

AD A 120870

ASD-TR-82-5012

HANDBOOK OF MILITARY AIRCRAFT DESIGN
NORMAL LOAD FACTOR EXCEEDANCE DATA

RAY J. VELDMAN
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OCTOBER 1982
Interim Report Period September 1965 - March 1982

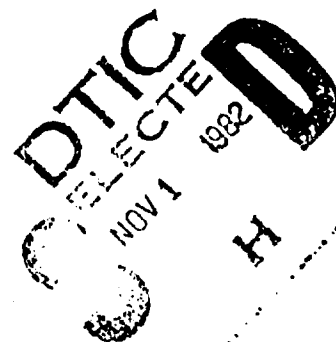
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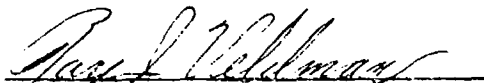
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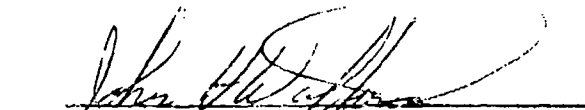
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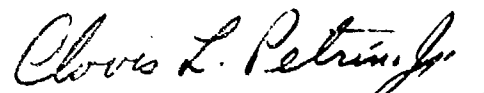
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ASD-TR-82-5012	2. GOVT ACCESSION NO. AD-A120870	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) HANDBOOK OF MILITARY AIRCRAFT DESIGN NORMAL LO/D FACTOR EXCEEDANCE DATA		5. TYPE OF REPORT & PERIOD COVERED Interim Report Sep 65 - Mar 82
		6. PERFORMING ORG. REPORT NUMBER N/A
7. AUTHOR(s) Ray J. Veldman Cyril Peckham		8. CONTRACT OR GRANT NUMBER(s) N/A
9. PERFORMING ORGANIZATION NAME AND ADDRESS Force Management Group ASD/ENFSL WPAFB OH 45433		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS AFSD-136
11. CONTROLLING OFFICE NAME AND ADDRESS Same		12. REPORT DATE October 1982
		13. NUMBER OF PAGES 110
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Same		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES JACK N. HOFFMAN ASD/ENF STINFO OFFICE		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Force Management, Structures, Flight Loads, Structural Life Management, Fatigue, Structural Integrity, Structural Maintenance, Inspection Scheduling, Data Recording, Data Analysis, Damage Tolerance, Individual Aircraft Track- ing.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The information presented in this handbook is derived from airborne data recorded using oscillograph and magnetic tape systems collecting Loads Environment Spectra Survey Data on a multitude of USAF aircraft. The data is broken down into three main categories: Cargo Class, Fighter/ Attack Class, and Trainer Class. Special information included in the hand- book are Ground Data from the C-141 and Aerial Refueling from the C-5. The		

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20. (continued)

data is broken down by aircraft, mission, and mission phase. Plots are provided and show comparisons of different aircraft models. The tables presented express NZ (normal load factor) in exceedances per 1000 flight hours and ground data in exceedances per 1000 flights.

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FOREWORD

This report was prepared by the Directorate of Flight Systems Engineering, Deputy for Engineering, Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio, Messrs. Cyril G. Peckham and Ray J. Veldman (ASD/ENFSL).

The authors gratefully acknowledge the assistance of Mr. Robert Mach, Aerospace Engineer (ASD/ENFSL); Mr. David J. Nowery and Mr. Lawrence C. Sloser, student engineering trainees from the University of Cincinnati; and Mr. Faustino Zapata, a student engineering trainee from the Illinois Institute of Technology.

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SECTION 1

INTRODUCTION

The US Air Force has been using the normal load factor exceedance data provided in Mil-A-8866 as design criteria for new aircraft since 1960. Two updates to this specification have occurred, in 1971 and 1975, but the load factor tables presented are still based upon a minimal amount of actual in-service data. In recent years the Force Management Group of ASD/ENFSL has provided normal load factor spectra for specific mission phases to supplement Mil-A-8866 for use in new aircraft Requests For Proposals.

This handbook represents a compilation of thousands of hours of actual operational usage recorded data from many aircraft flying most missions and mission phases in both combat and noncombat environments. It is intended to supplement Tables I-VIII of Mil-A-008866B (USAF) as design spectra for new aircraft and selected sections will be referenced in future design requirements documents.

Since new data is continuously recorded on current aircraft, this handbook will be updated as necessary to reflect the newly acquired service information.

SECTION 2

DISCUSSION

All tables appearing in the handbook use the same load factor (N_z) interval definition. For example, if the load factor exceedances listed are - - - 0.6, 0.4, 0.2 -0.2, -0.4, -0.6 - - -, the data appearing under 0.2 and -0.2 include the interval from 0.2 to 0.4 and -0.2 to -0.4 respectively, but does not include the value of 0.4 or -0.4. It should be noted that all tables and plots list the reference and the amount of data represented. This is an indication to the user of the expected data stability. For example, the F-16 data sample is quite small since this is a relatively new recording effort. Although use of this data as criteria for a new aircraft would be questionable, additional data being recorded is suggesting early data stability for most missions.

Many of the plots appearing in this report have data points from similar missions presented with a curve faired between the points. The curve represents our recommended representation of the average mission. It should also be noted that all points that appear on the plots represent actual recorded data points. Any extrapolation of these points could lead to serious inaccuracies. The user should coordinate any extrapolation of the data points or any use of small sample data with this office.

SECTION 3

DATA

This section contains three classes of aircraft data which are Cargo, Fighter/Attack and Trainer. All the data is presented in the form of tables and illustrations.

TABLE 1

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS

WORLDWIDE MISSION DATA

ΔNZ	TRAINING	COMBAT TRAINING	LOGISTICS < 5 HRS	LOGISTICS HRS	
2.0	1.6	1.5	5.7	.4	
1.8	5.2	3.0	10.4	1.2	
1.6	18.8	9.5	19.3	3.1	
1.4	33	26	35	7.0	
1.2	69	78	84	17.4	
1.0	145	233	199	43	
0.9	366	636	508	116	
0.8	939	1950	1609	364	
0.7	2465	6249	5592	1483	
0.6	7859	19487			
0.5	24662	52478			
0.4	36811	60941	11007	4034	
0.3	7499	16795	1544	463	
0.2	1506	4203	258	85	
-0.1	710	1720	110	43	
-0.2	323	955	51	21.3	
-0.3	72	160	10.9	5.9	
-0.4	17.3	32	3.3	1.7	
-0.5					
-0.6					
-0.7					
-0.8					
-0.9					
-1.0					
HOURS:	9859	838	10113	8825	

TABLE 1

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS WORLDWIDE MISSION DATA

Δ NZ	RESCUE	SHUTTLE	AIR DROP		
2.0					
1.8					
1.6					
1.4					
1.2					
1.0		1.0	1.2		
0.9		4.4	6.6		
0.8		8.8	35		
0.7		20.1	50		
0.6	3.9	41	117		
0.5	9.7	97	215		
0.4	30	238	497		
0.3	85	817	1111		
0.2	290	2847	2940		
	1233	10496	8295		
	5435		25456		
-0.2	9706	19093	39220		
-0.3	1362	2210	8221		
-0.4	186	319	1717		
-0.5	89	140	820		
-0.6	39	59	348		
-0.7	10.0	12.4	74		
-0.8	2.8	2.9	17.7		
-0.9					
-1.0					
HOURS:	1816	3437	1697		

HOURS REFERS TO AMOUNT OF RECORDED DATA
 REFERENCE: C-130, (SEG-TR-65-34), (70-WRNE-199), (ASD-TR-64-78), (WRAMA-72-MME-011)

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS WORLDWIDE LOGISTICS MISSION PHASE DATA

ΔZ	LOGISTICS <5 HRS ASCENT	LOGISTICS <5 HRS CRUISE	LOGISTICS <5 HRS DESCENT	LOGISTICS >5 HRS ASCLNT	LOGISTICS >5 HRS CRUISE	LOGISTICS >5 HRS DESCENT
2.0			14.9			
1.8			30			
1.6			69			
1.4		1.0	140			
1.2		3.5	366			
1.0	5.0	11.5	770		2.0	
0.9	11.4	37	1986	85	5.0	686
0.8	35	122	5939	831	19.6	2744
0.7	145	391	19118	3878	51	9768
0.6	690	1236			275	
0.5	3054					
0.4	10869					
0.3						
0.2						
-0.2	24404	3352	33997	11975	1436	24404
-0.3	4126	450	5899	1215	100	4116
-0.4	740	95	1030	106	13.7	555
-0.5	340	37	470	47	4.6	255
-0.6	154	17.7	193	21.3	2.0	131
-0.7	42	6.4	41			
-0.8	9.9	3.1	9.9			
-0.9						
-1.0						
HOURS:	201	958	202	47	510	31

TABLE 3

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS SOUTHEAST ASIA OPERATIONS MISSION DATA

Δ NZ	SHUTTLE	LOGISTICS <5 HRS			
2.0					
1.8	.2				
1.6	.25				
1.4	.35				
1.2	.5				
1.0	3.5	2.4			
0.9	8.6	5.5			
0.8	20.9	13.4			
0.7	48	32			
0.6	131	85			
0.5	310	260			
0.4	992	725			
0.3	3171	2348			
0.2	10749	7774			
-0.2	22578	14746			
-0.3	2721	2266			
-0.4	386	360			
-0.5	139	145			
-0.6	61	44			
-0.7	12.4	8.4			
-0.8	3.3	1.2			
-0.9					
-1.0					
HOURS:	5738	2460			

REFERENCE: C-130B, E, (TI-243-69-24)

HOURS REFERS TO AMOUNT OF RECORDED DATA

TABLE 3

MANEUVER NZ EXCEEDANCES PER 1000 HOURS
SOUTHEAST ASIA MISSION DATA

CARGO CLASS		SHUTTLE		
ΔN2	LOGISTICS <5 HRS & SEA			
2.0				
1.8				
1.6				
1.4				
1.2				
1.0	5.1	.3		
0.9	9.3	3.6		
0.8	18.1	20.6		
0.7	35	48		
0.6	84	119		
0.5	209	310		
0.4	550	927		
0.3	1754	3049		
0.2	6019	10654		
-0.2	11738	21272		
-0.3	1686	2530		
-0.4	278	361		
-0.5	138	140		
-0.6	50	60		
-0.7	12.0	12.5		
-0.8	2.9	3.2		
-0.9				
-1.0				
HOURS:		12579	9175	

TABLE 3

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS SOUTHEAST ASIA OPERATIONS MISSION PHASE DATA

Δ NZ	SHUTTLE ASCENT	SHUTTLE CRUISE	SHUTTLE DESCENT	LOGISTICS <5 HRS ASCENT	LOGISTICS <5 HRS CRUISE	LOGISTICS <5 HRS DESCENT
2.0	2.5		8.2			
1.8	4.6		22.5			
1.6	9.1	1.1	60	7.0	1.3	18.9
1.4	31	8.5	144	11.5	3.4	51
1.2	111	23	357	28	11.1	175
1.0	285	58	920	86	30	405
0.9	935	157	2699	327	99	1222
0.8	3516	519	8228	1356	314	4405
0.7	13473	2182	25900	6285	1155	16305
0.6						
0.5						
0.4						
0.3						
0.2						
-0.2	37455	7880	40545	19324	2797	37518
-0.3	4715	742	5030	2401	355	4784
-0.4	626	130	661	296	61	658
-0.5	220	57	250	77	25	230
-0.6	101	25	93	21.1	10.5	81
-0.7	26	6.5	13.0		1.6	23
-0.8	5.8	2.1	2.2		.6	9.5
-0.9						
-1.0						
HOURS:	1214	2820	1336	284	1528	211

