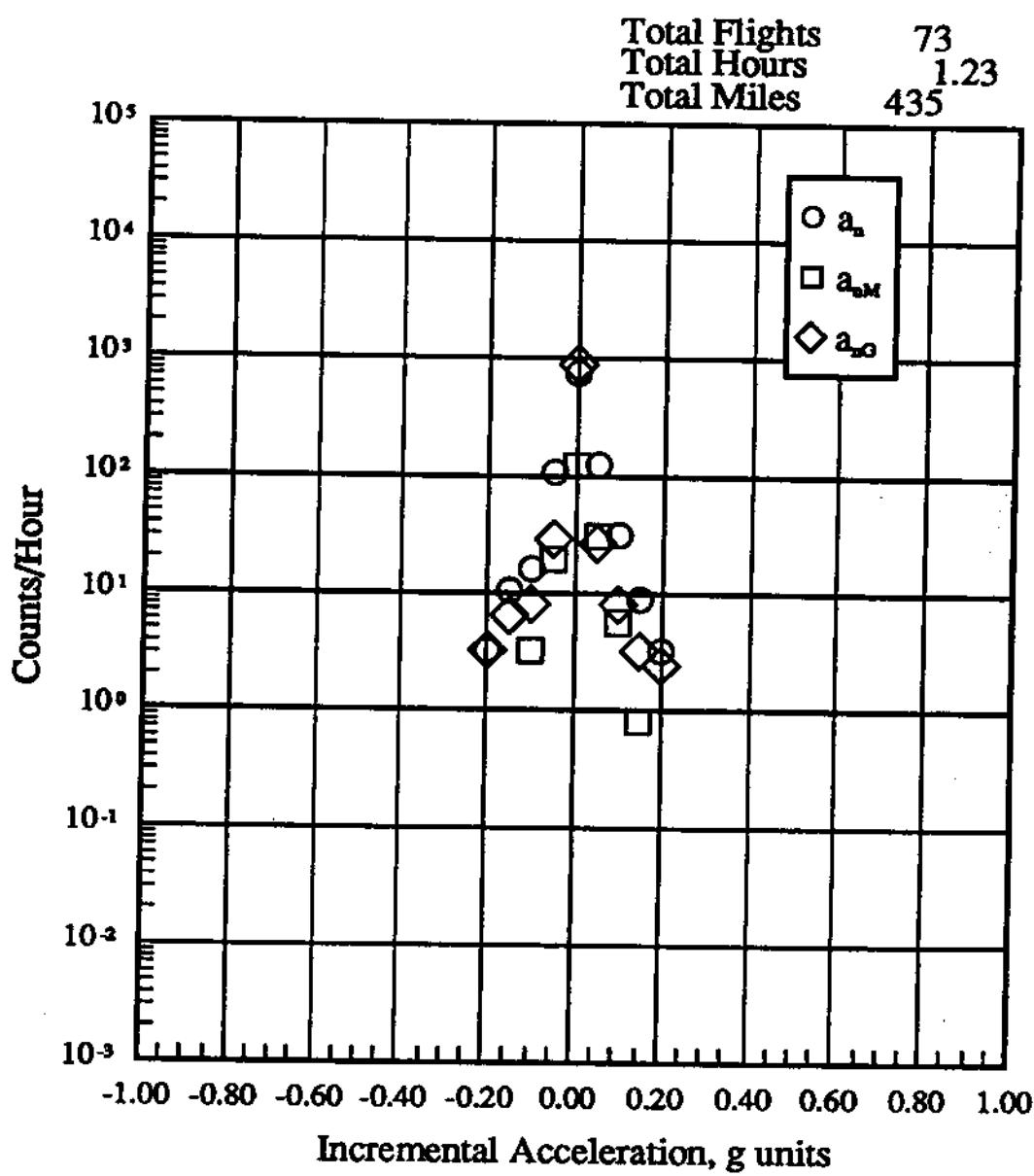
(d)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 4500 feet altitude

Figure 22.- Continued.



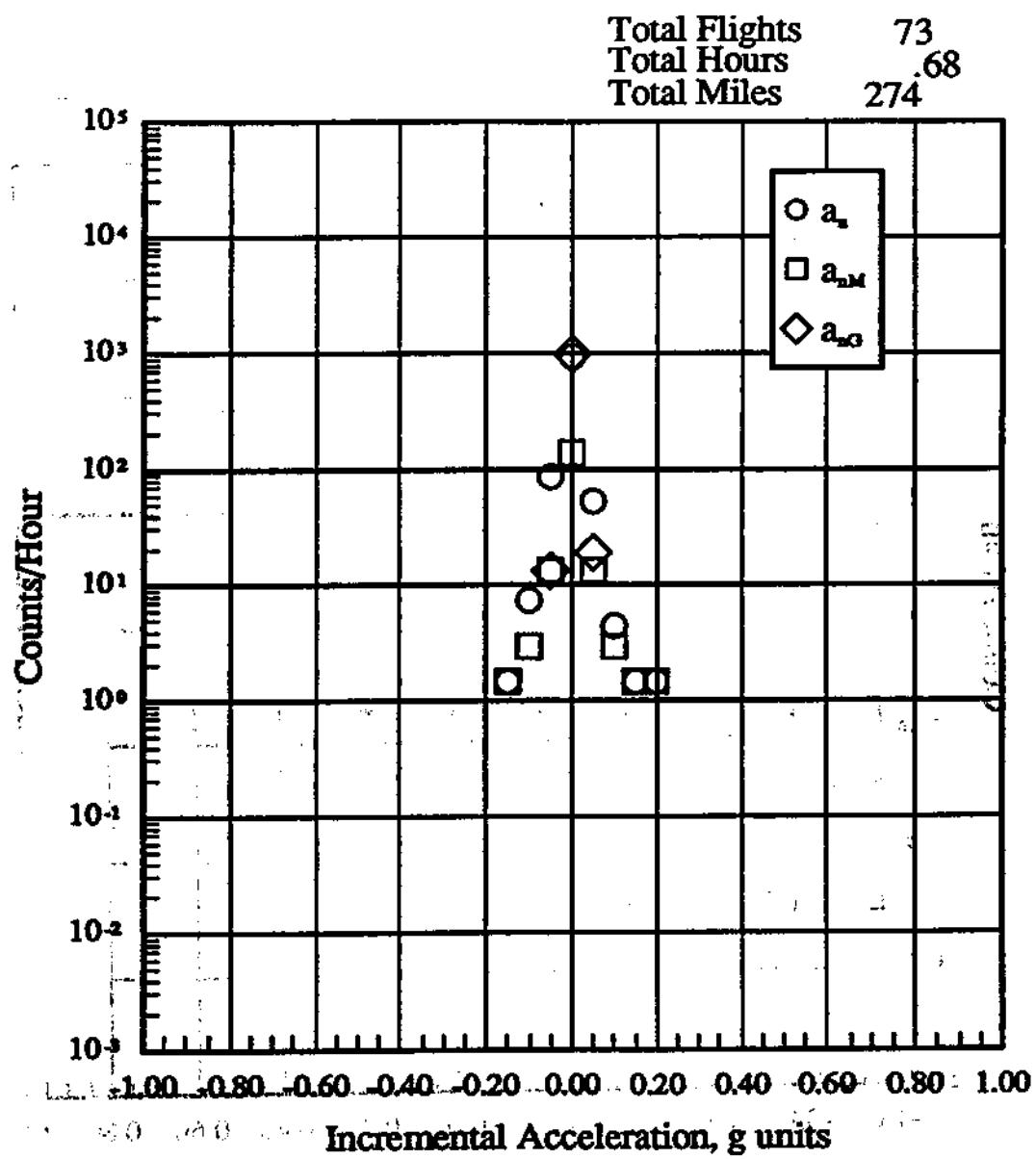
(e)  $a_s$ ,  $a_M$ ,  $a_G$ , 4500 to 9500 feet altitude

Figure 22.- Continued.



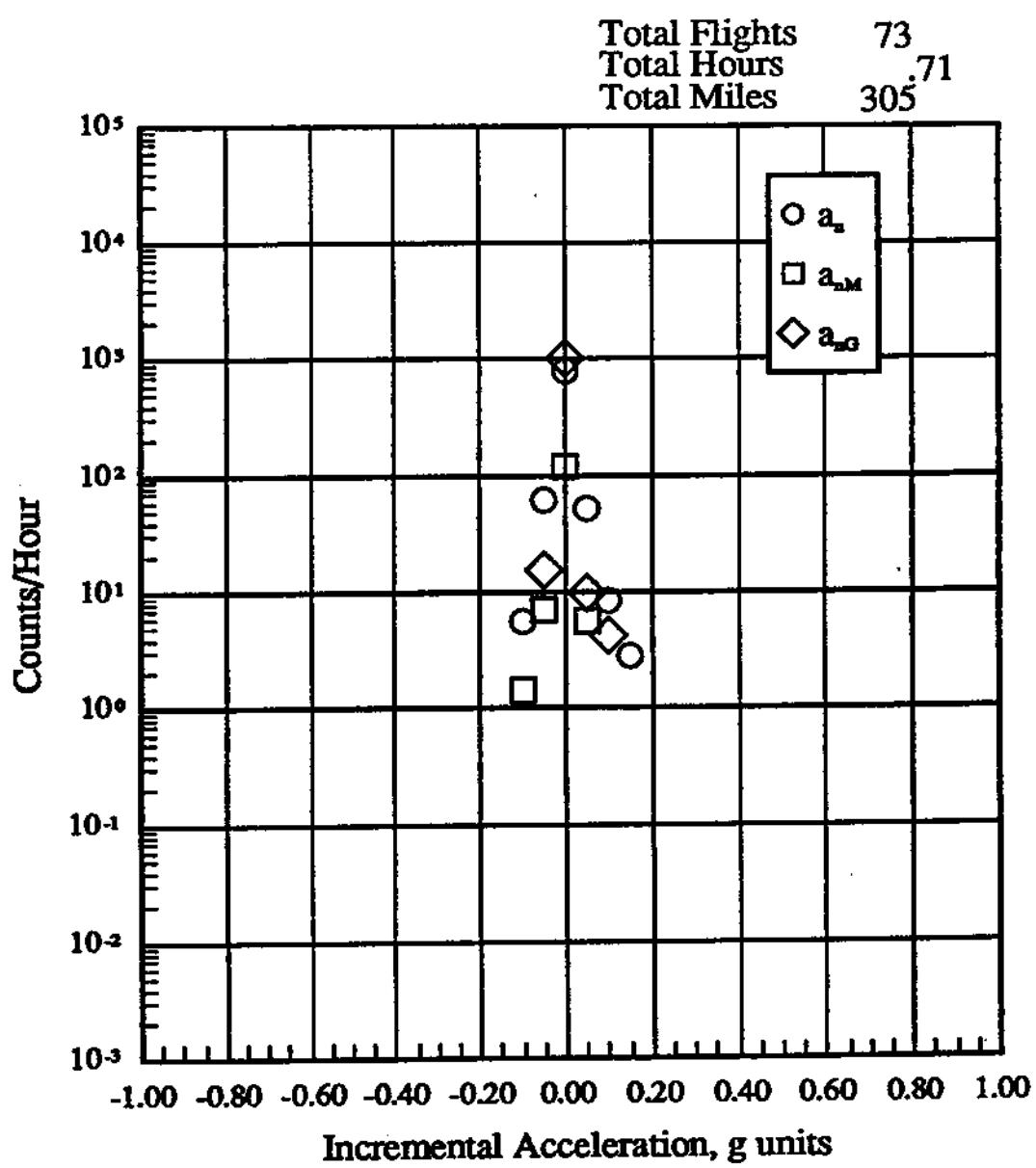
(f)  $a_n$ ,  $a_{nm}$ ,  $a_{ng}$ , 9500 to 14500 feet altitude

Figure 22.- Continued.



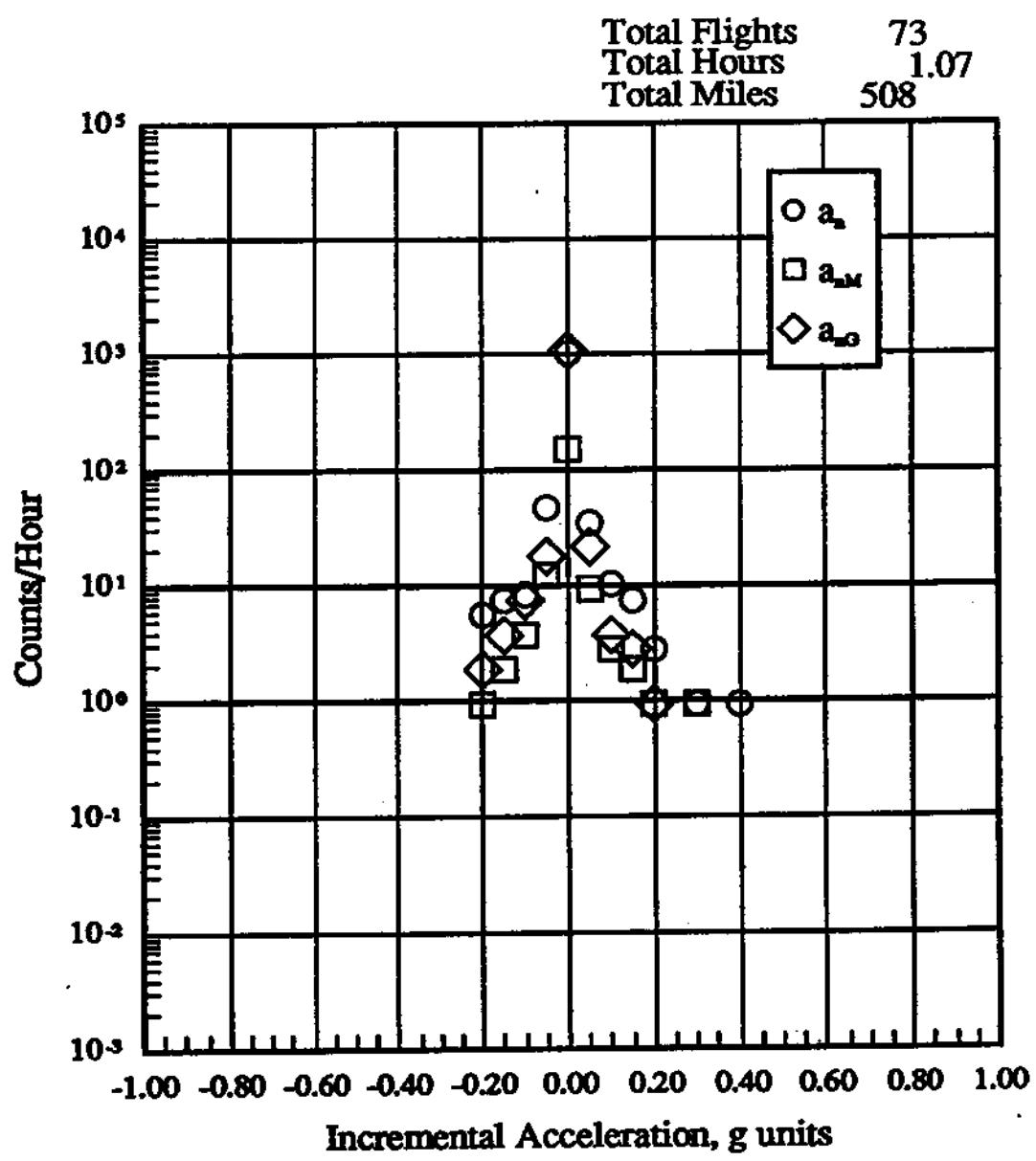
(g)  $a_s$ ,  $a_M$ ,  $a_G$ , 14500 to 19500 feet altitude

Figure 22.- Continued.