REFERENCE: C-130B, E, (TI-243-69-24)

HOURS REFERS TO AMOUNT OF RECORDED DATA

TABLE 4

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS

MISSION PHASE DATA

Δ NZ	LOGISTICS ASCENT	LOGISTICS CRUISE	LOGISTICS DESCENT	SHUTTLE ASCENT	SHUTTLE CRUISE	SHUTTLE DESCENT
2.0			7.3	2.3		8.5
1.8			17.3	3.6		20.5
1.6			44	9.4		60
1.4		1.2		31	1.0	137
1.2	6.2	3.6	102	108	5.2	353
1.0	12.5	11.3	269	280	22.4	900
0.9	31	35	560	926	52	2681
0.8	94	108	1596	3463	159	8153
0.7	478	344	5155	13314	519	25601
0.6	2060	1186	17680		2170	
0.5	8187					
0.4						
0.3						
0.2						
-0.2	21432	3010	35797	37164	7865	40216
-0.3	3117	391	5329	4702	742	4974
-0.4	480	74	840	630	127	665
-0.5	190	30	350	285	56	280
-0.6	76	13.3	136	109	25	92
-0.7	13.5	3.6	33	25	8.1	13.5
-0.8	4.1	1.6	9.7	6.3	3.1	2.1
-0.9						
-1.0						
HOURS:	485	2486	413	1278	2945	1408

TABLE 5

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS TRAINING MISSION PHASE DATA

ΔNZ	ASCENT	CRUISE	DESCENT	BEFORE DROP	AIR DROP	AFTER DROP
2.0	8.0	6.6	14.0	9.8		12.4
1.8	16.2	13.0	37	20.5		49
1.6	40	30	98	47	27	156
1.4	71	65	245	145	59	320
1.2	183	163	679	565	157	1027
1.0	375	370	1550	1200	560	2080
0.9	1115	921	3871	4627	1951	6540
0.8	3883	2521	10829	13269	7488	16024
0.7	14377	7294	29685	33536	27753	39241
0.6						
0.5						
0.4						
0.3						
0.2						
-0.2	34300	11200	46955	37556	39856	39813
-0.3	5814	2443	10675	14887	8625	13416
-0.4	1041	642	2132	4531	1689	4163
-0.5	400	340	770	2300	810	1900
-0.6	170	179	367	1338	368	1008
-0.7	35	45	49	380	75	295
-0.8	8.0	10.6	7.0	86	13.5	75
-0.9						
-1.0						
HOURS:	376	1513	286	409	222	161

REFERENCE: C-130A/B, E, (WRAMA-72-NME-011), (70-WRNE-199), (SEG-TR-65-34), (ASD-TR-64-78)

HOURS REFERS TO AMOUNT OF RECORDED DATA

TABLE 6

MANEUVER NZ EXCEEDANCES PER 1000 HOURS
CARGO CLASS RESCUE MISSION PHASE DATA

Δ NZ	ASCENT	CRUISE	DESCENT		
2.0					
1.8					
1.6					
1.4					
1.2					
1.0					
0.9					
0.8			18.4		
0.7		2.8	41		
0.6	17.1	13.3	129		
0.5	69	38	270		
0.4	291	119	783		
0.3	1285	503	3370		
0.2	5467	2482	14908		
-0.2	19512	4106	33103		
-0.3	2665	495	4687		
-0.4	411	73	580		
-0.5	165	37	265		
-0.6	60	13.3	138		
-0.7		3.0	26		
-0.8		1.0	9.2		
-0.9					
-1.0					
HOURS:	117	1054	109		