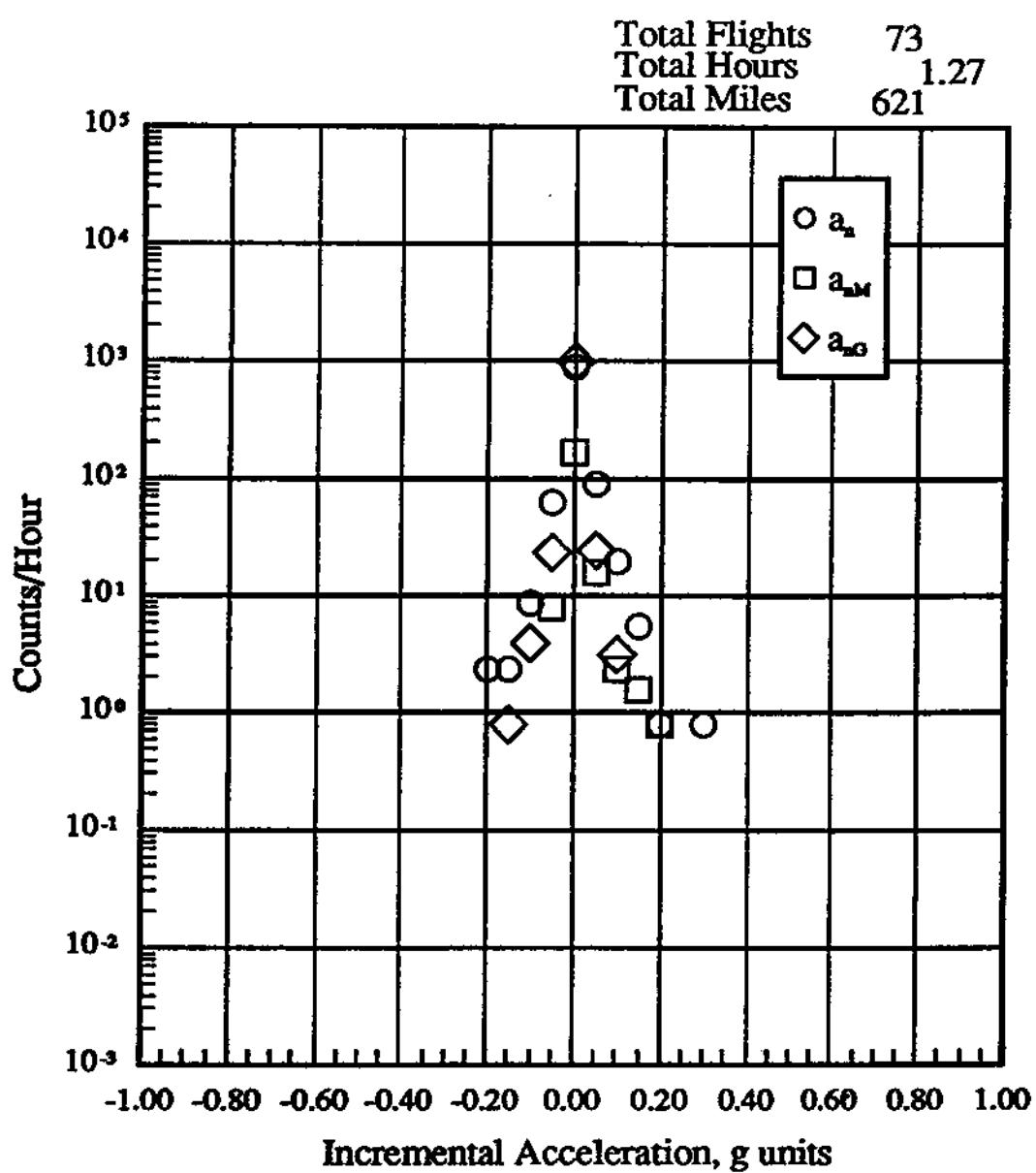
(h)  $a_s$ ,  $a_M$ ,  $a_G$ , 19500 to 24500 feet altitude

Figure 22.- Continued.



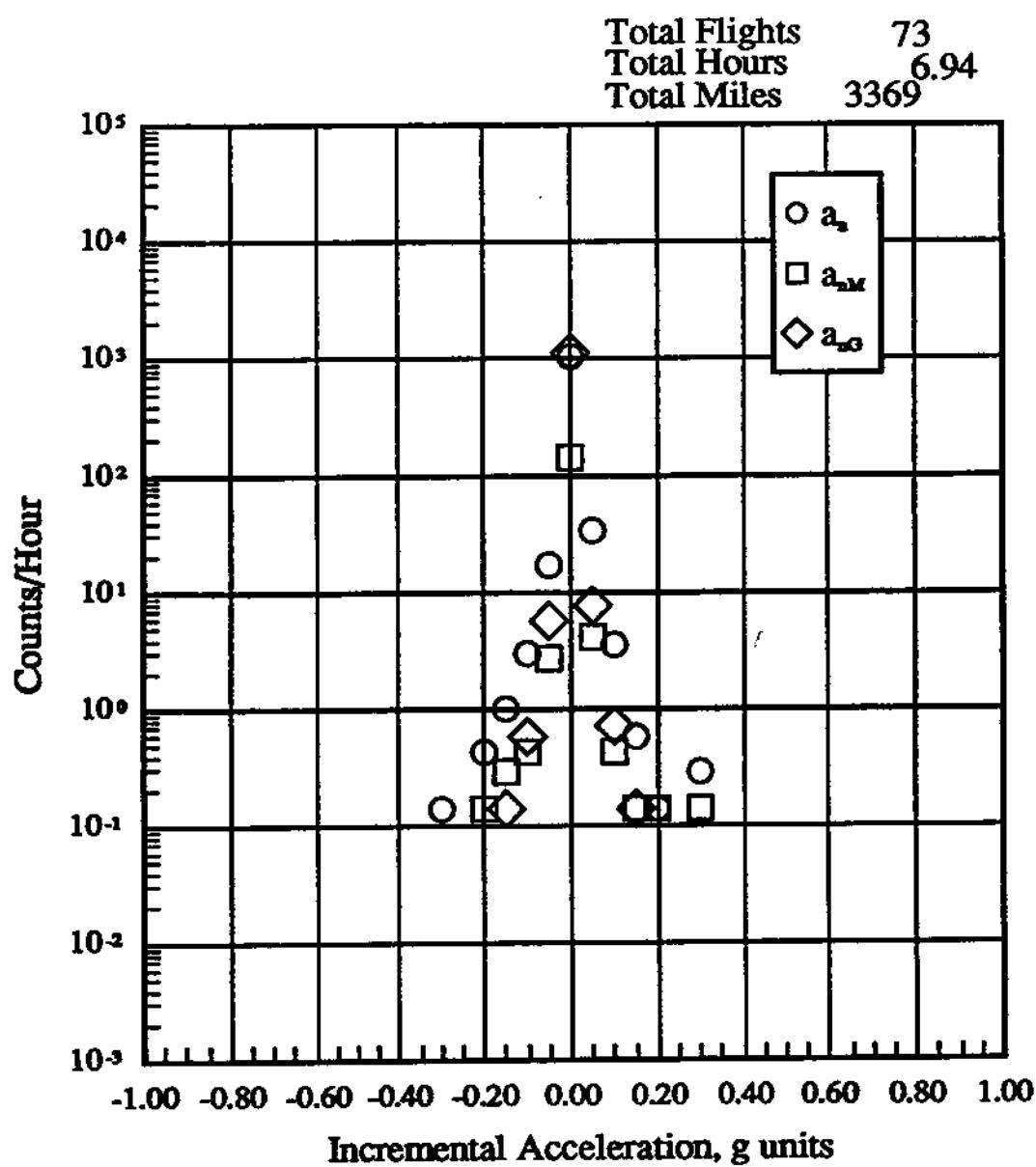
(i)  $a_s$ ,  $a_M$ ,  $a_o$ , 24500 to 29500 feet altitude

Figure 22.- Continued.



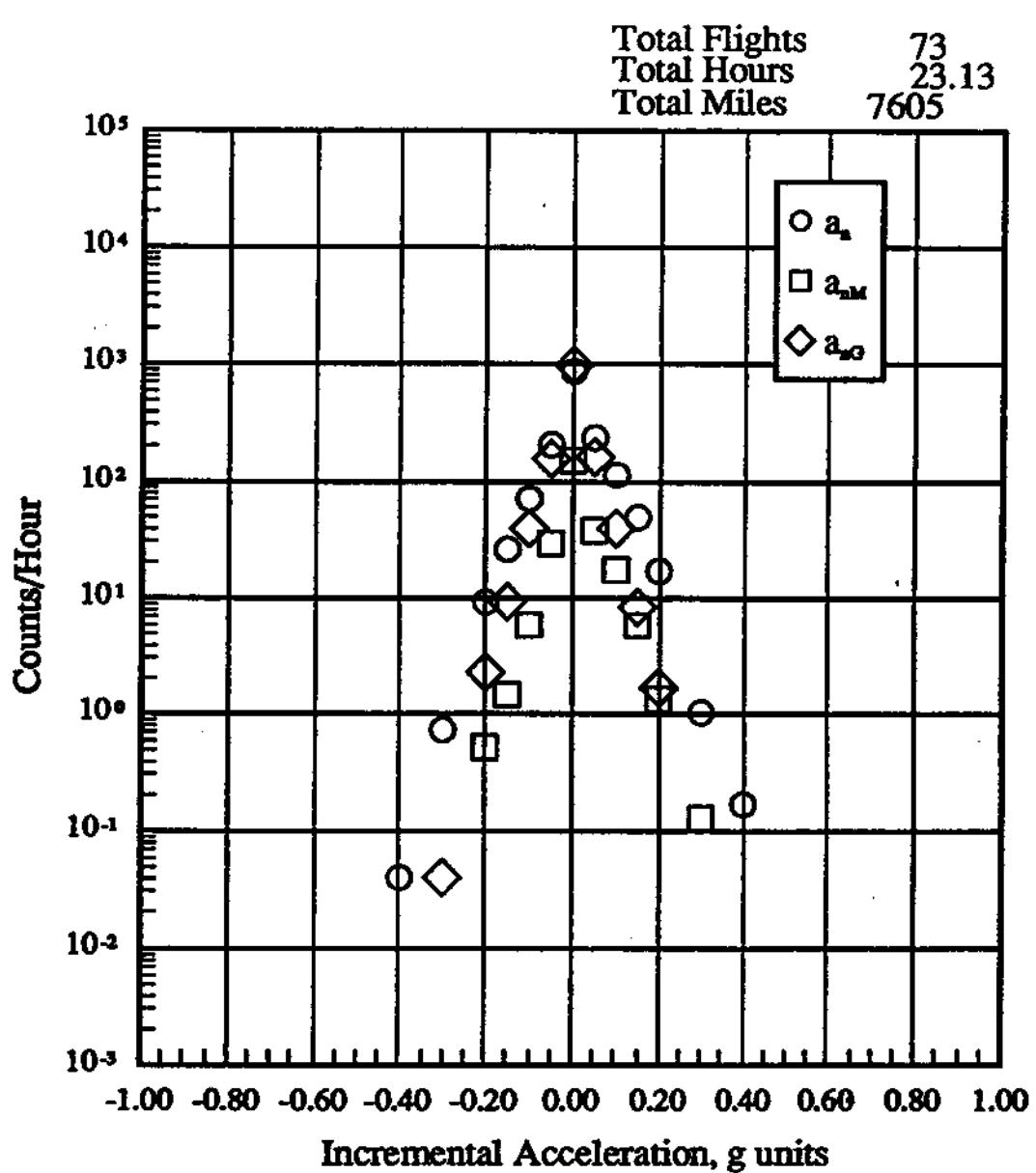
(j)  $a_s$ ,  $a_M$ ,  $a_{MG}$ , 29500 to 34500 feet altitude

Figure 22.- Continued.



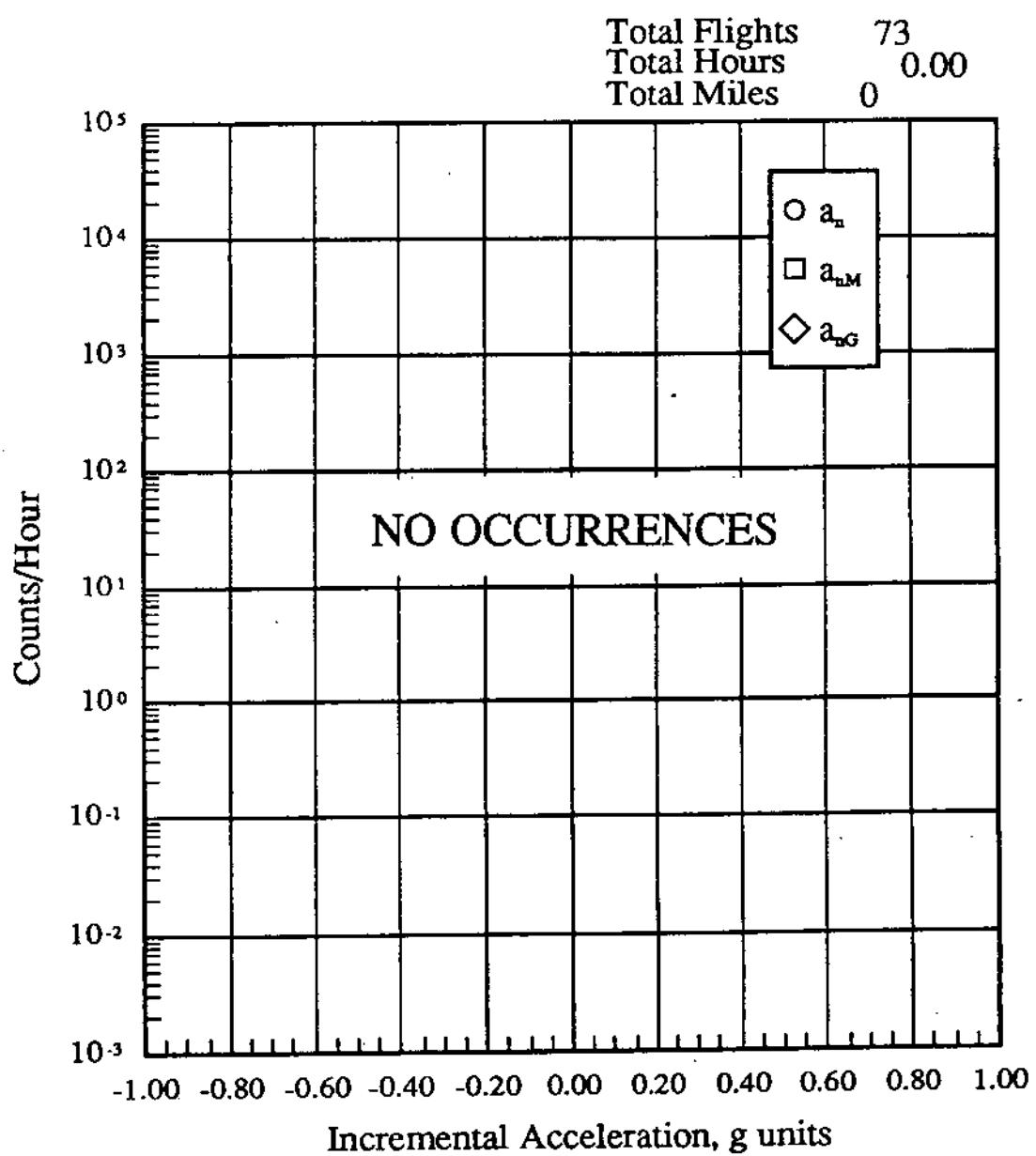
(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

Figure 22.- Continued.