REFERENCE: C-130P, H, (70-WRNE-199)
HOURS REFERS TO AMOUNT OF RECORDED DATA

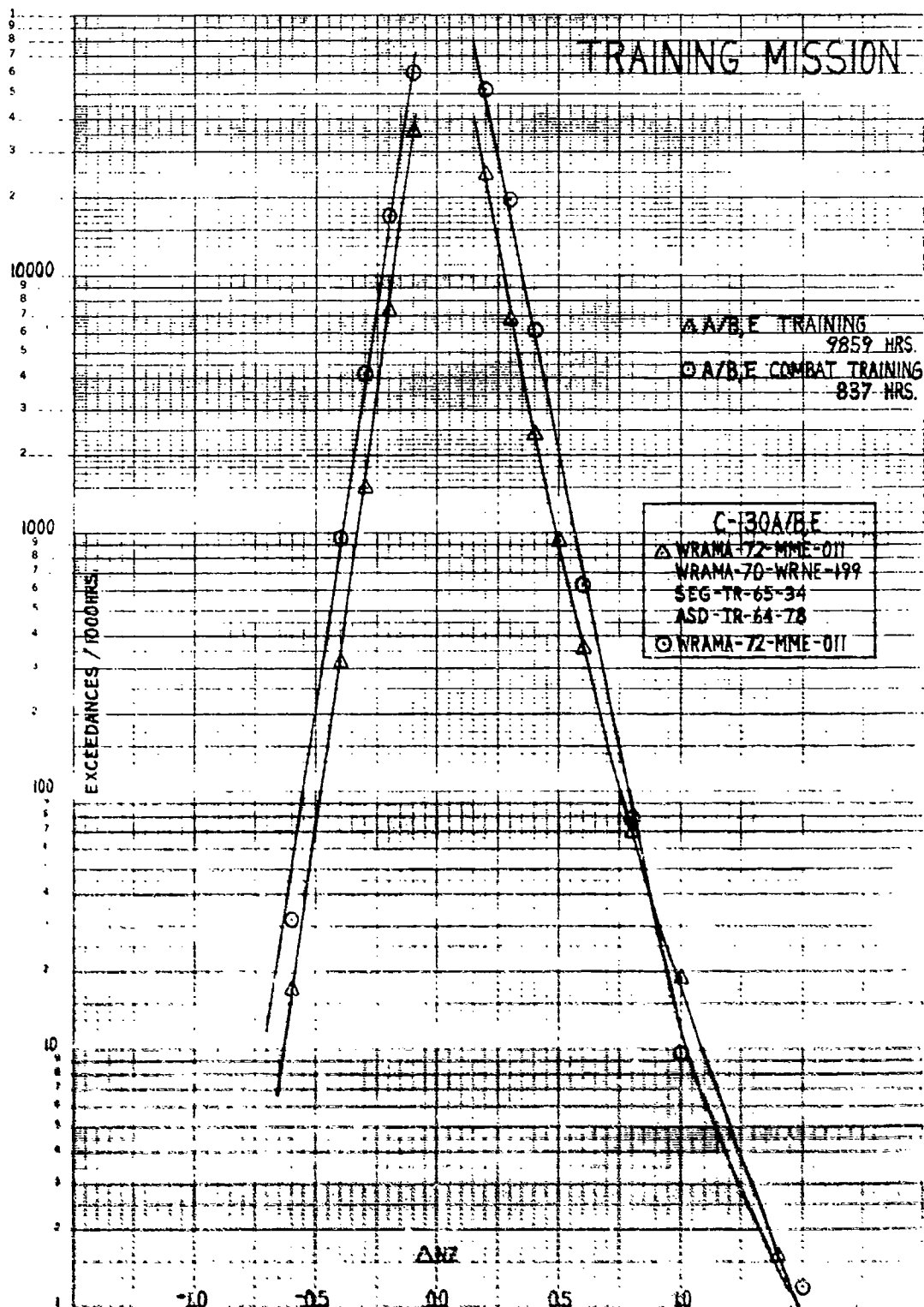


FIGURE 1

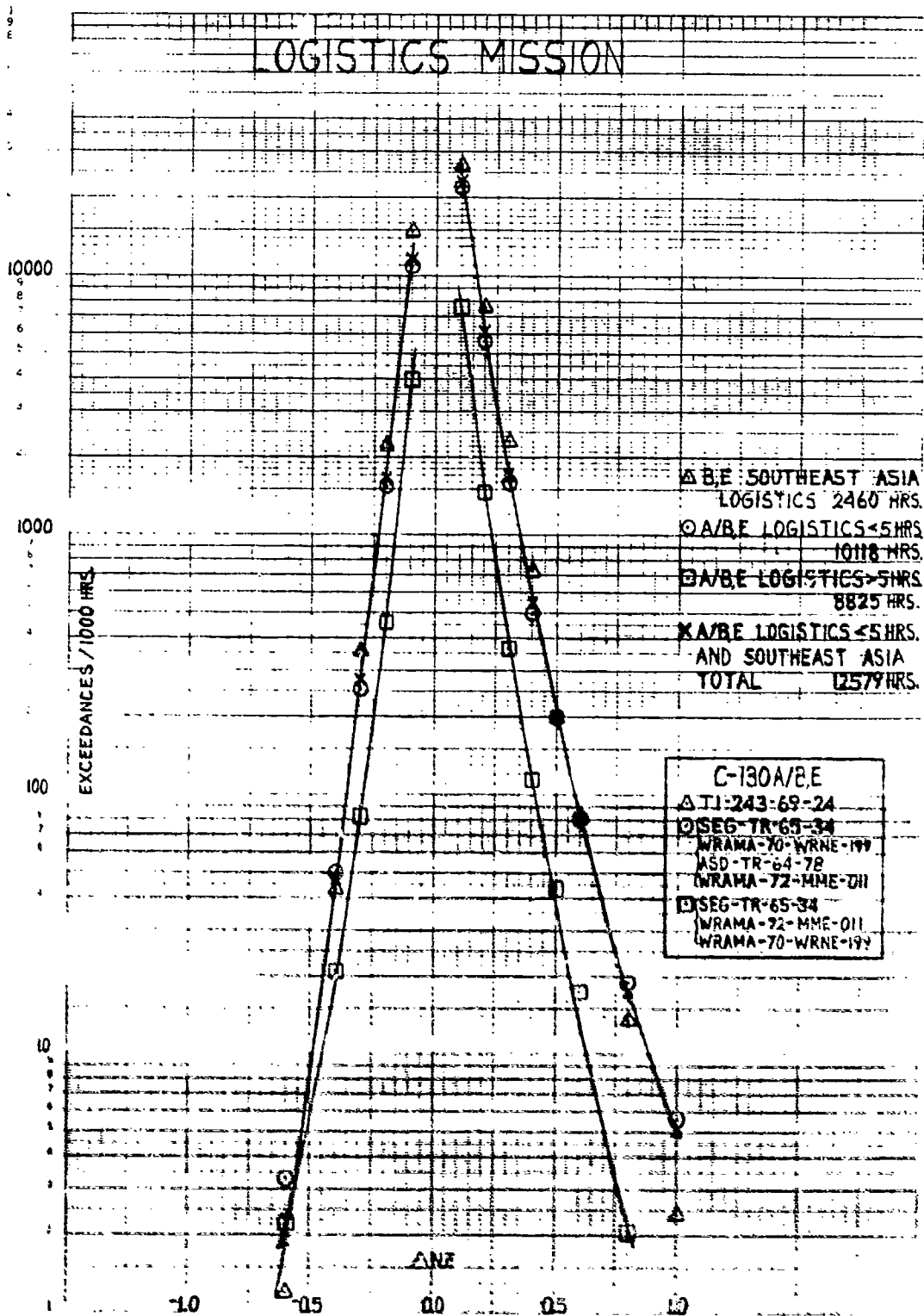


FIGURE 2

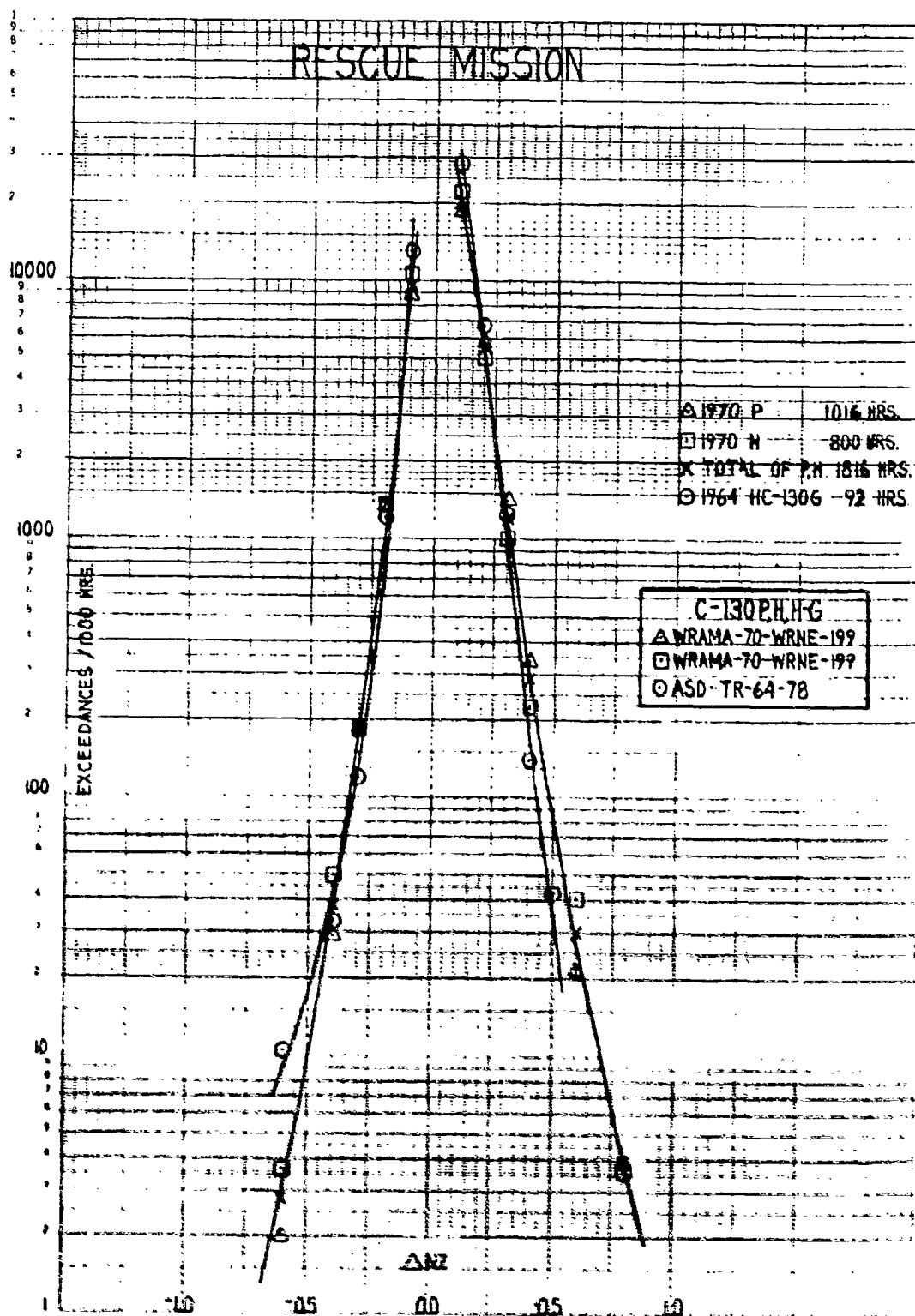


FIGURE 3