(m)  $a_n$ ,  $a_M$ ,  $a_G$ , -500 to 44500 feet altitude

Figure 22.- Continued.



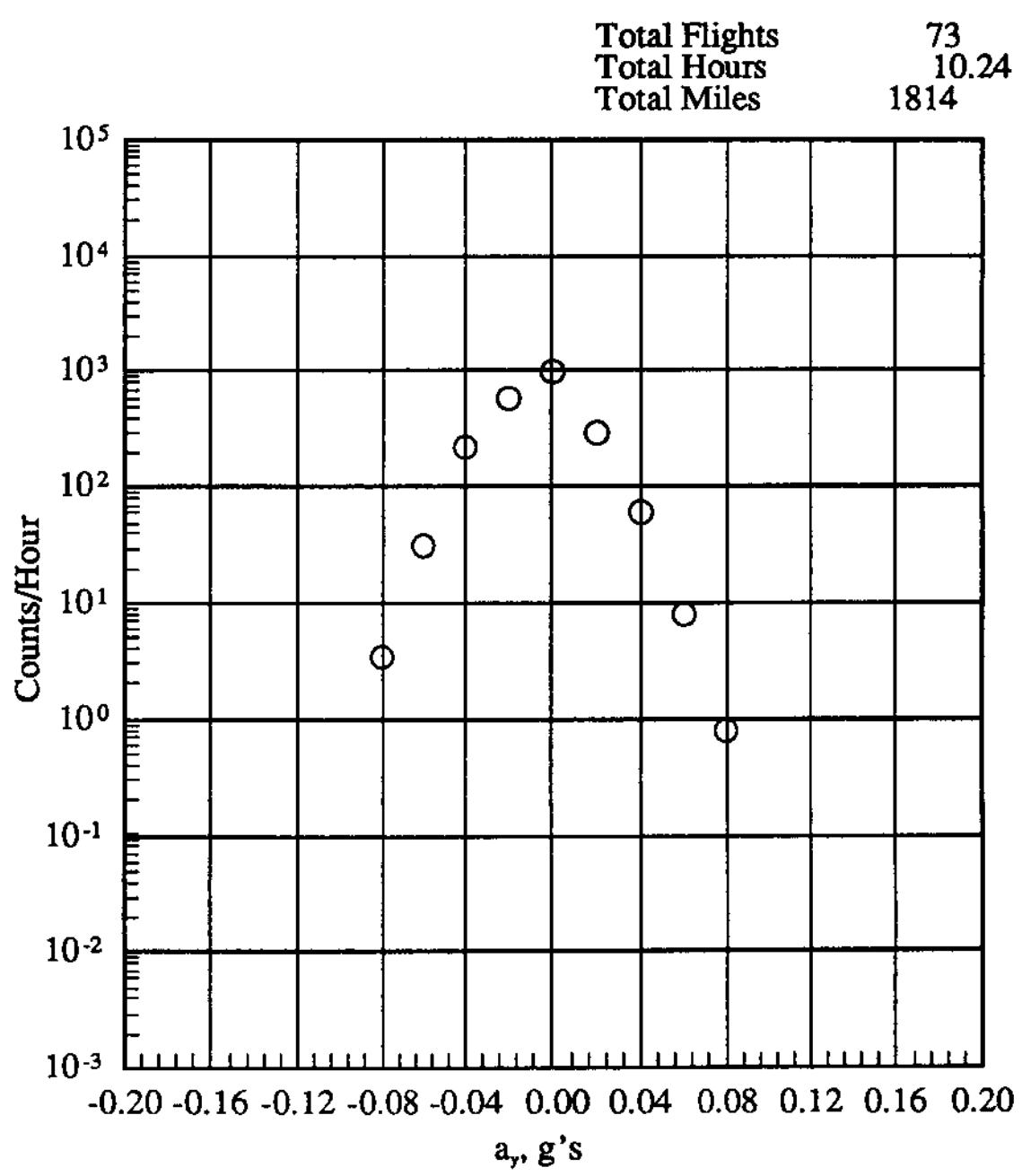
(I)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 39500 to 44500 feet altitude

Figure 22.- Continued.

LEVEL	PRESSURE ALTITUDE BANDS											
	-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		
G'S	0	0	0	0	0	0	0	0	0	0	0	0
.48	0	0	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0
.16	0	0	0	0	0	0	0	0	0	0	0	0
.12	0	0	0	0	0	0	0	0	0	0	0	0
.08	0.78	0	0	0	0	0	0	0	0	0	0	0.34
.06	7.91	5.73	0	0	0	0	0	0	0	0	0	3.75
.04	60.77	26.76	4.86	0	1.41	5.61	25.98	8.36	0	0	0	28.42
.02	294.37	100.35	45.35	13.22	12.65	1054.21	906.30	1293.87	0	0	0	141.82
0	994.59	731.09	660.07	574.30	743.33	21.50	40.16	13.83	0	0	0	1032.34
-.02	562.98	97.48	69.65	99.88	36.53	0.93	3.15	0.43	0	0	0	276.75
-.04	222.07	17.20	1.62	7.34	1.41	0	0	0	0	0	0	99.48
-.06	31.46	0	0	0	0	0	0	0	0	0	0	13.88
-.08	3.42	0	0	0	0	0	0	0	0	0	0	1.51
-.12	0	0	0	0	0	0	0	0	0	0	0	0
-.16	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19		
FLIGHT HOURS @ ALT	1614.48	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	7664.77		
TOTAL FLIGHTS									73			
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									23.19			
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									7664.77			

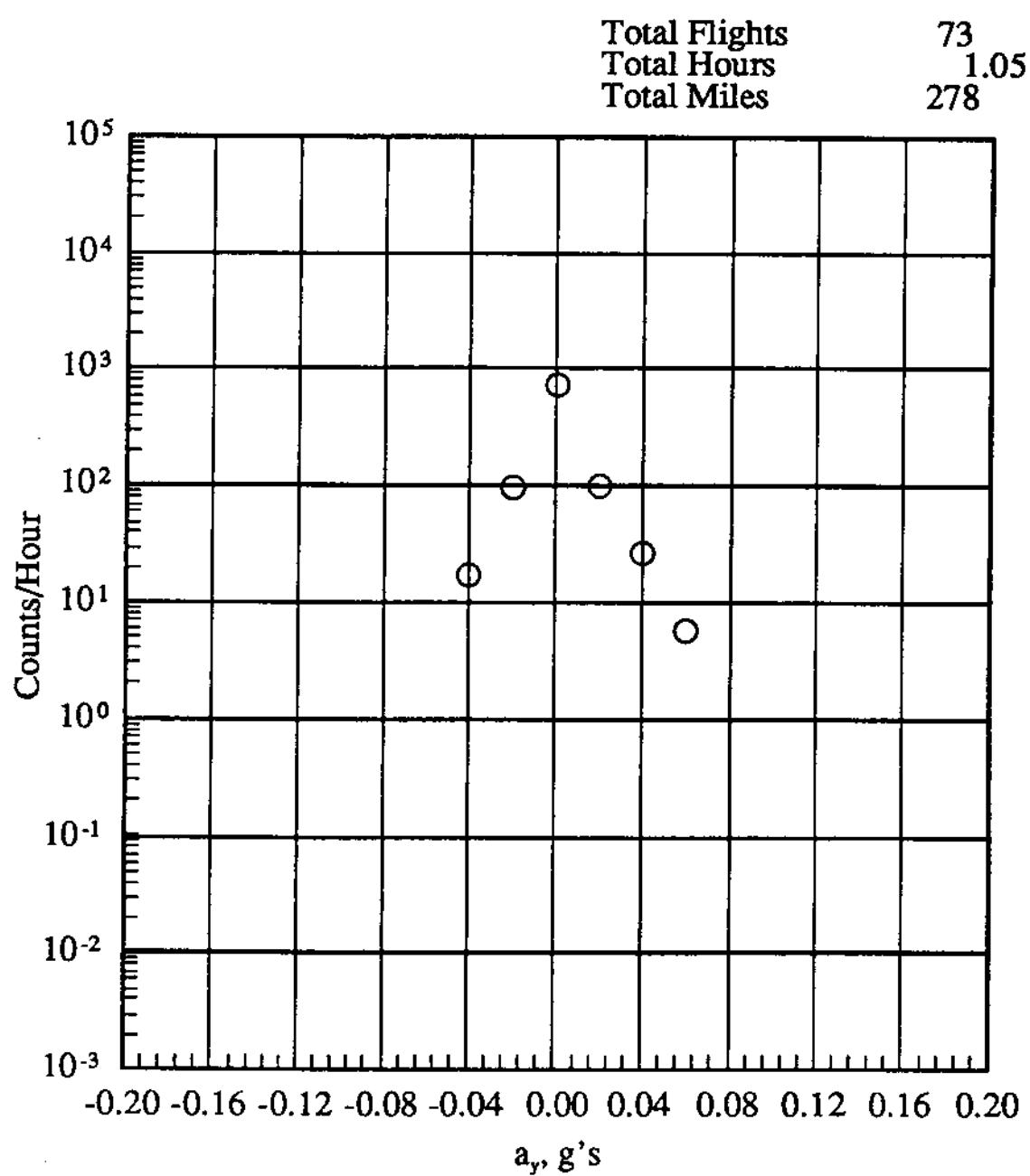
(a)  $a_y$  Level crossing counts per hour within pressure altitude bands

Figure 23.- Lateral acceleration exceedances: Non-revenue flights.



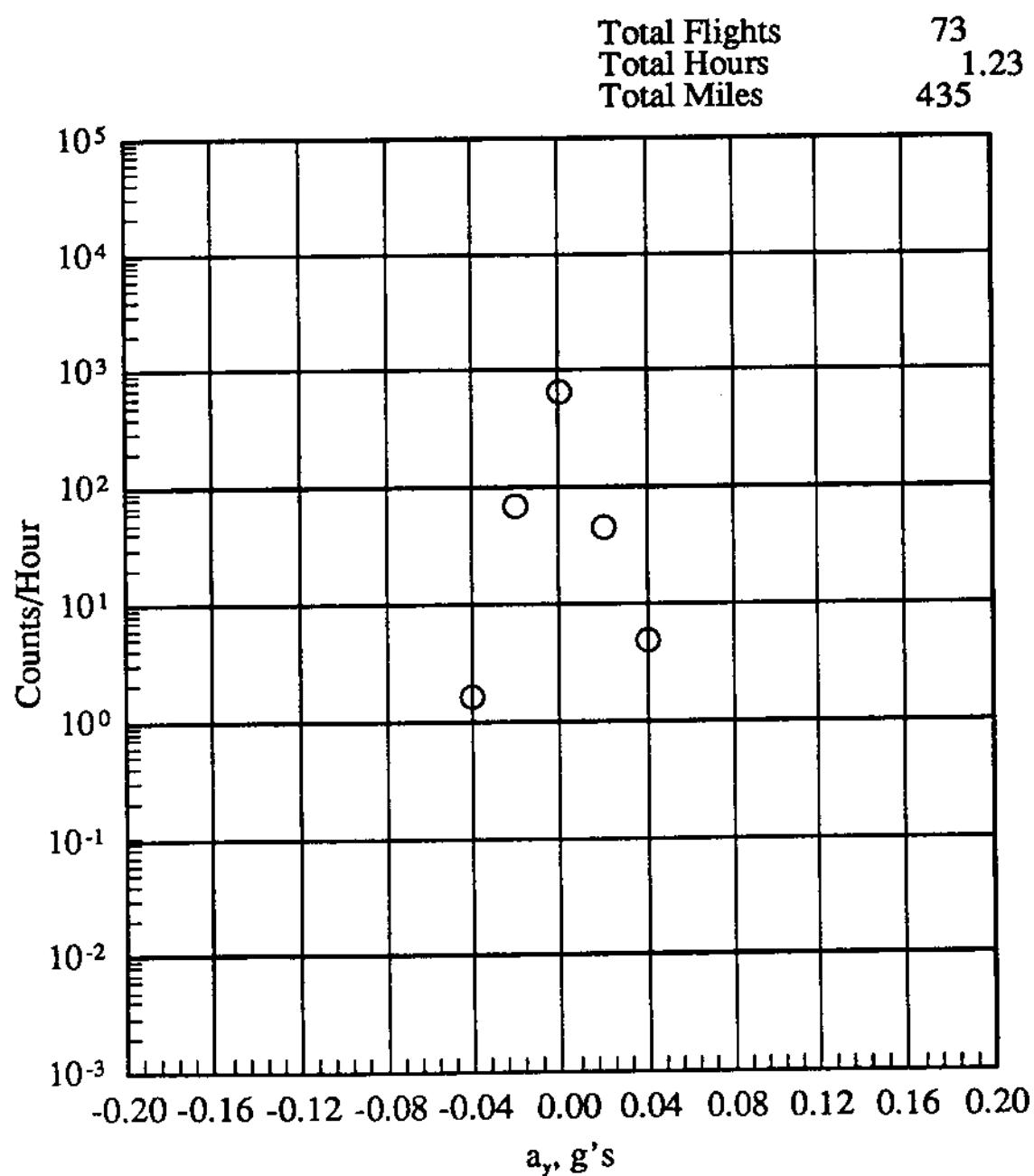
(b) -500 to 4500 feet altitude

Figure 23.- Continued.



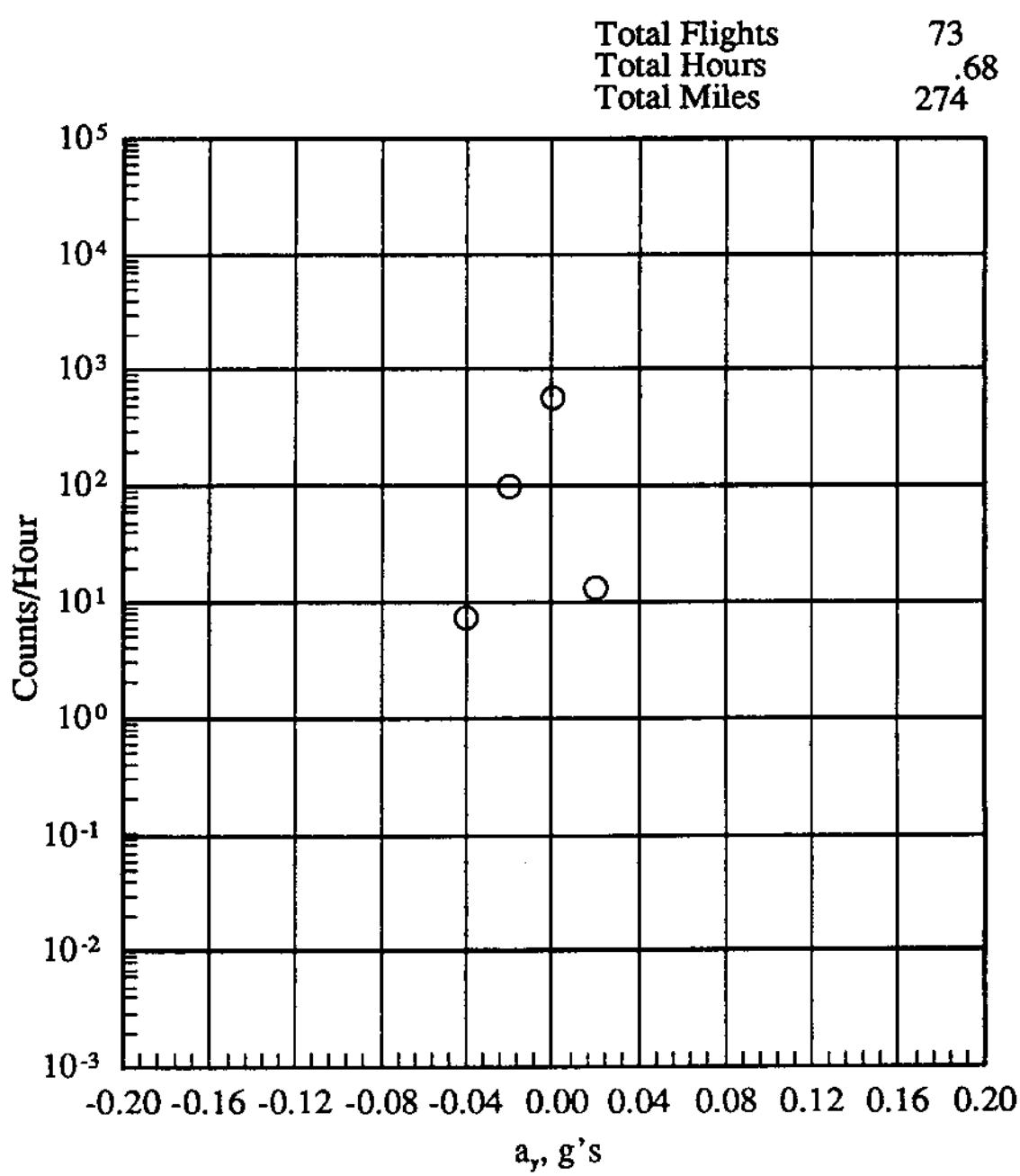
(c) 4500 to 9500 feet altitude

Figure 23.- Continued.



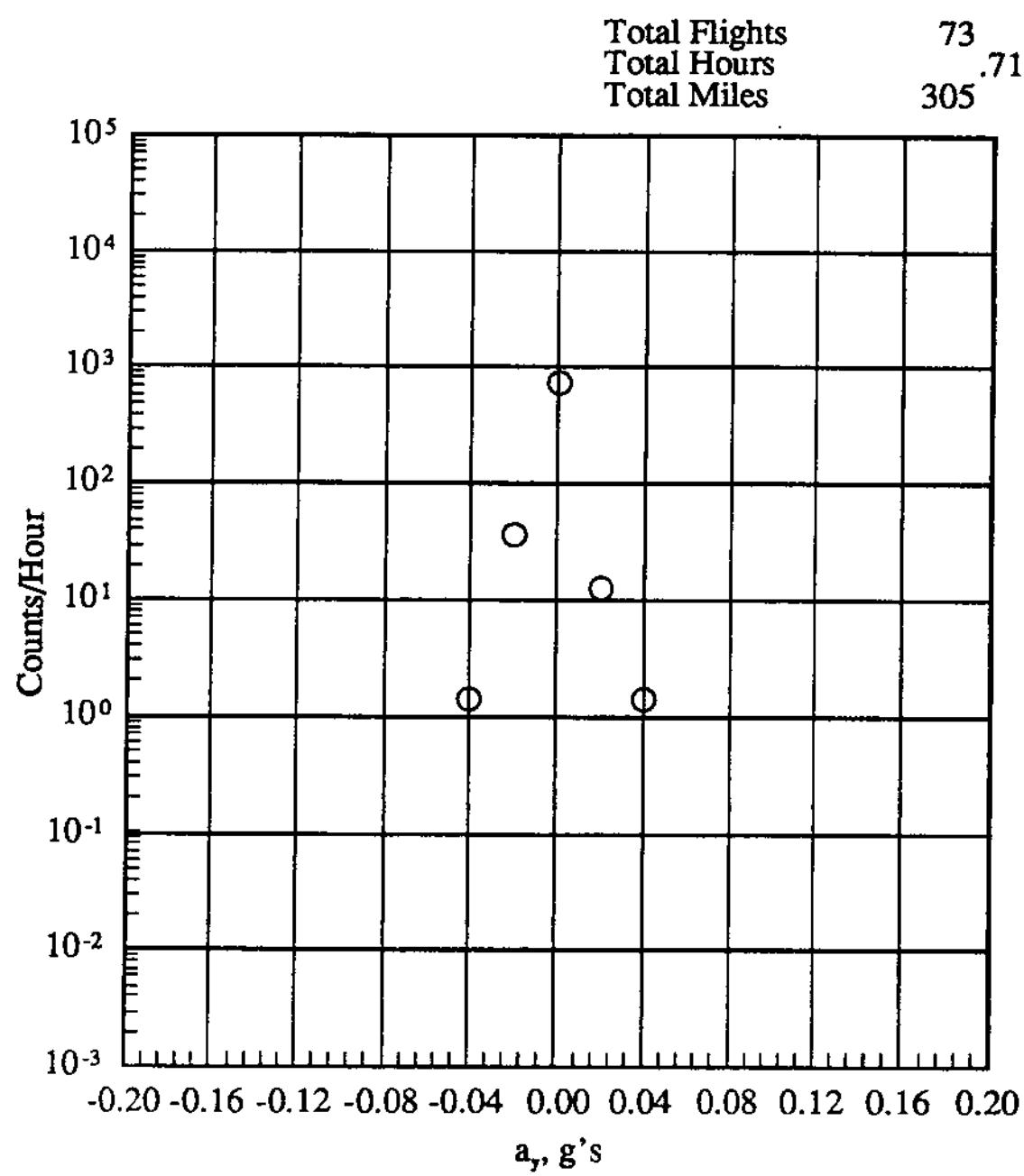
(d) 9500 to 14500 altitude

Figure 23.- Continued.



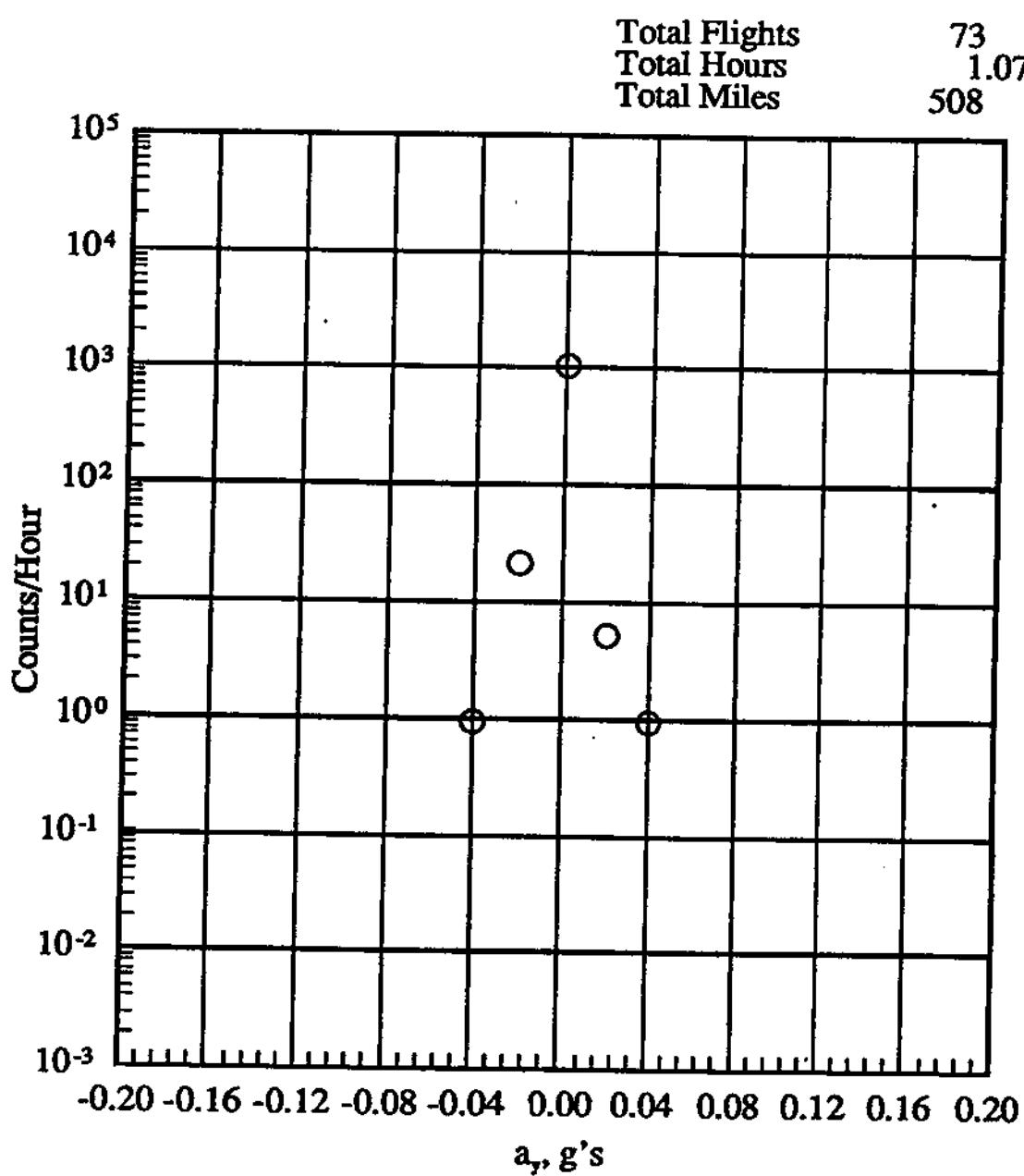
(e) 14500 to 19500 feet altitude

Figure 23.- Continued.



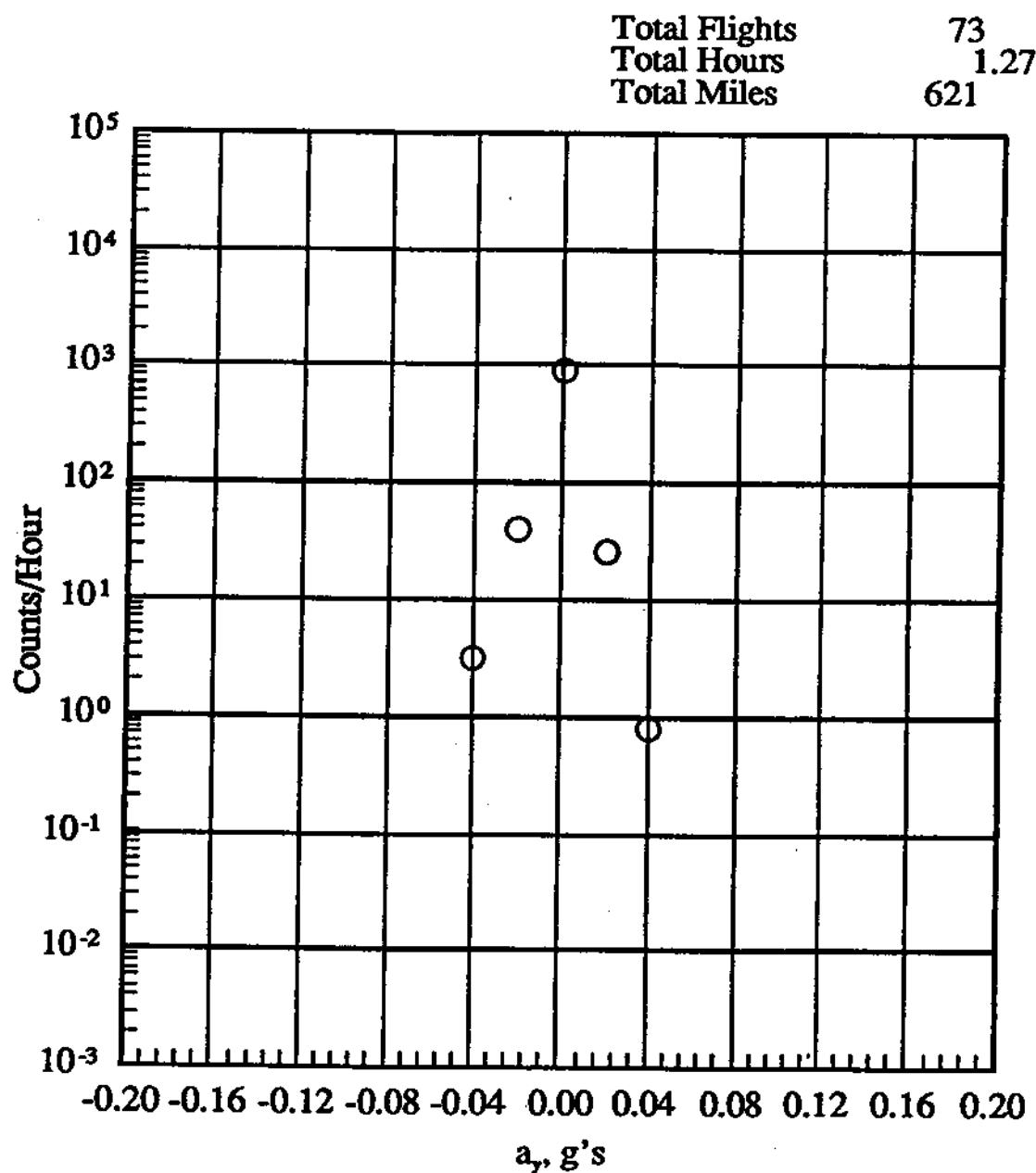
(f) 19500 to 24500 feet altitude

Figure 23.- Continued.