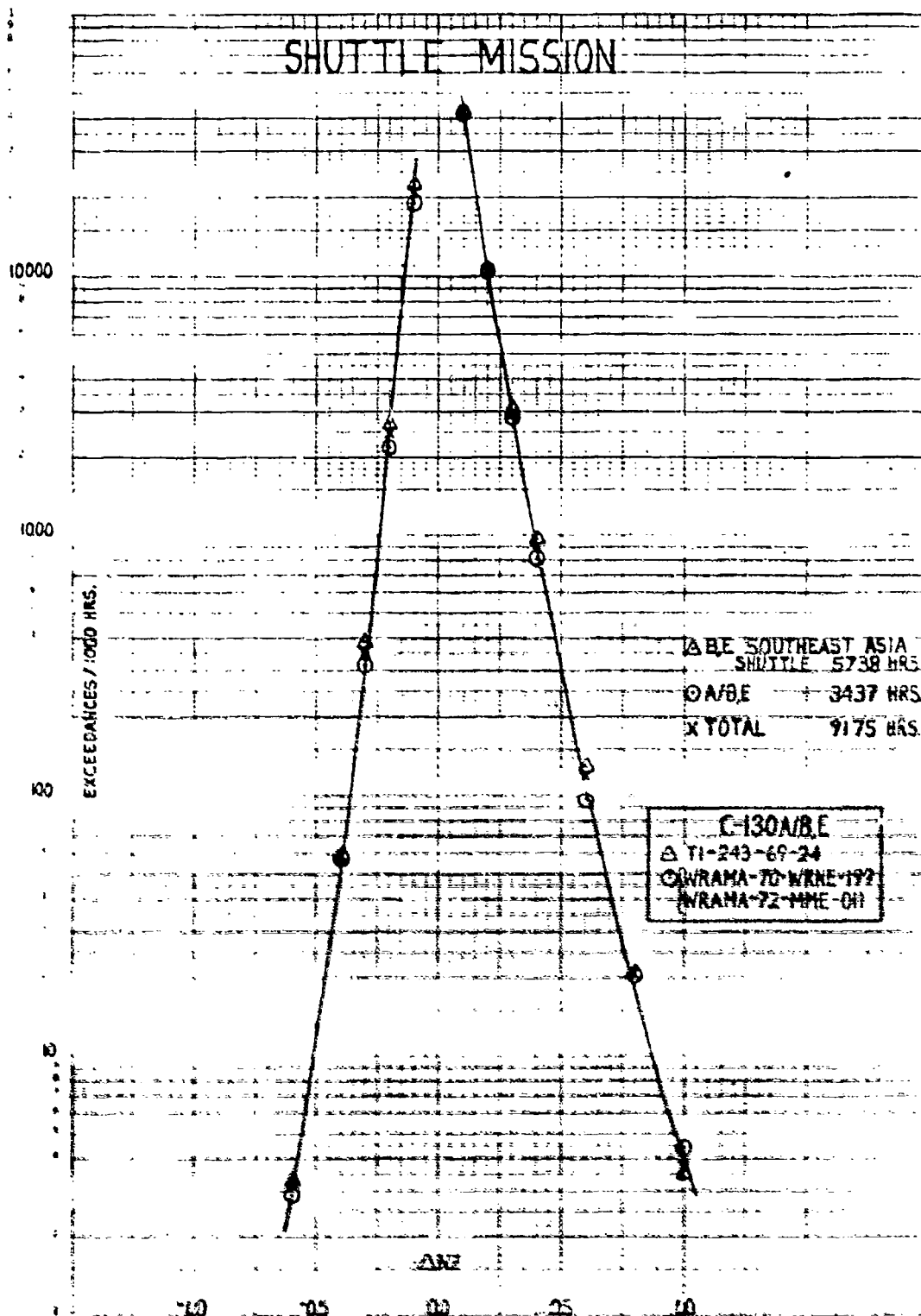


FIGURE 4

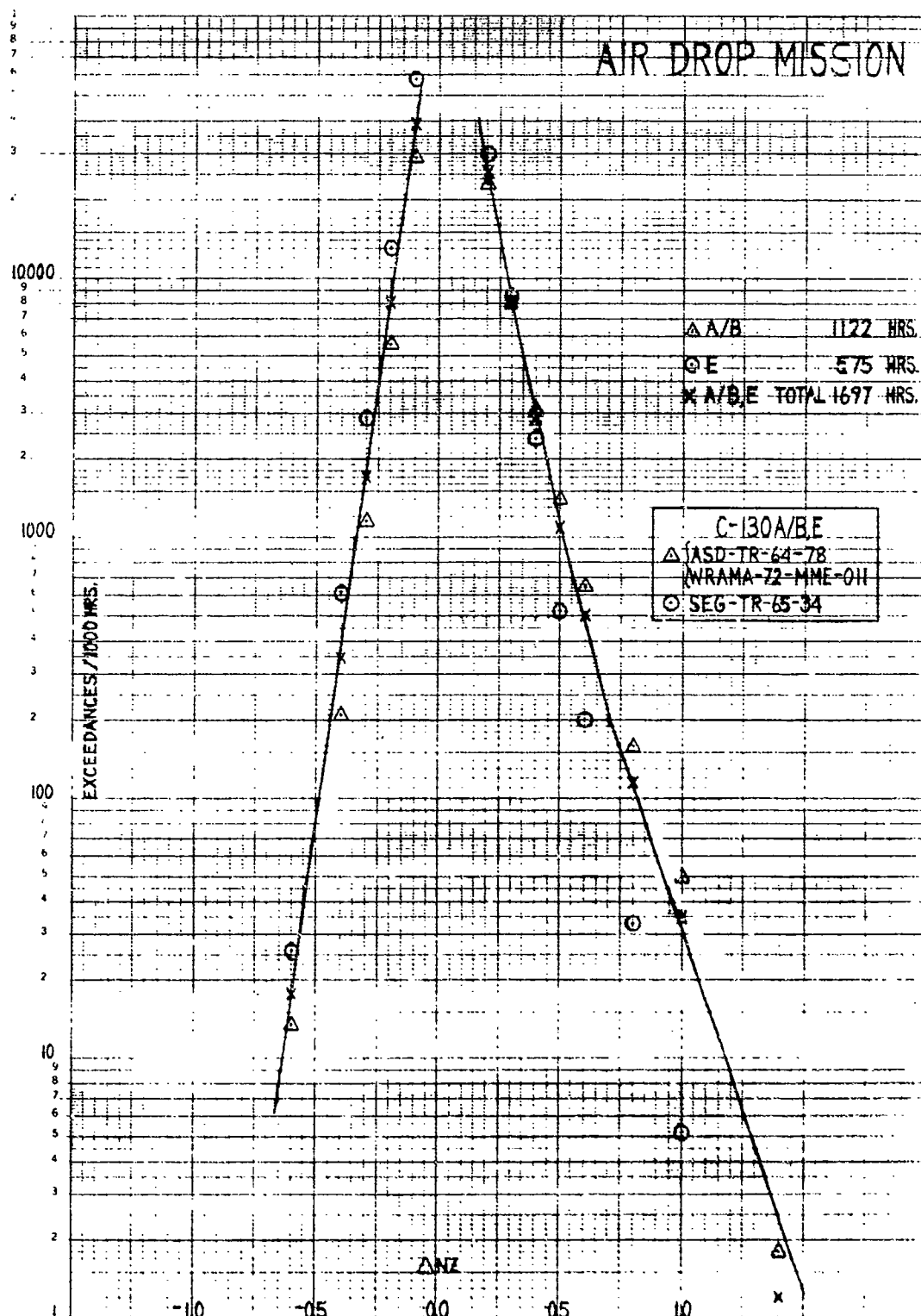


FIGURE 5

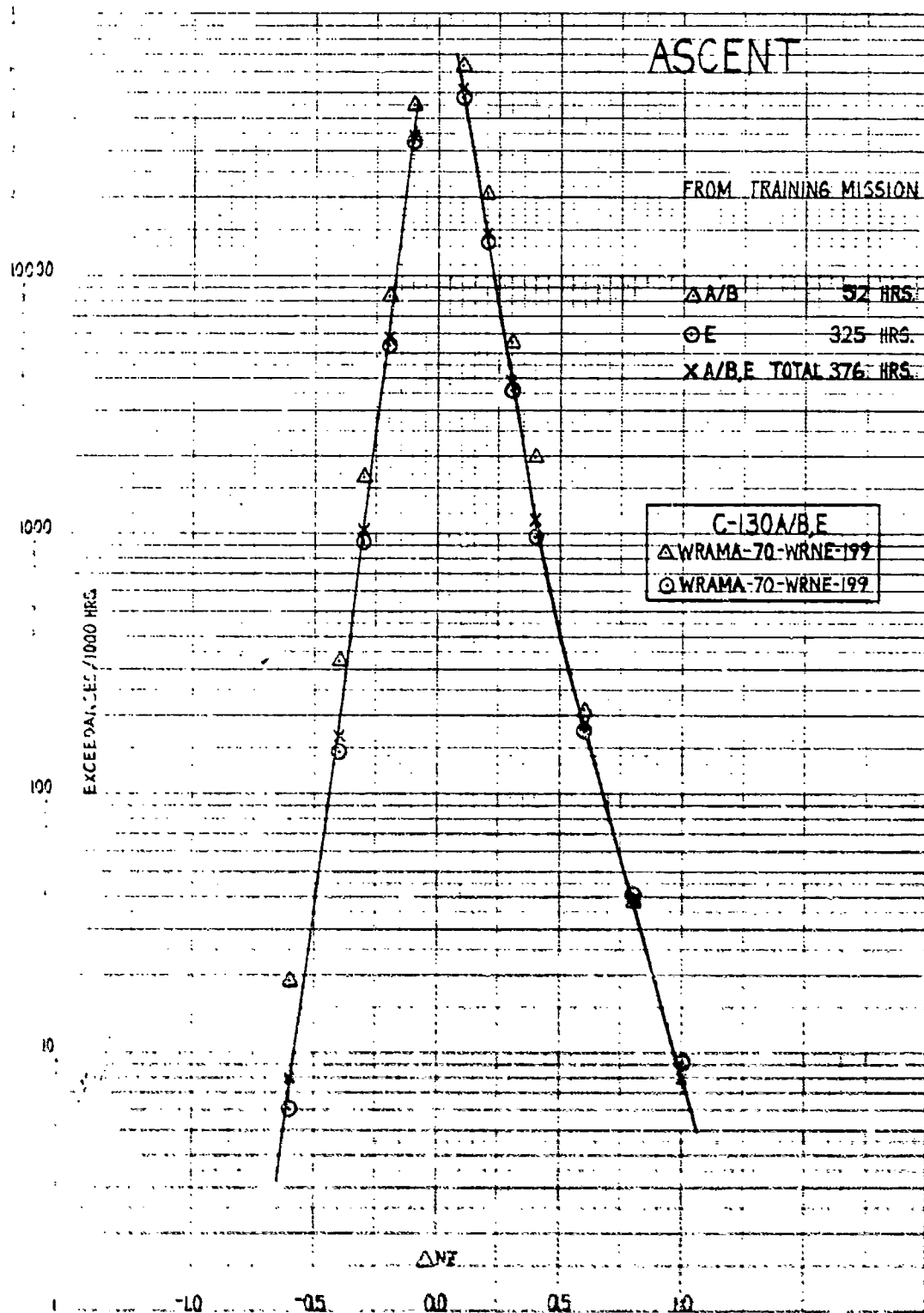


FIGURE 6

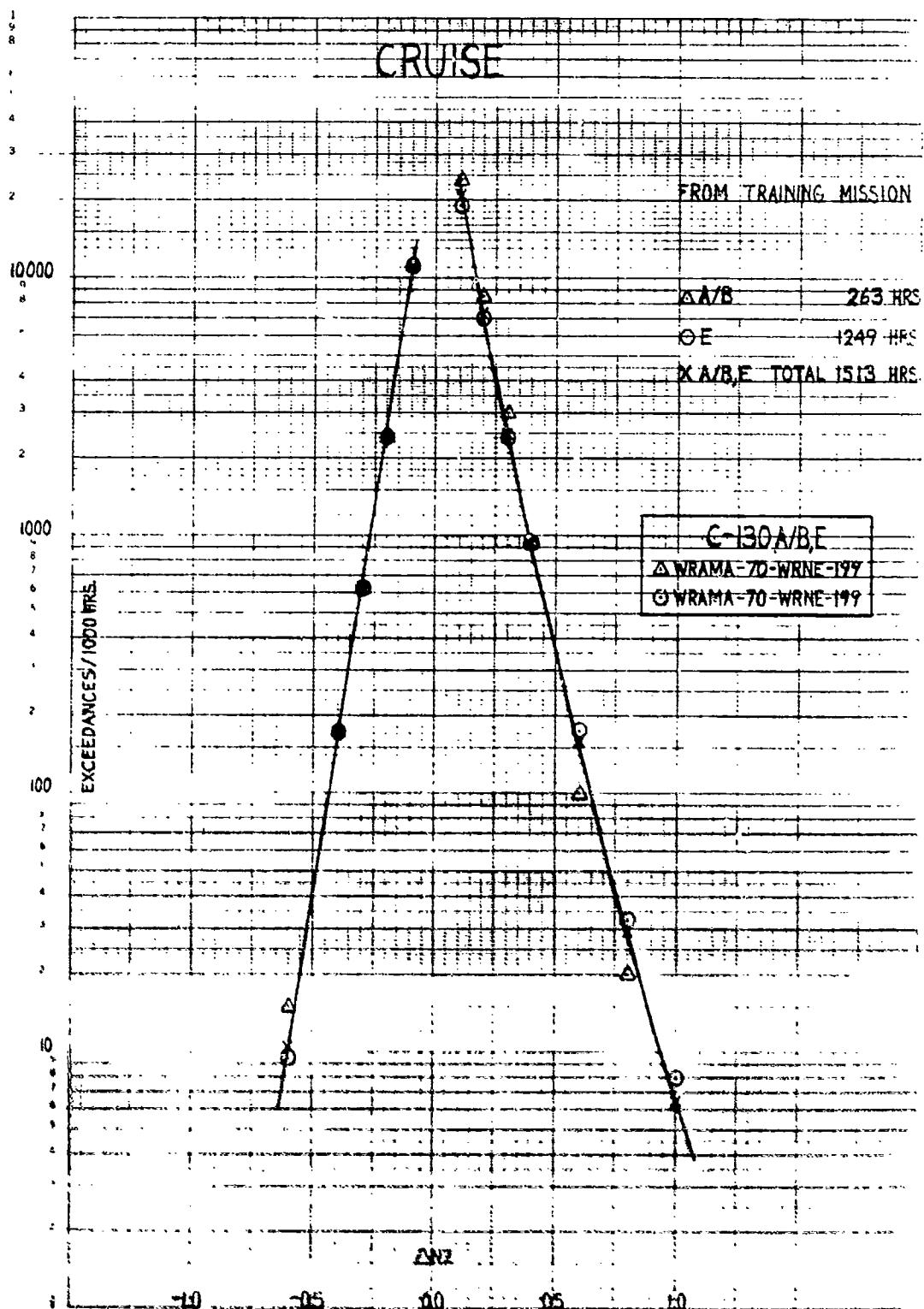


FIGURE 7

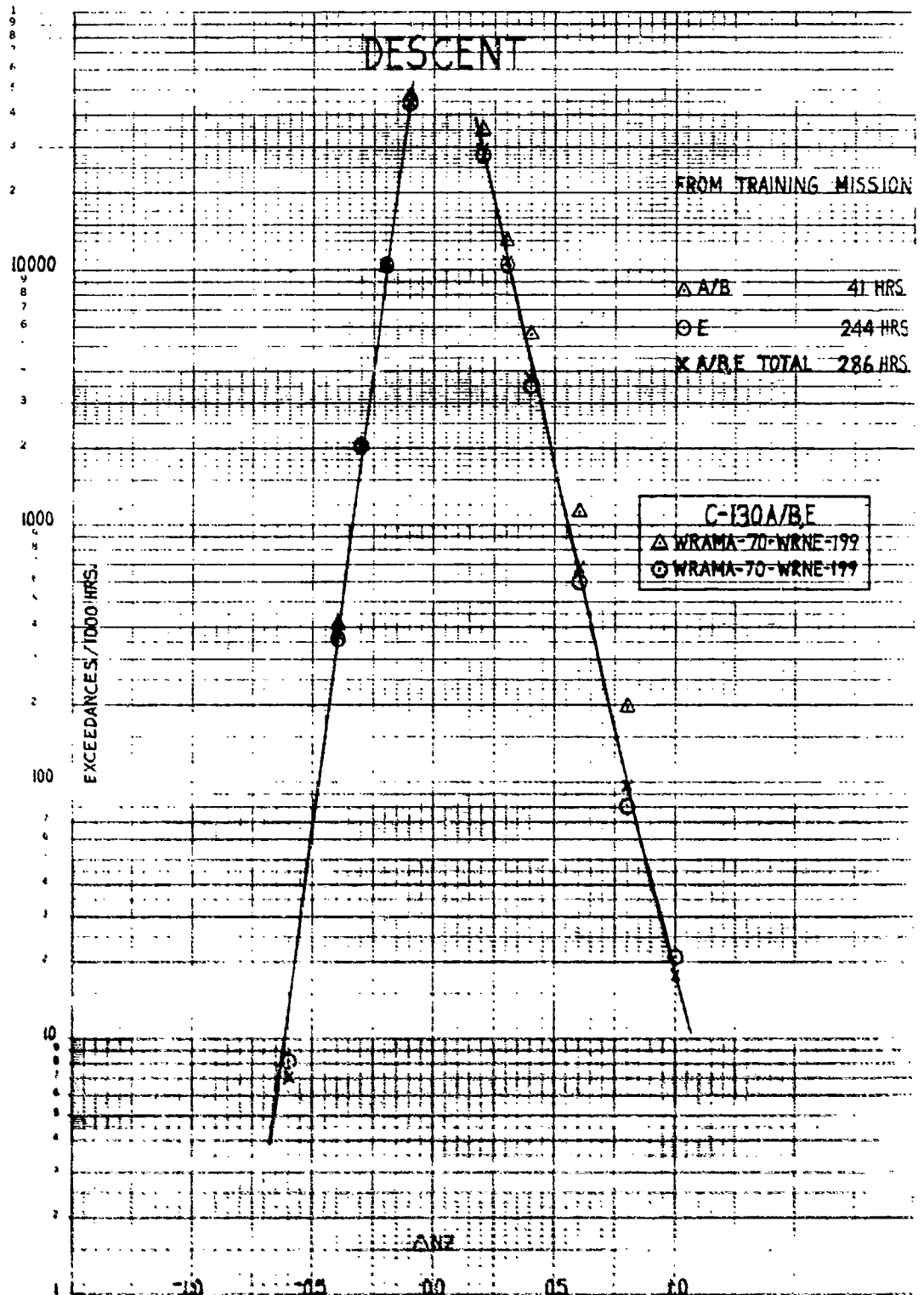


FIGURE 8

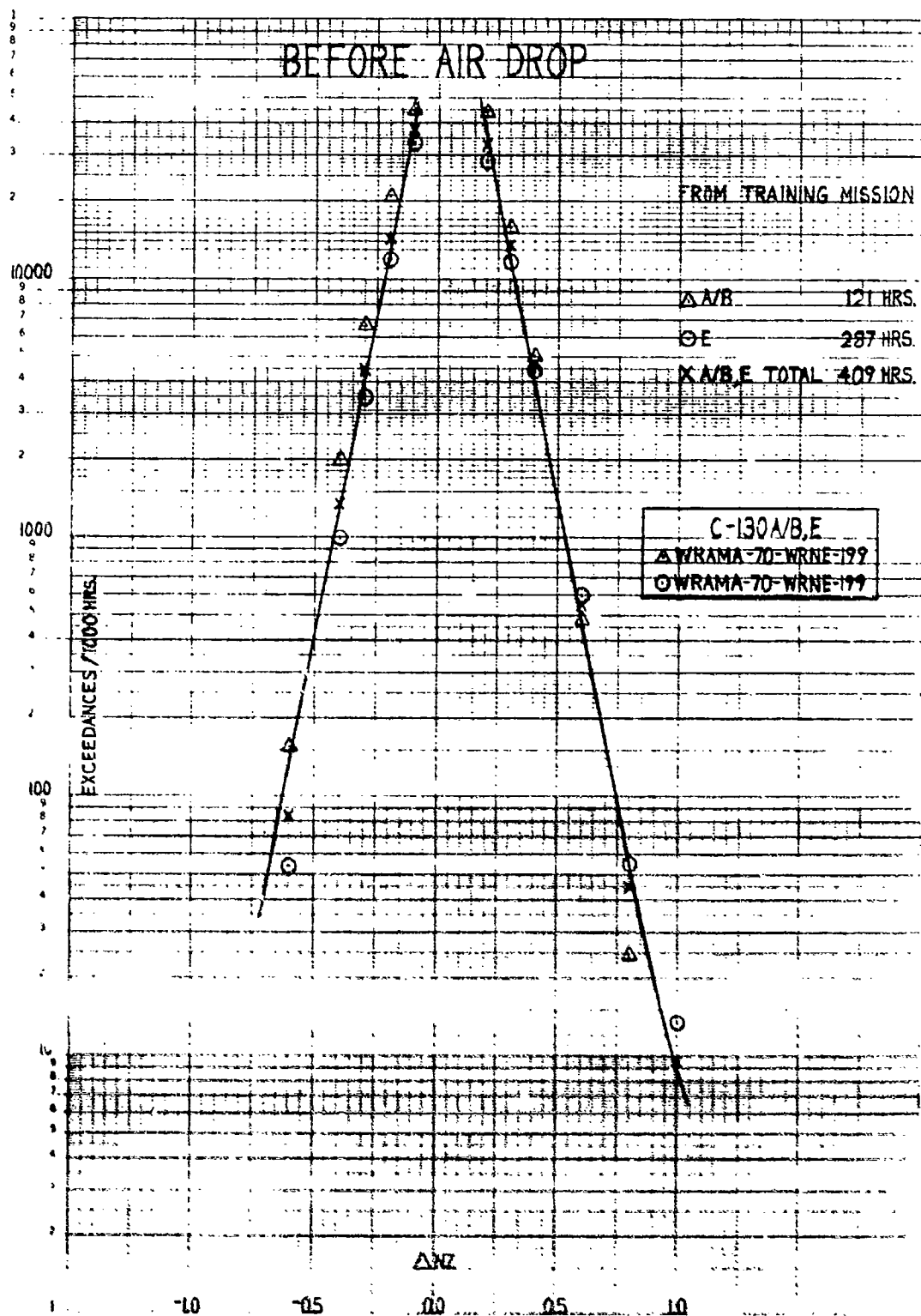


FIGURE 9

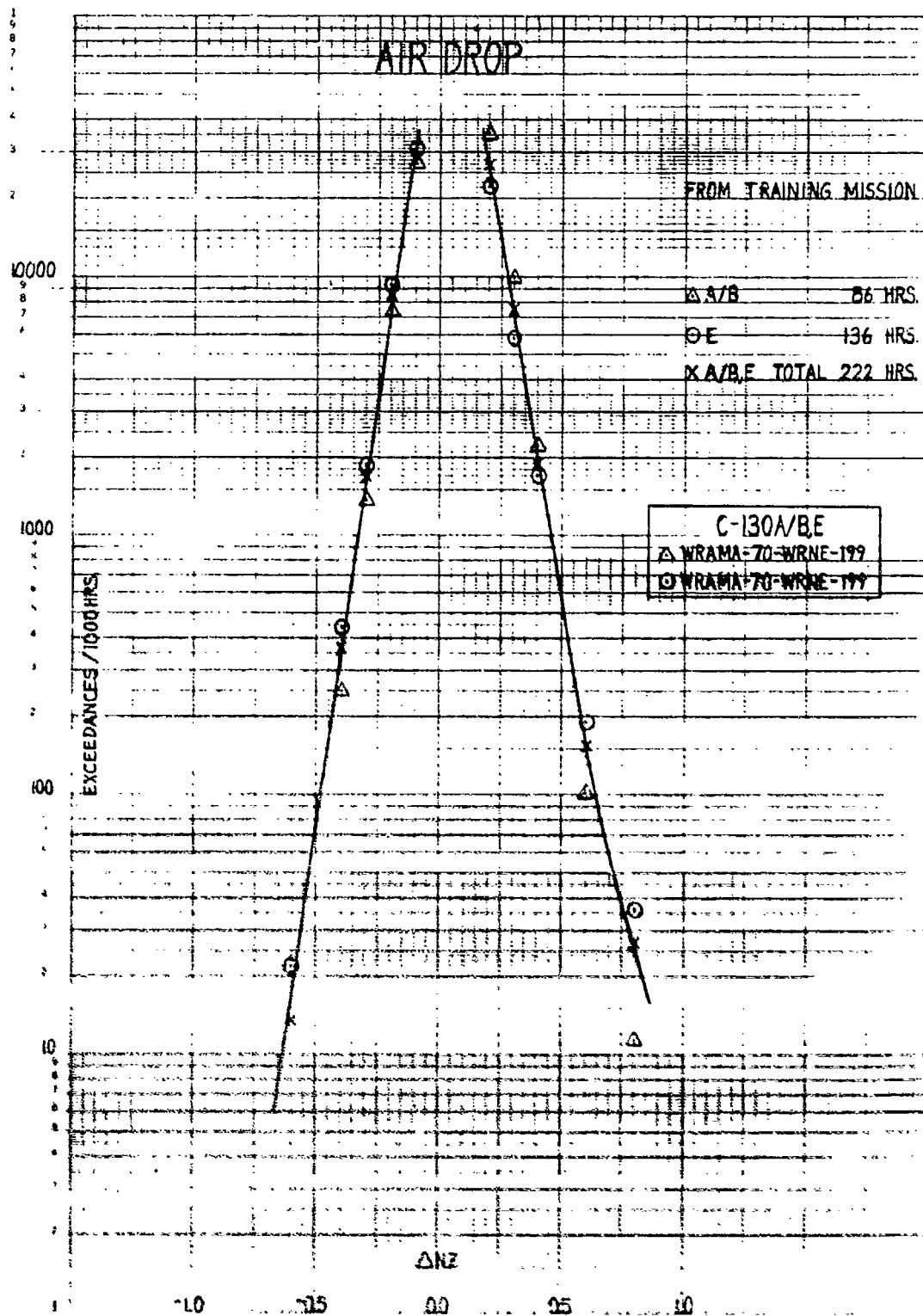


FIGURE 10

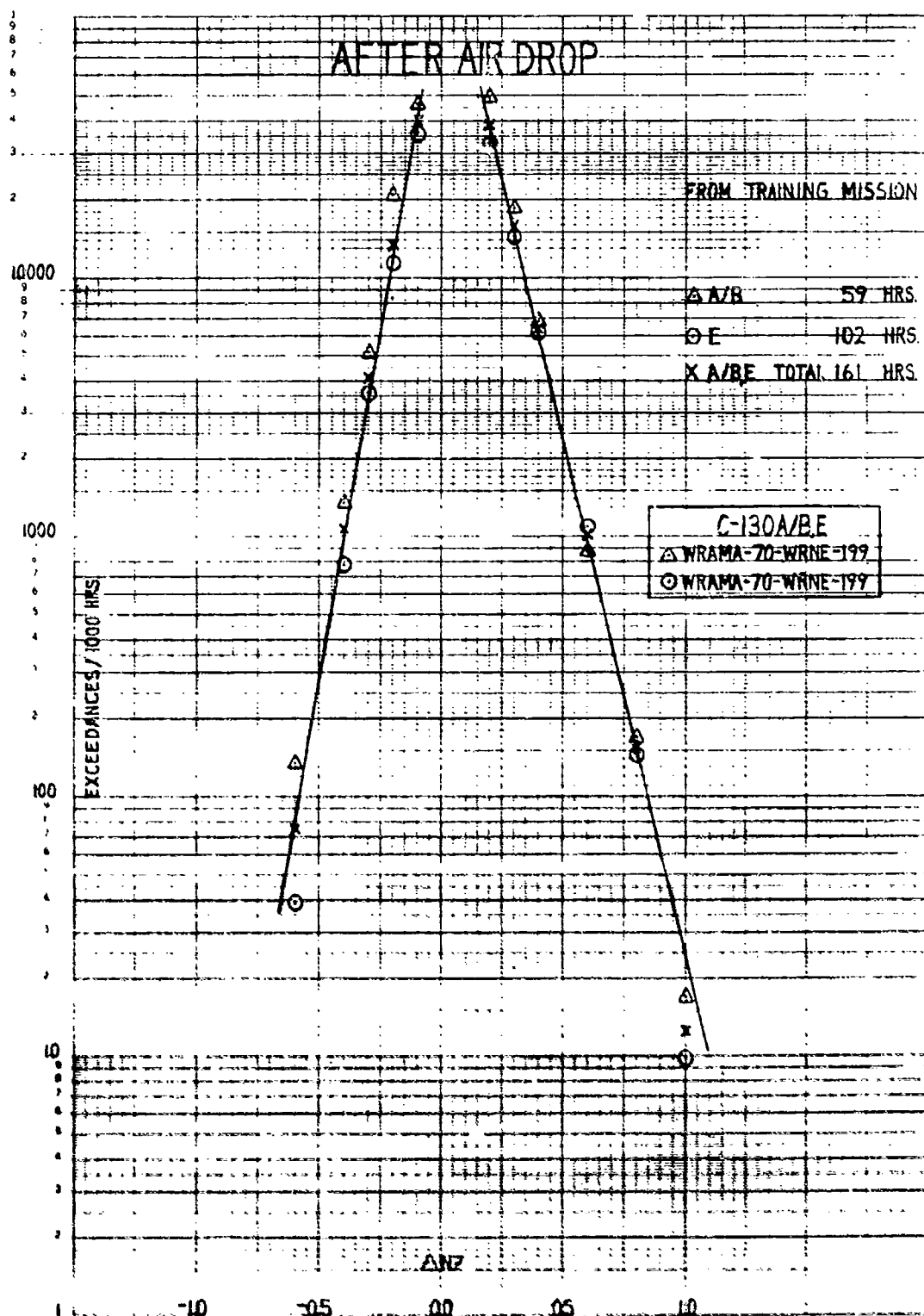


FIGURE 11

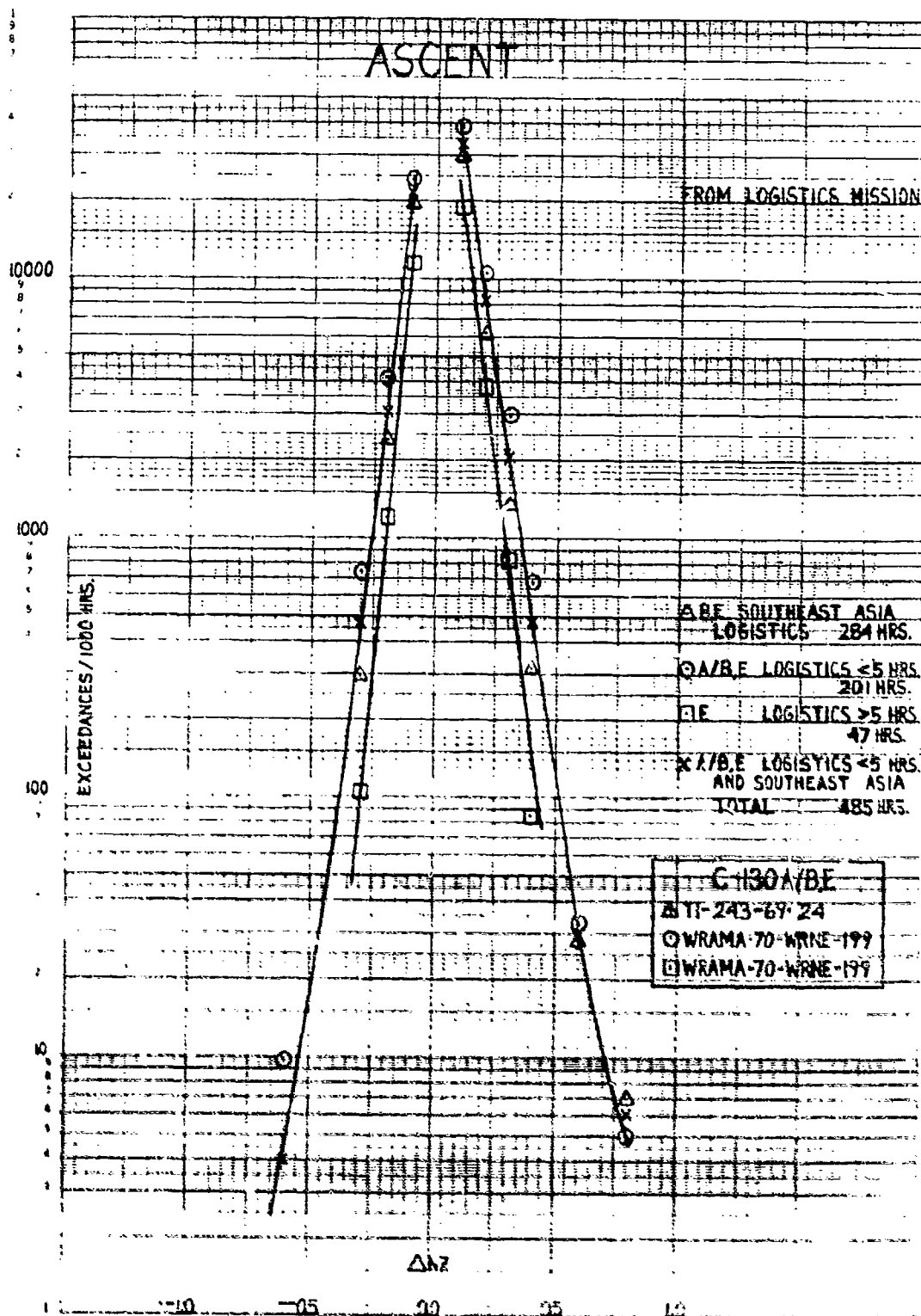


FIGURE 12