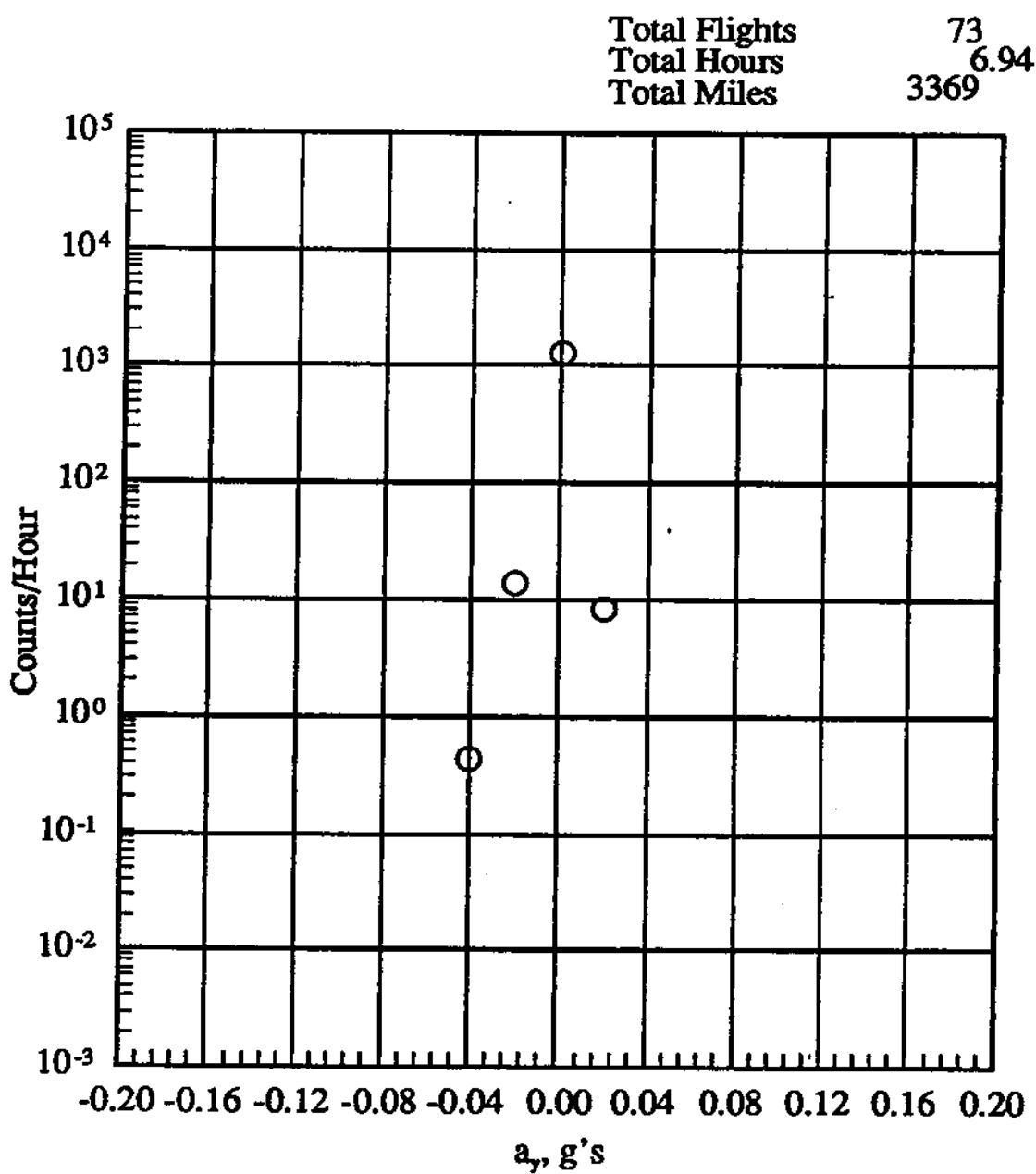
(g) 24500 to 29500 feet altitude

Figure 23.- Continued.



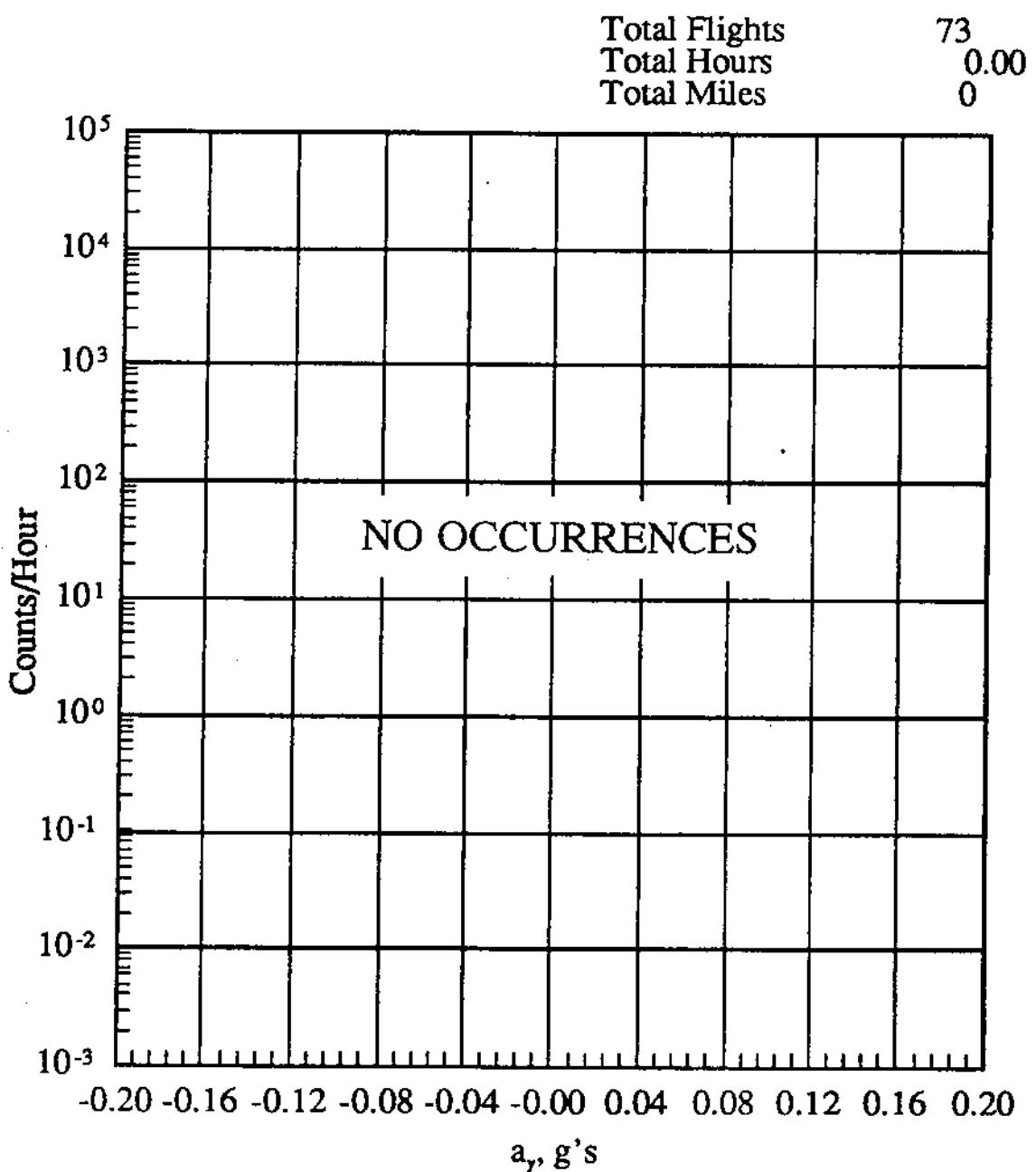
(h) 29500 to 34500 feet altitude

Figure 23.- Continued.



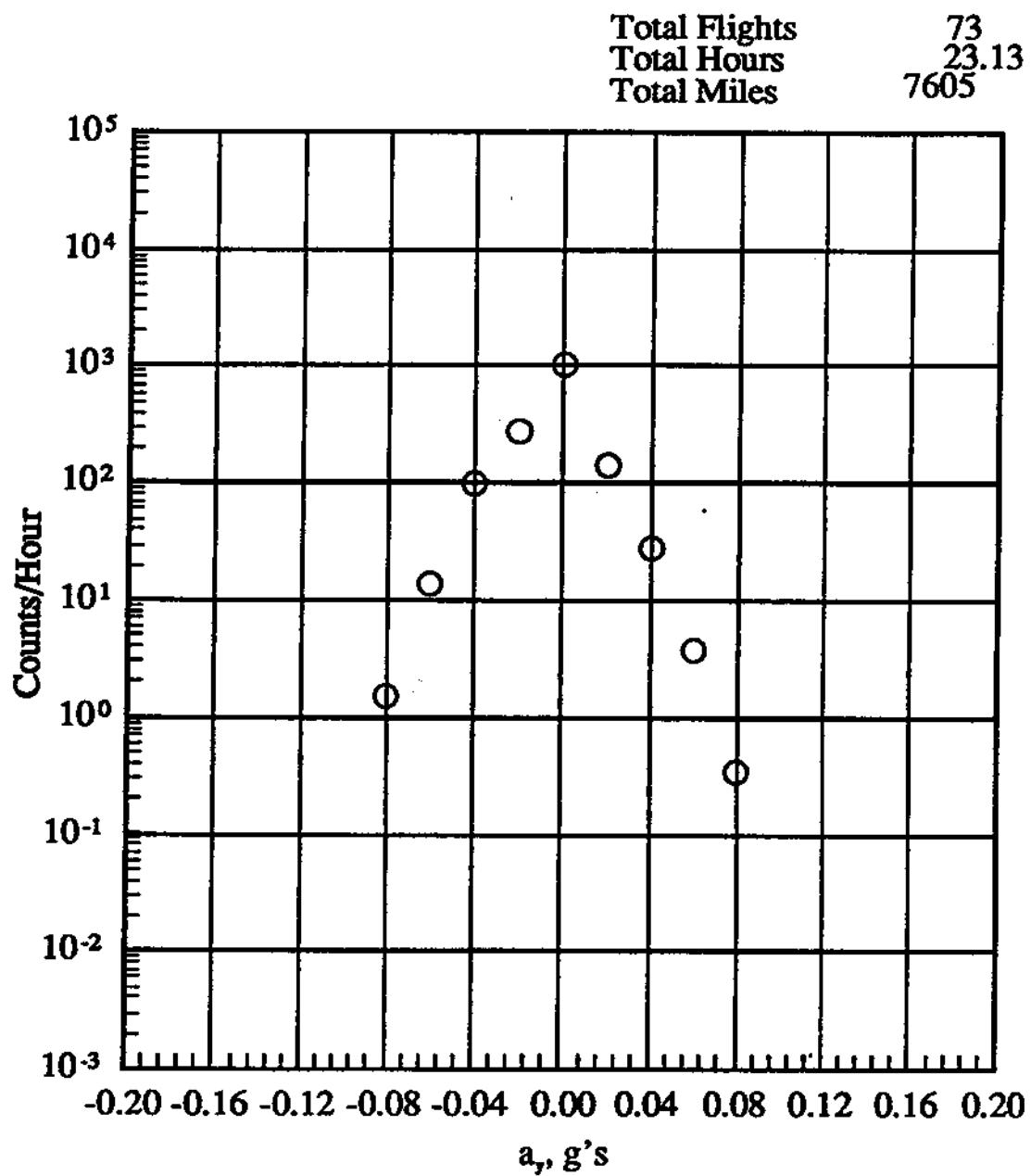
(i) 34500 to 39500 feet altitude

Figure 23.- Continued.



(j) 39500 to 44500 feet altitude

Figure 23.- Continued.



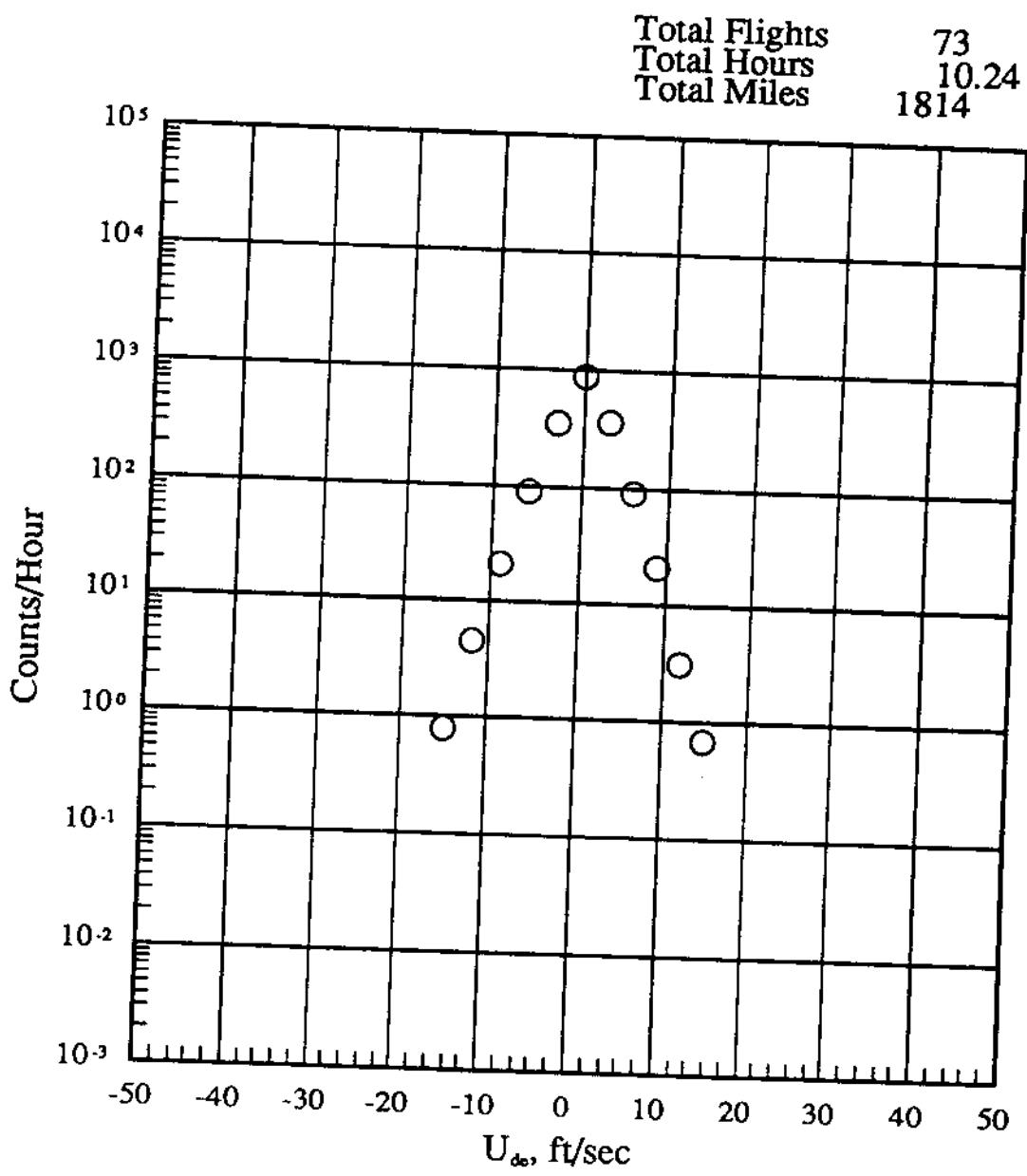
(k) -500 to 44500 feet altitude

Figure 23.- Concluded.

		PRESSURE ALTITUDE BANDS							
		-500 TO 4500 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
U <sub>de</sub> FT/SEC									
100	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
15	0.68	0	0	0	0	0	0	0	0.30
12	3.13	0	0	0	0	0	0	0	1.38
9	20.81	0	2.43	0	0	0	0	0	9.31
6	90.96	4.78	3.24	0	0	1.87	0	0.14	40.66
3	364.81	38.23	12.96	0	4.22	8.41	4.72	2.45	164.93
0	880.96	820.92	898.46	987.03	1001.87	1074.77	981.89	1122.45	972.23
-3	352.60	31.54	9.72	1.47	0	9.35	6.30	1.30	158.77
-6	90.18	0.96	5.67	0	0	2.80	0.79	0.14	40.36
-9	20.91	0	0.81	0	0	0.93	0	0	9.31
-12	4.49	0	0	0	0	0	0	0	1.98
-15	0.78	0	0	0	0	0	0	0	0.34
-20	0	0	0	0	0	0	0	0	0
-30	0	0	0	0	0	0	0	0	0
-40	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0
FLIGHT MILES @ ALT	1914.46	278.29	435.09	273.62	305.17	508.15	620.66	9369.31	0
TOTAL FLIGHTS								73	
TOTAL FLIGHT HOURS								23.19	
TOTAL FLIGHT MILES								7604.77	
FLAPS UP AND DOWN									
FLAPS UP AND DOWN									

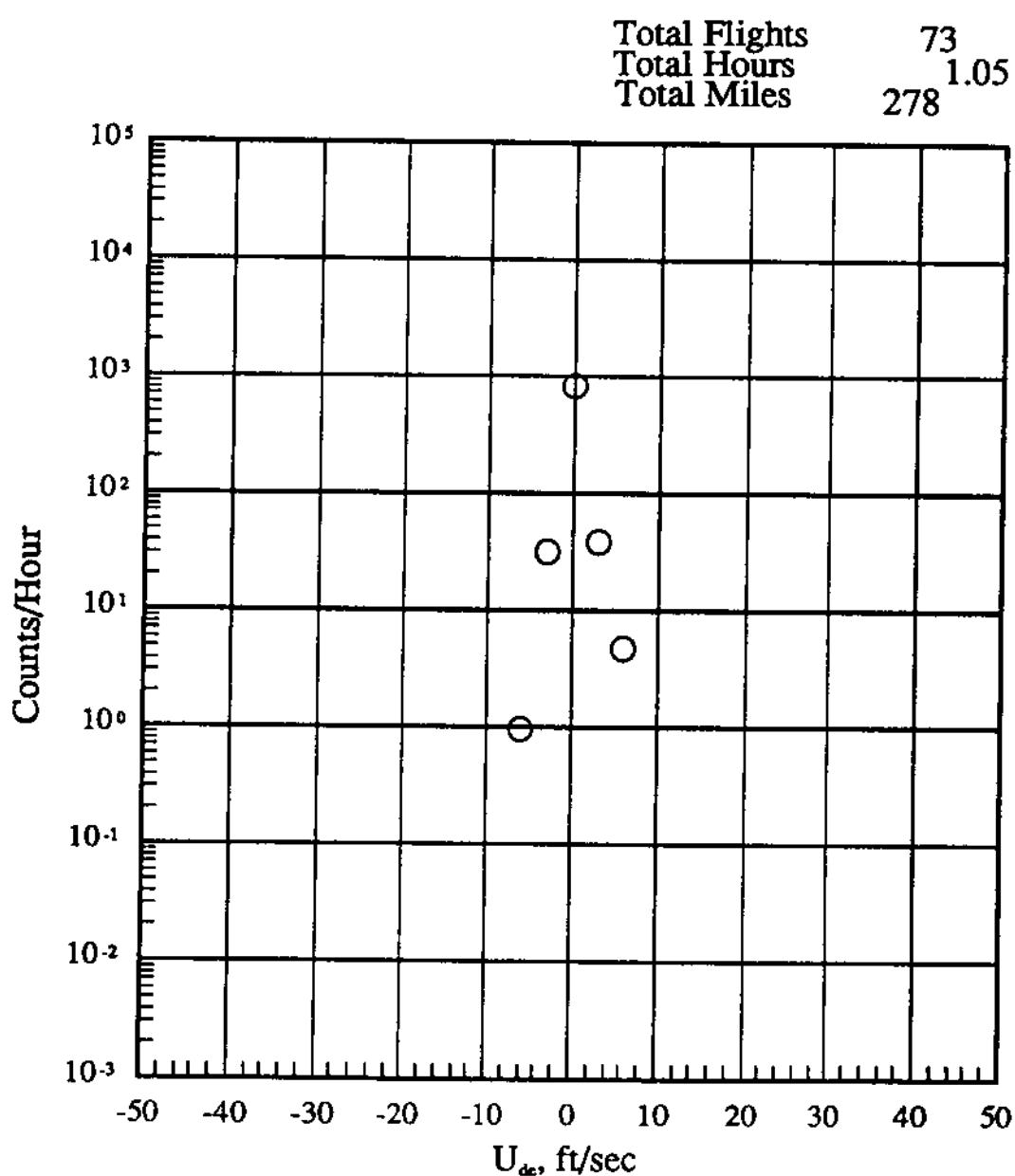
(a) U<sub>de</sub> Level crossing counts per hour within pressure altitude bands

Figure 24.- U<sub>de</sub> exceedances: Non-revenue flights.



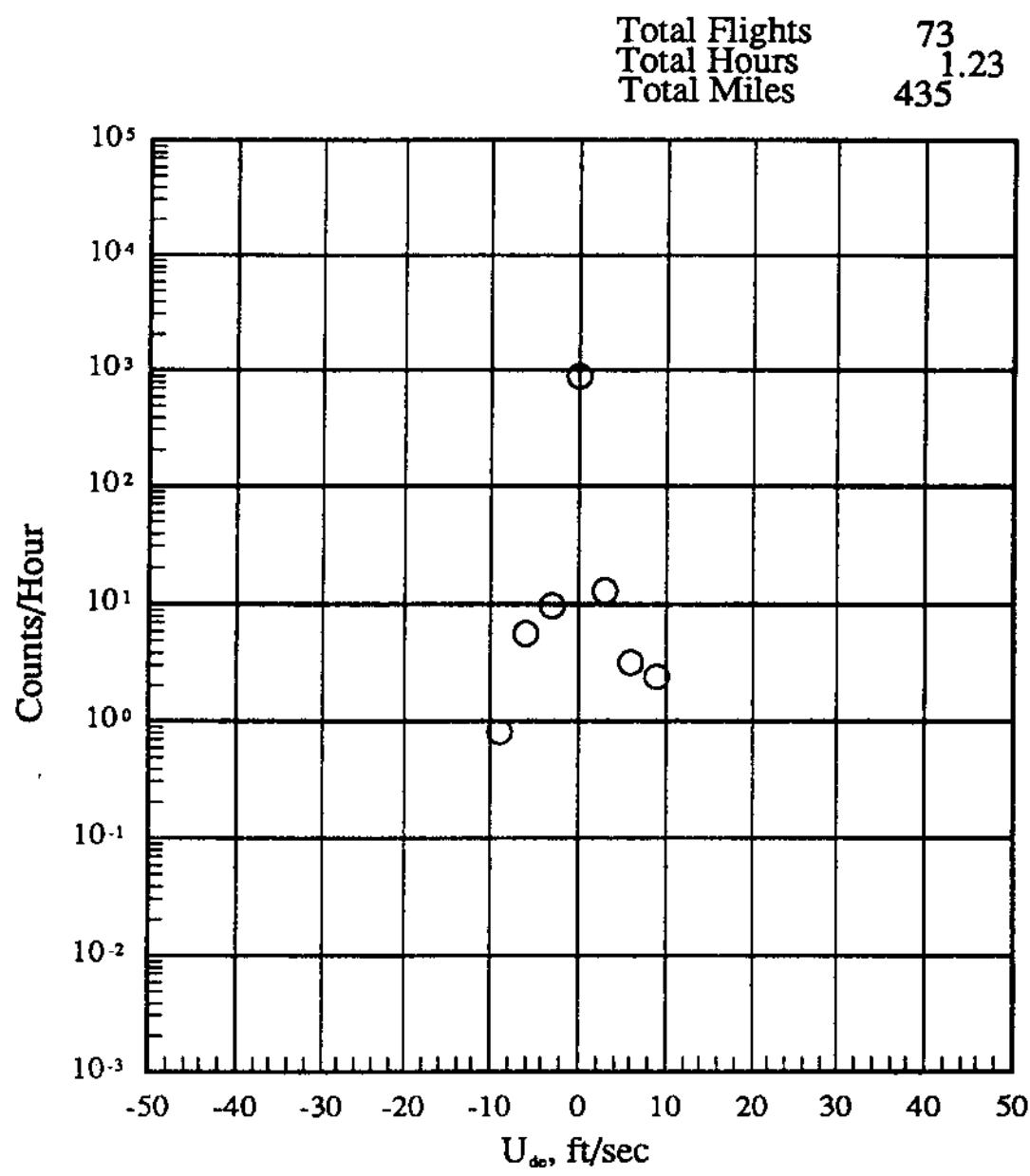
(b) -500 to 4500 feet altitude

Figure 24.- Continued.



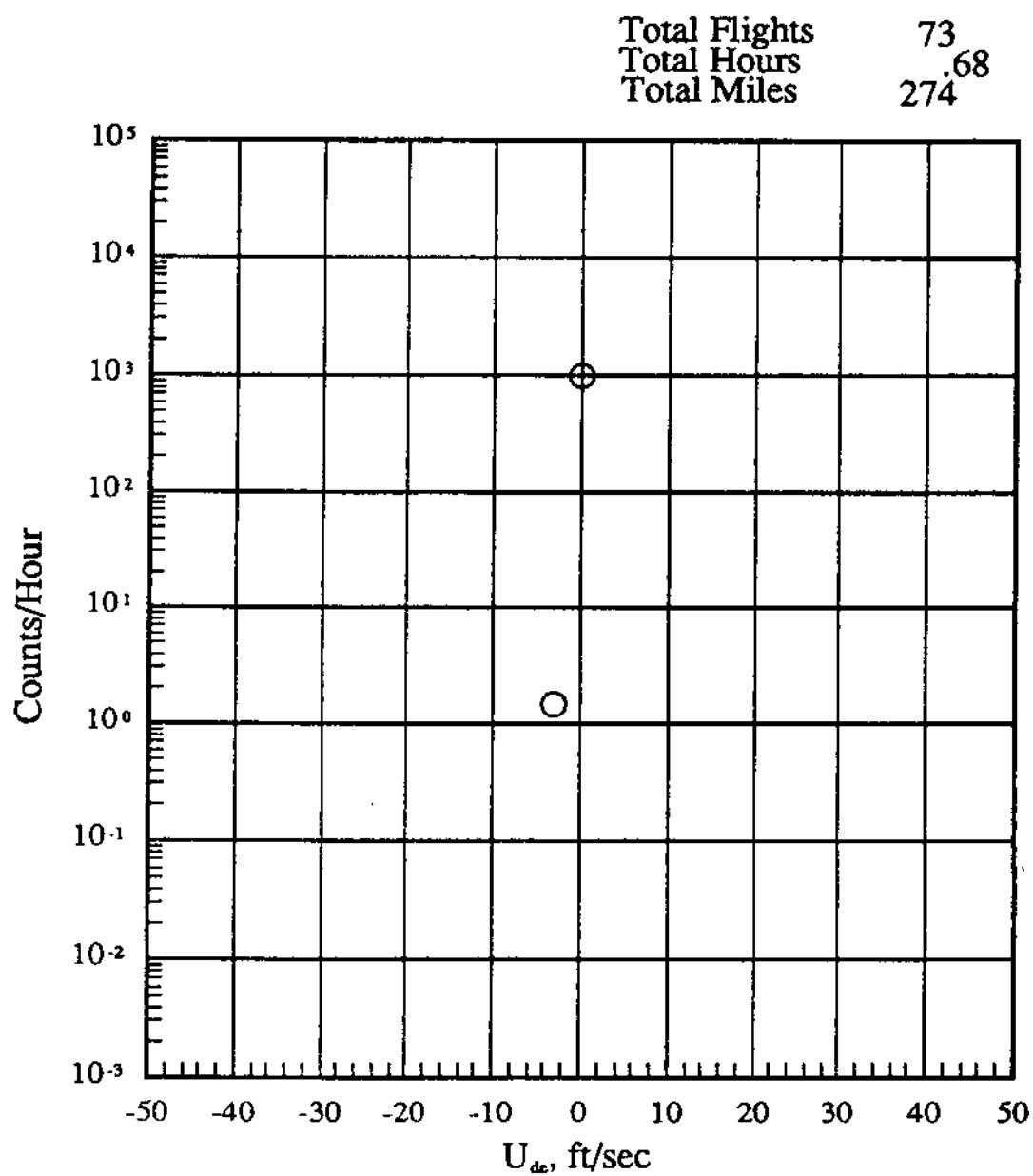
(c) 4500 to 9500 feet altitude

Figure 24.- Continued.