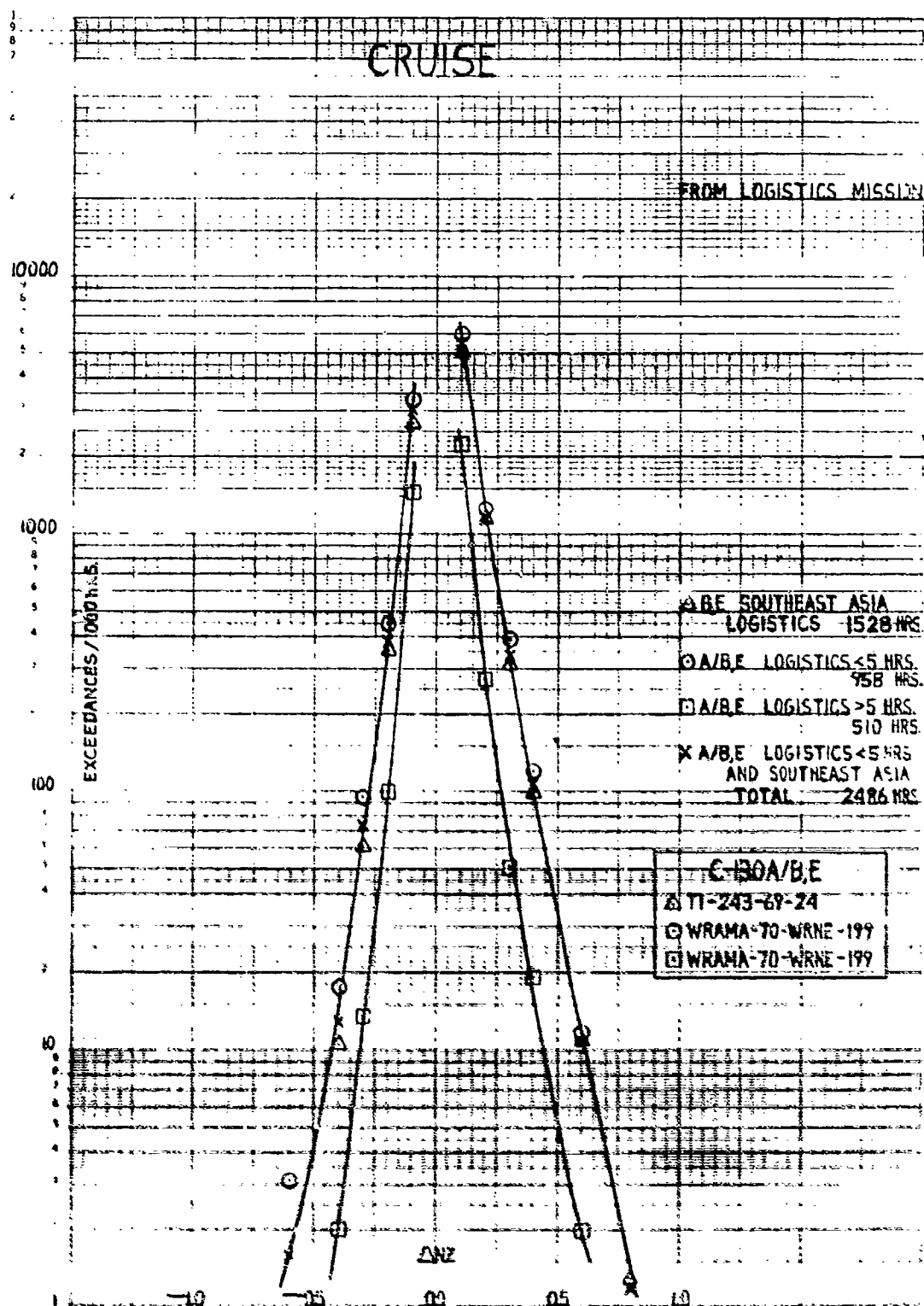


FIGURE 13

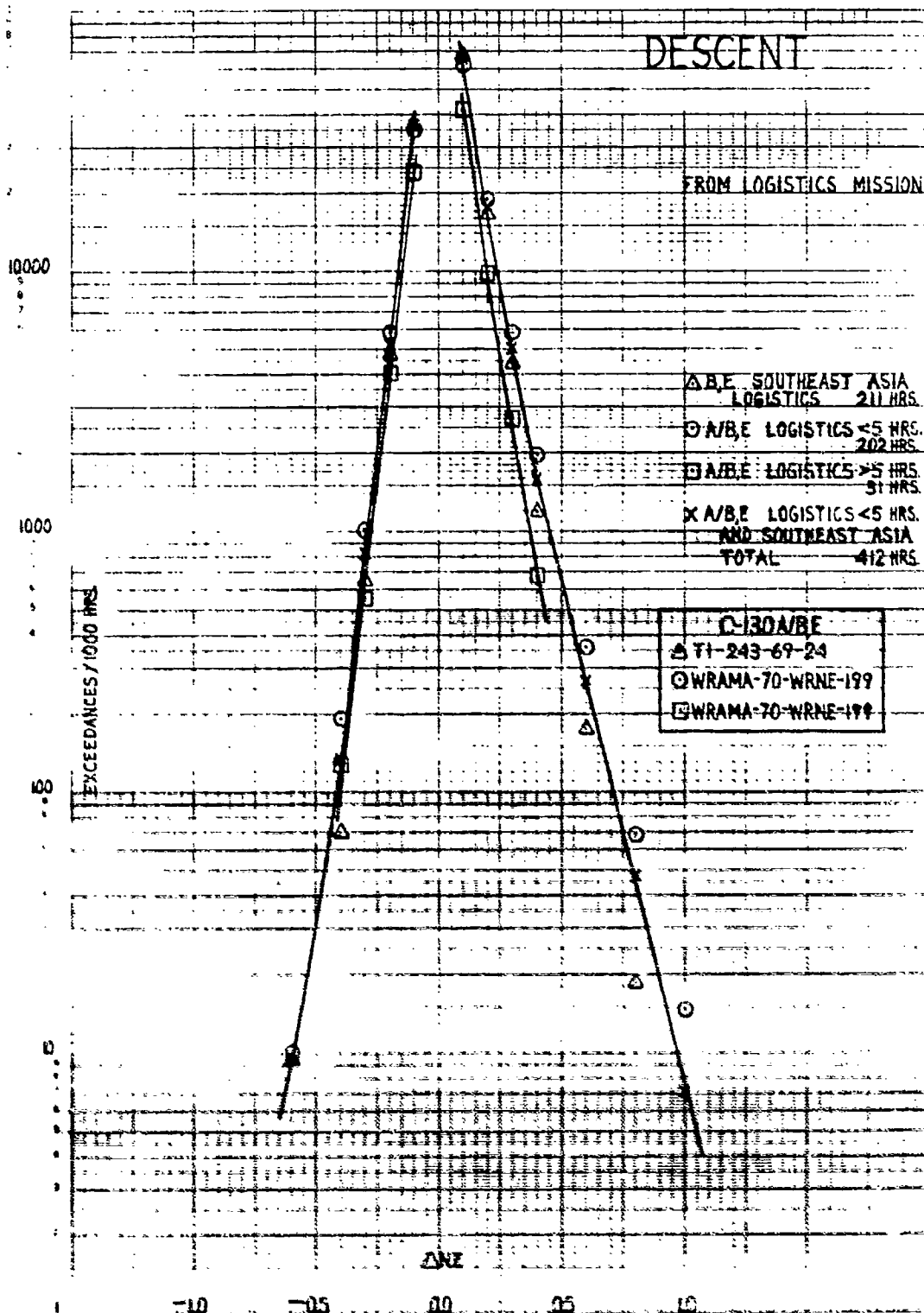


FIGURE 14

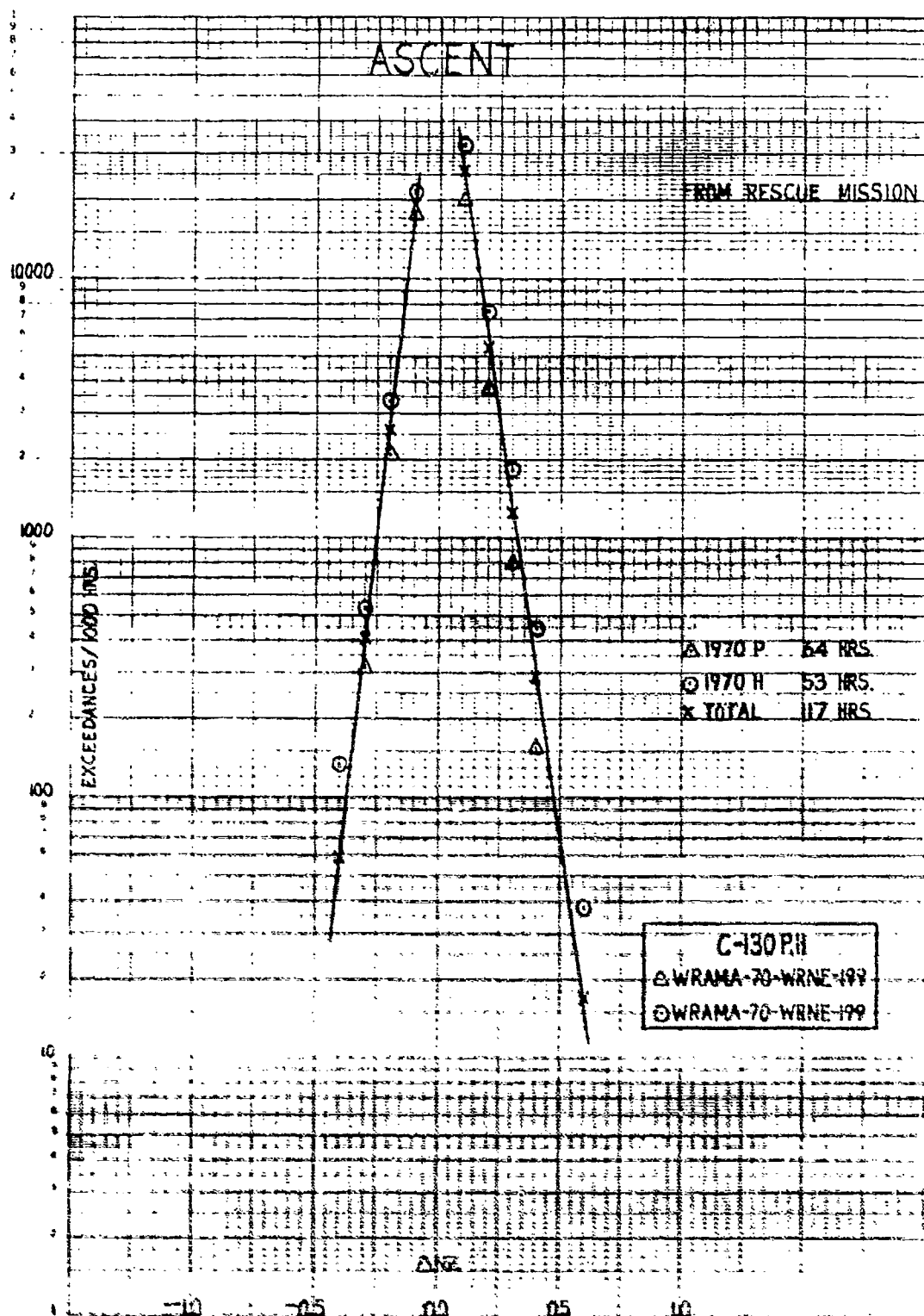


FIGURE 15

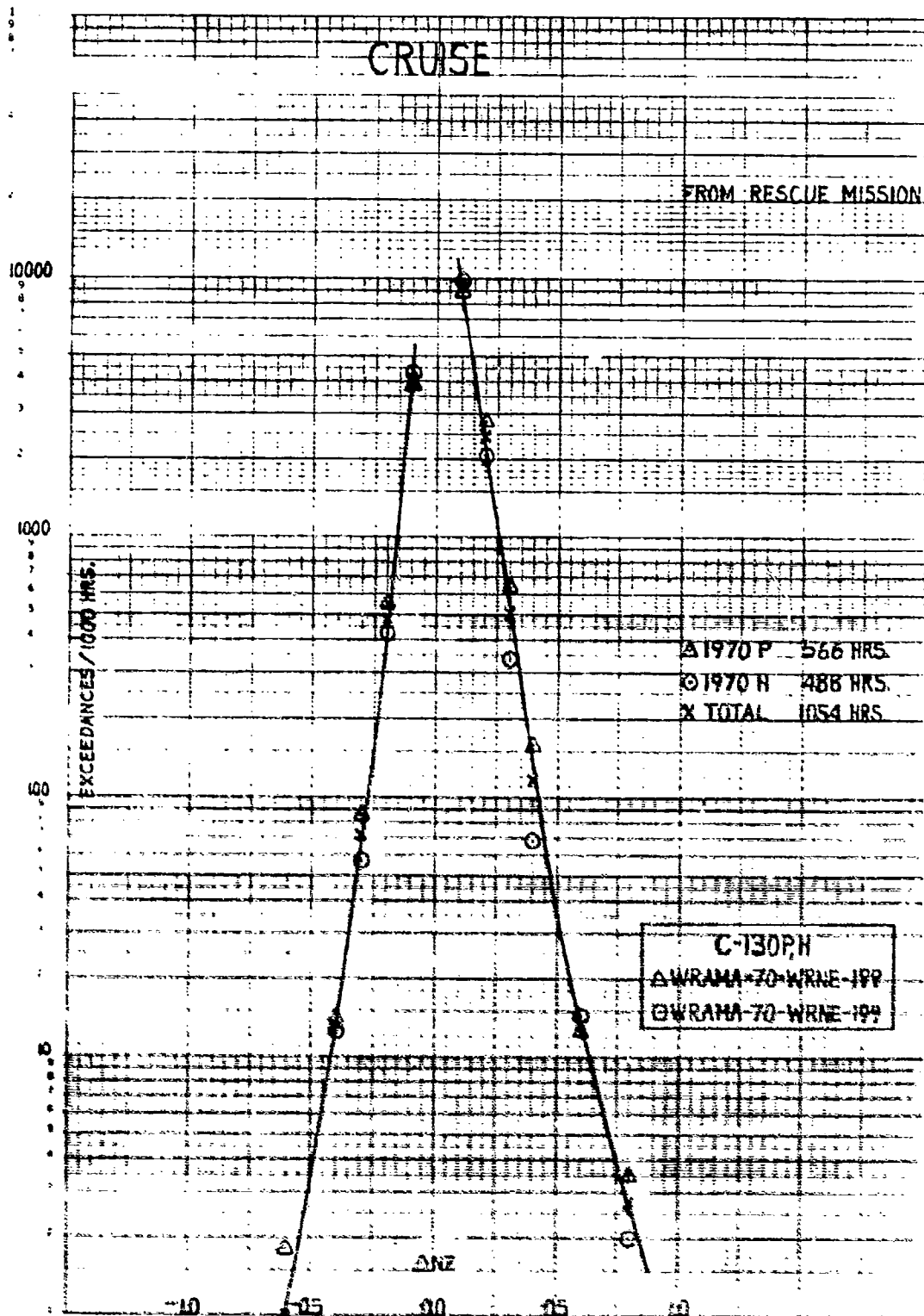


FIGURE 16

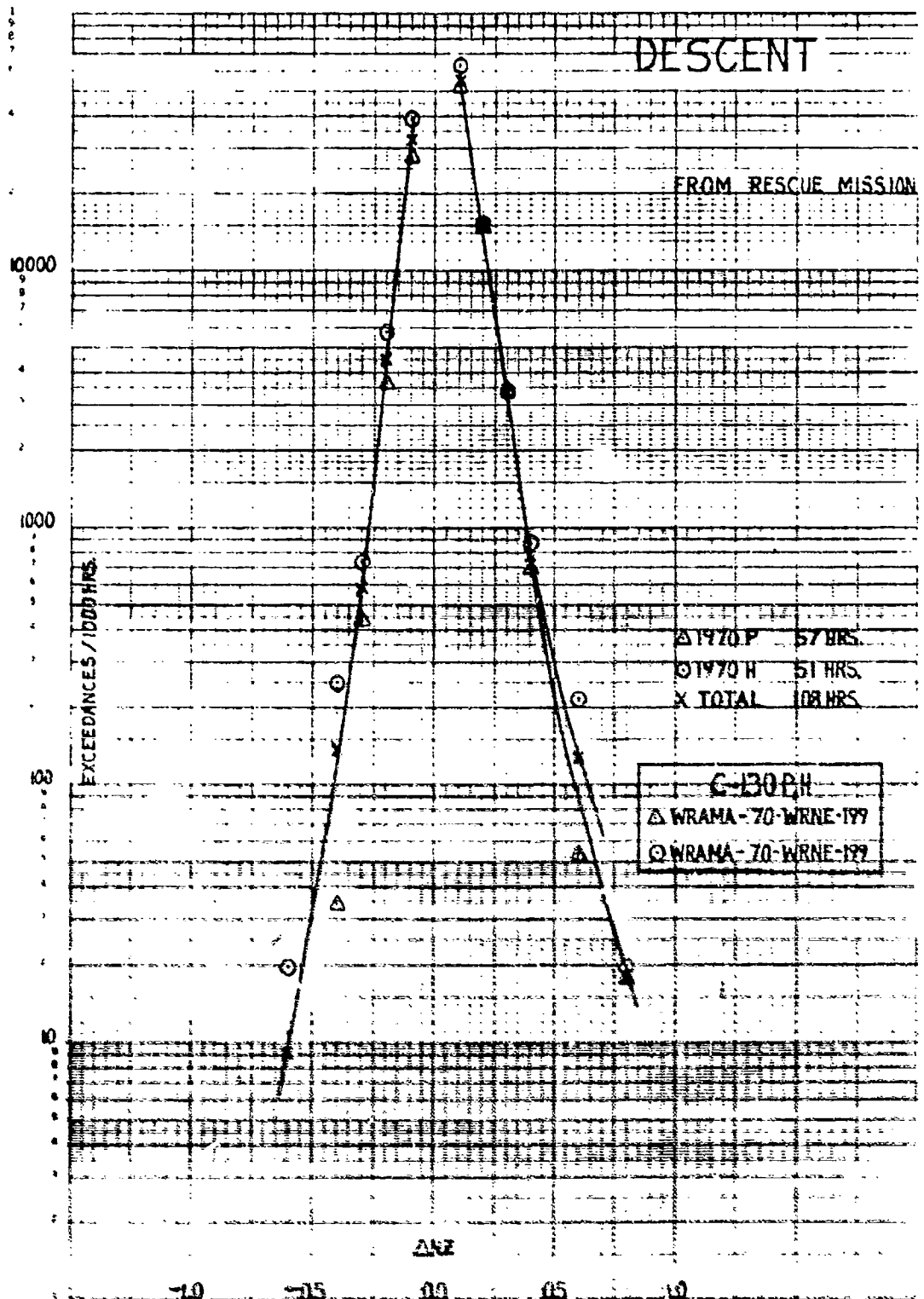