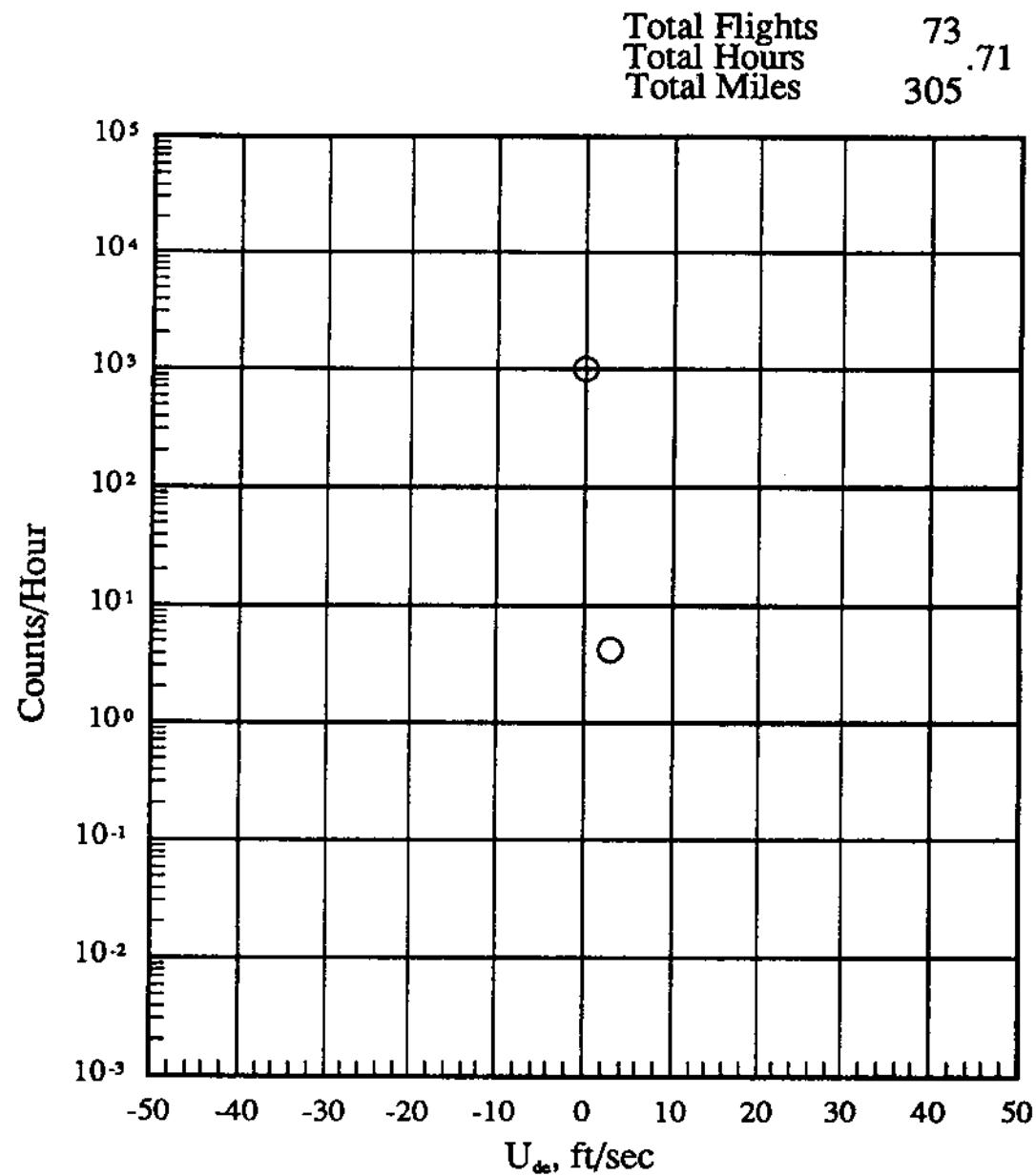
(d) 9500 to 14500 feet altitude

Figure 24.- Continued.



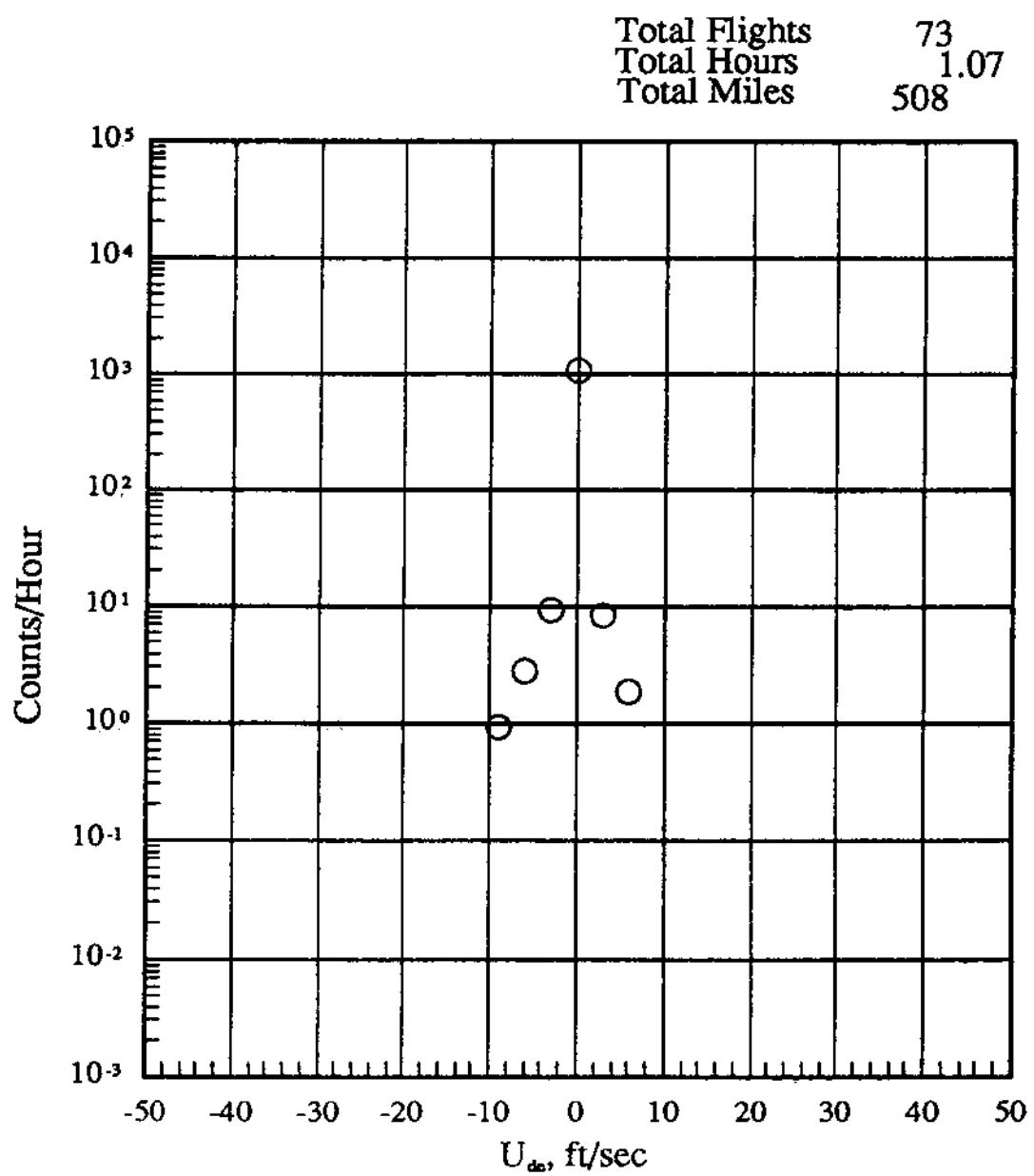
(e) 14500 to 19500 feet altitude

Figure 24.- Continued.



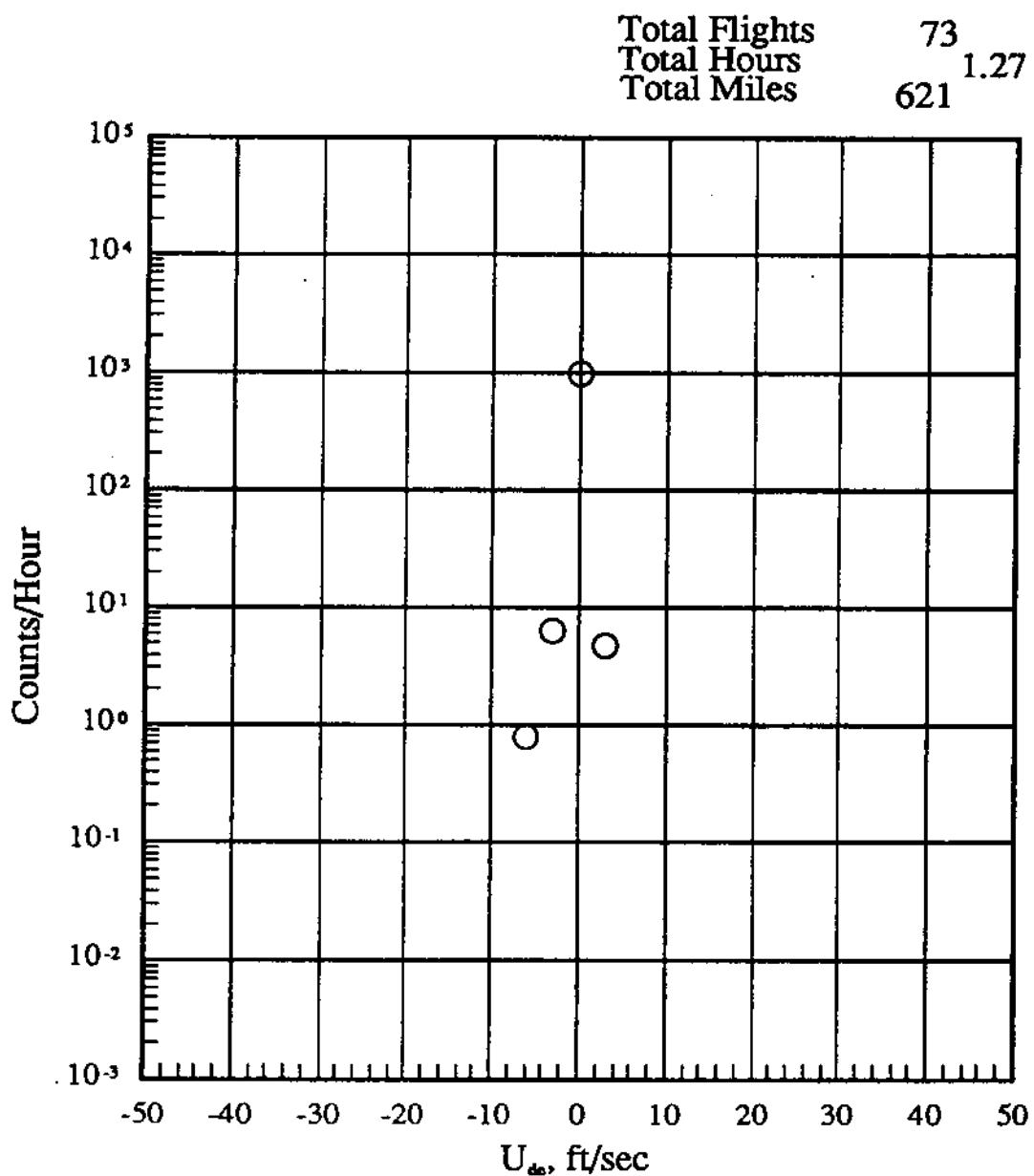
(f) 19500 to 24500 feet altitude

Figure 24.- Continued.



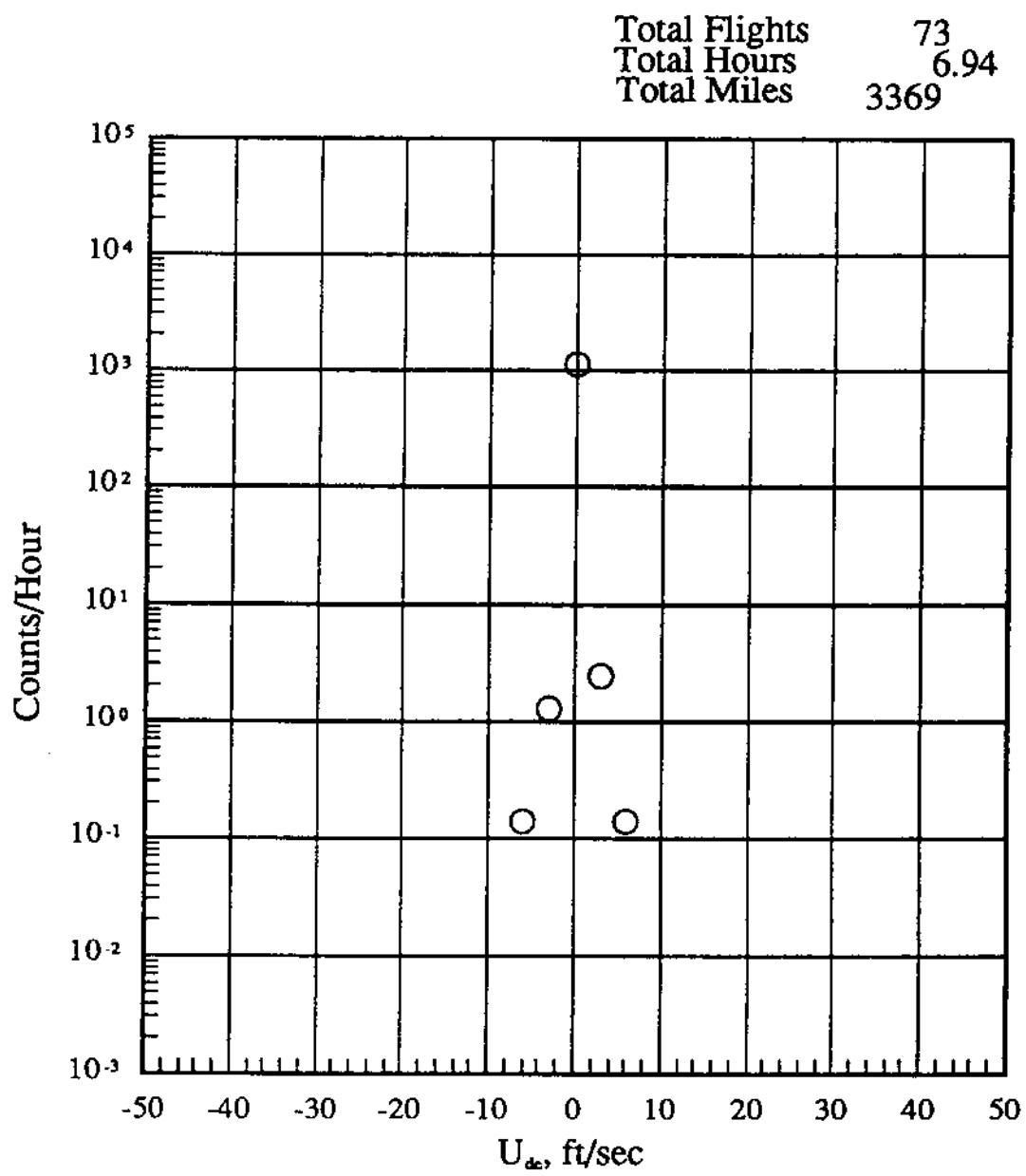
(g) 24500 to 29500 feet altitude

Figure 24.- Continued.



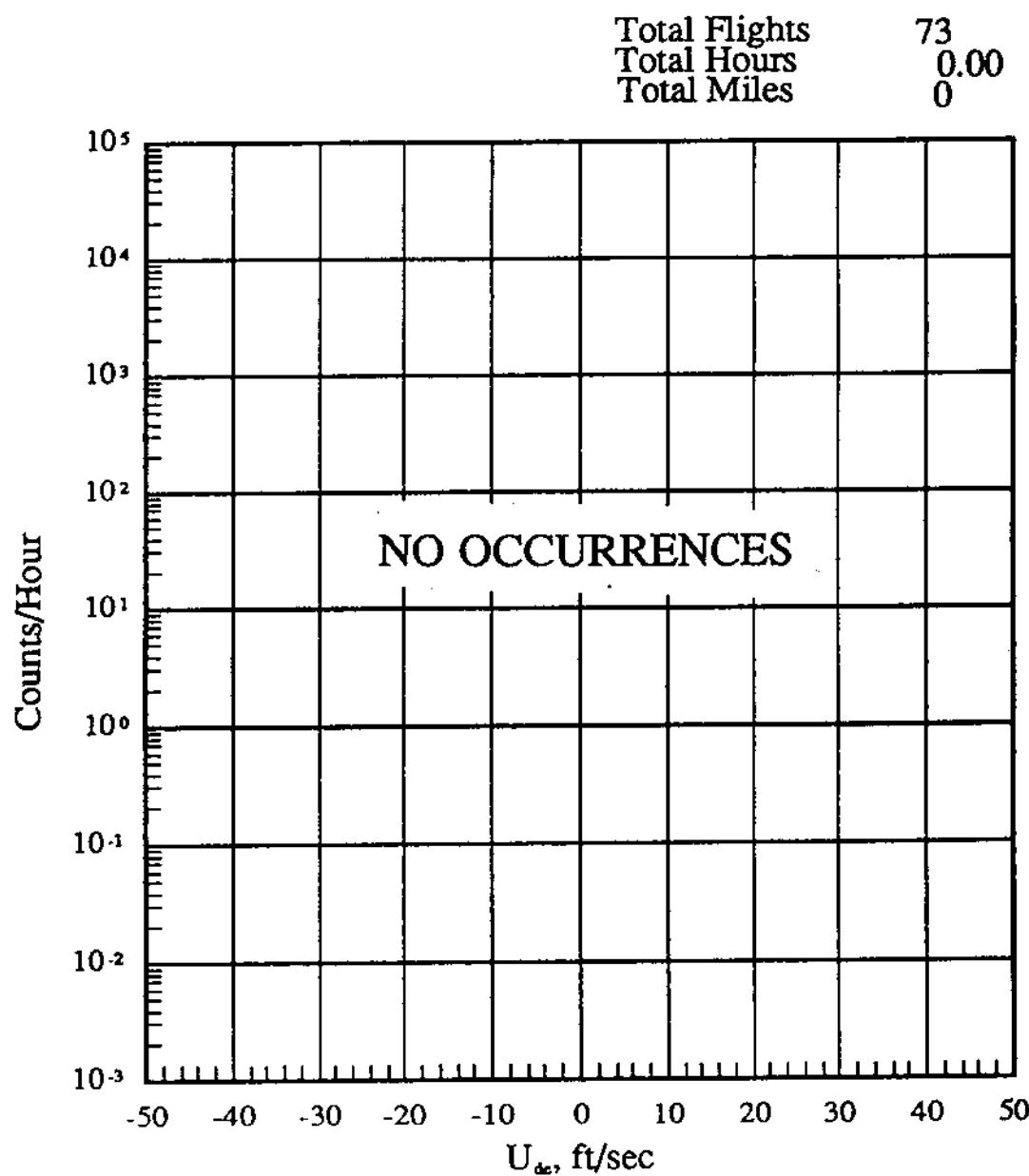
(h) 29500 to 34500 feet altitude

Figure 24.- Continued.



(i) 34500 to 39500 feet altitude

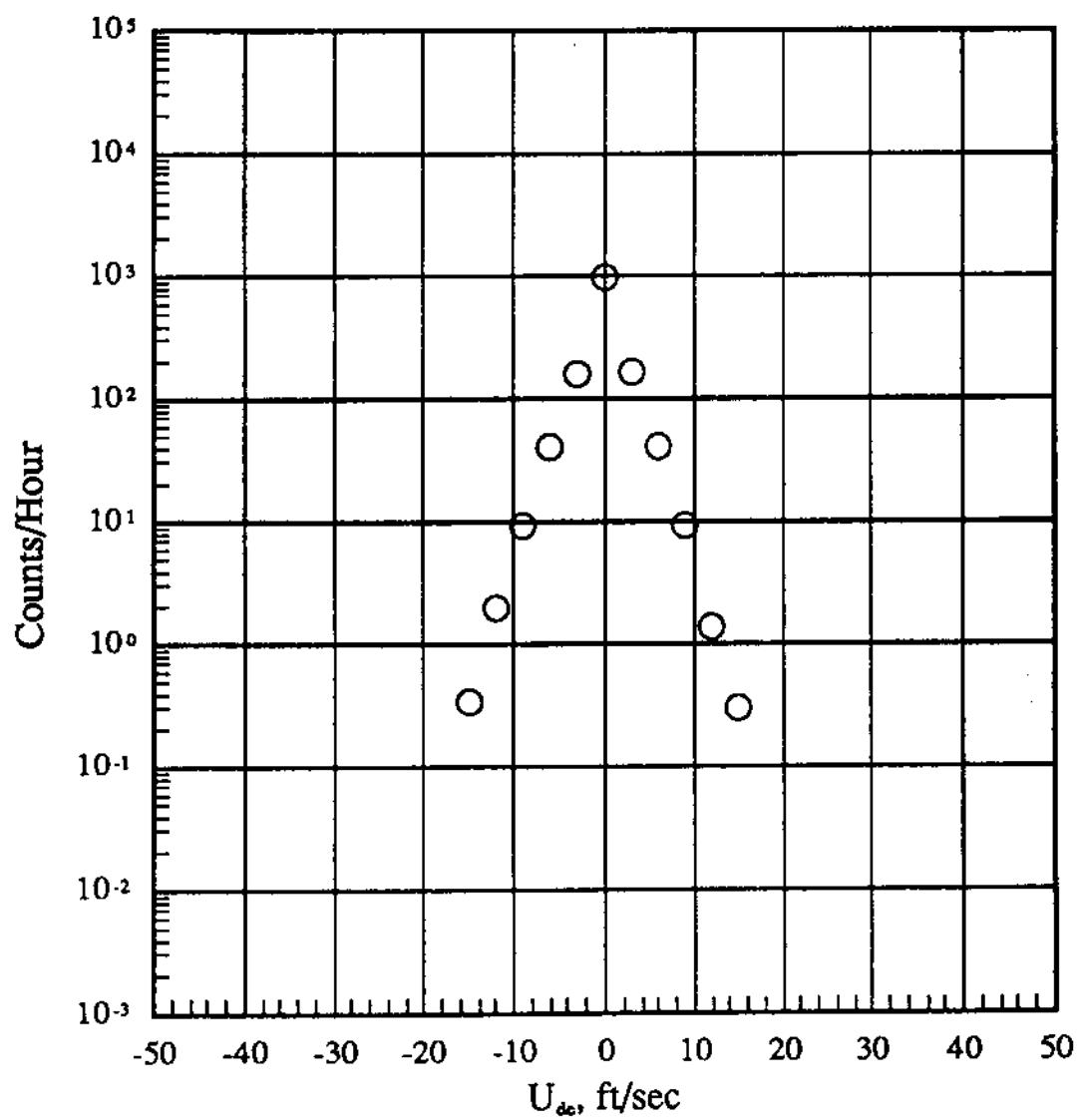
Figure 24.- Continued.



(j) 39500 to 44500 feet altitude

Figure 24.- Continued.

Total Flights 73  
Total Hours 23.13  
Total Miles 7605



(k) -500 to 44500 feet altitude

Figure 24.- Concluded.

DATA FROM 247 HOURS & 70 FLIGHTS

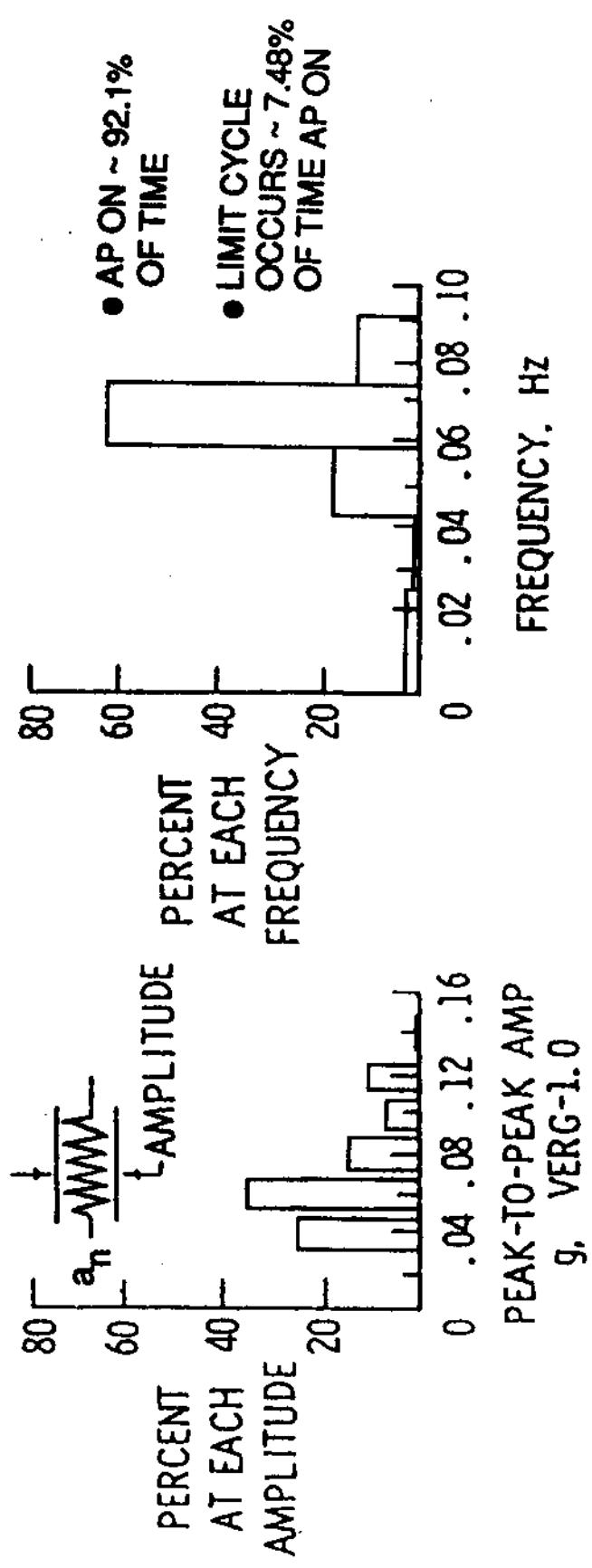


Figure 25.- Autopilot "limit cycle" experience.

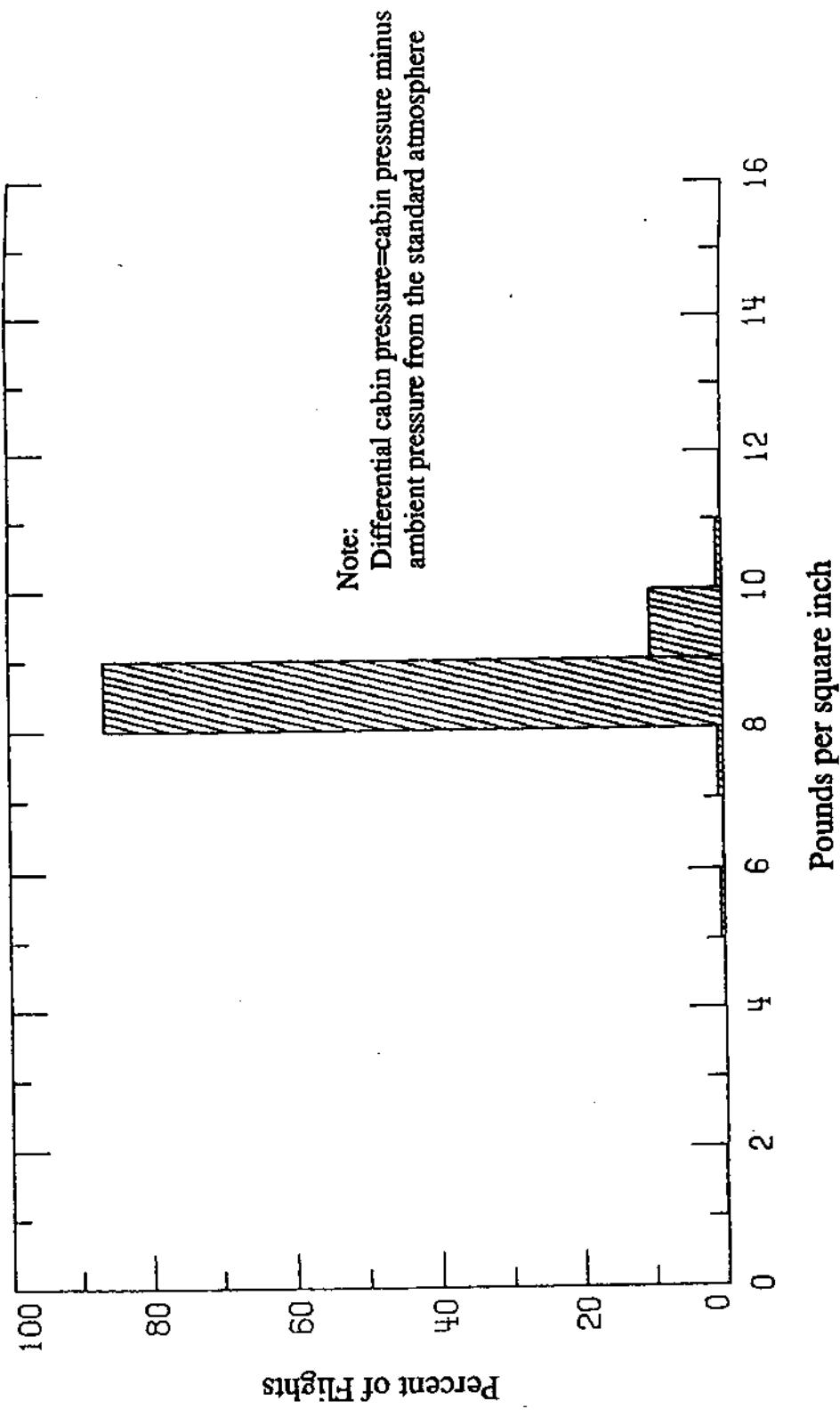


Figure 26.- Maximum differential cabin pressure per flight; Percent of flights.



## Report Documentation Page

1. Report No. <b>NASA CR-181909, VOL. IV DOT/FAA-CT-89/36-IV</b>	2. Government Accession No.	3. Recipient's Catalog No.	
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7. Author(s) <b>Norman L. Crabill</b>		6. Performing Organization Code	
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