FIGURE 17

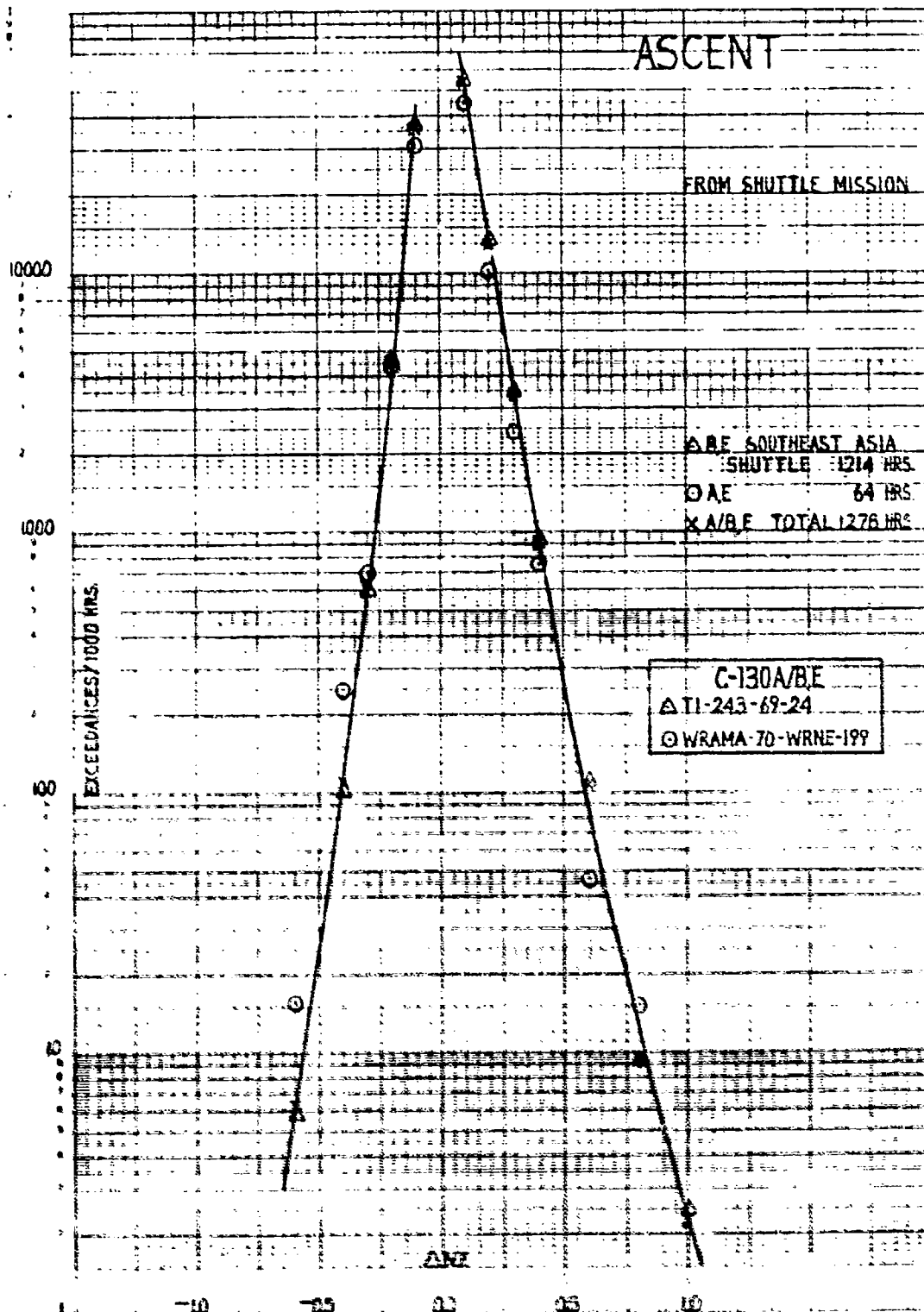


FIGURE 18

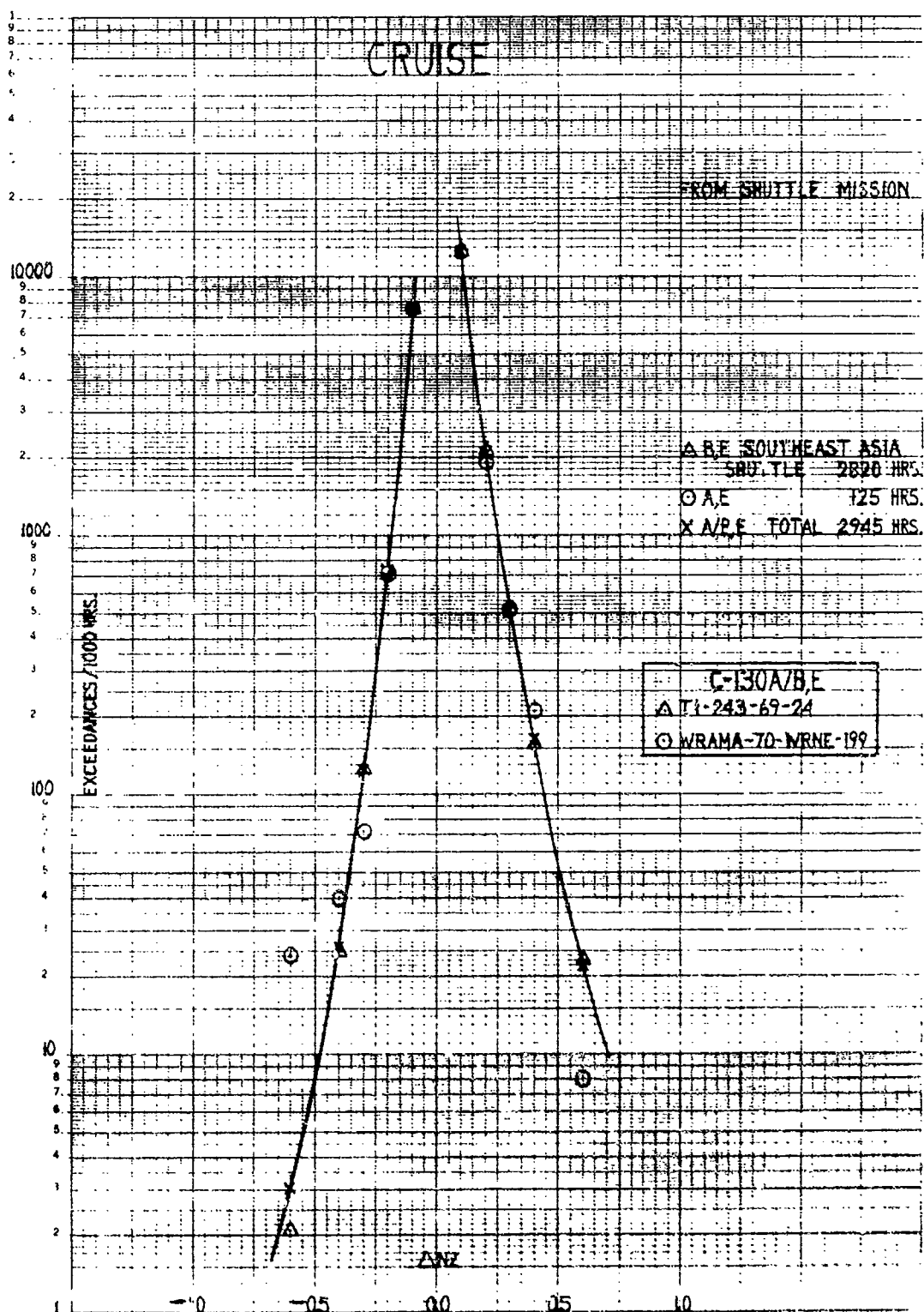


FIGURE 19

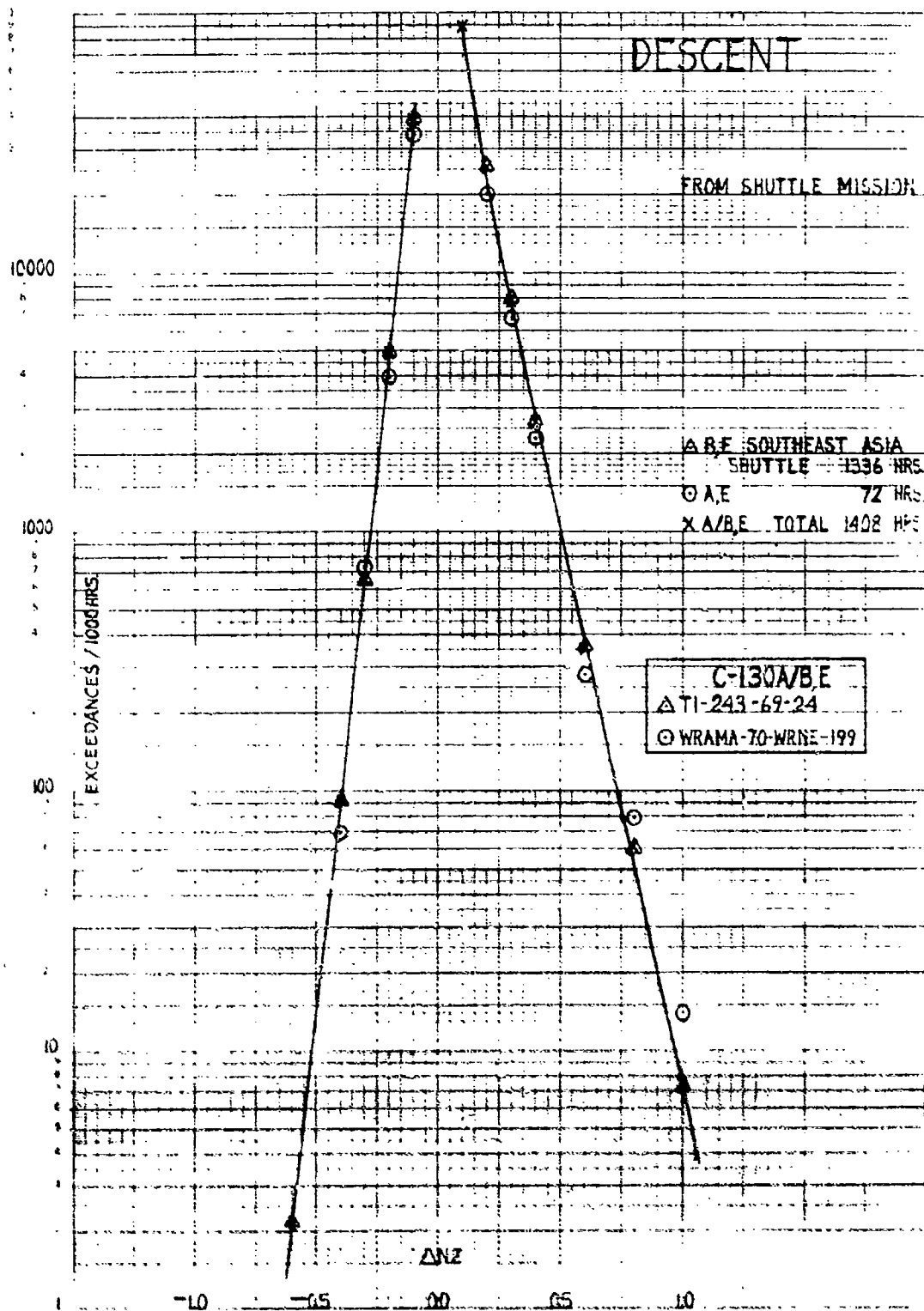


FIGURE 20

TABLE 7

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS MISSION DATA

ΔNZ	TRAINING	LOGISTICS < 4 HRS.	LOGISTICS 4-10 HRS.	LOGISTICS > 10 HRS.	
1.6					
1.4	1.5				
1.2	5.4				
1.0	24				
0.9	50				
0.8	93	1.2	.6		
0.7	255	2.8	1.5	2.4	
0.6	579	11.6	5.2	6.6	
0.5	1520	45	17.0	-26	
0.4	4004	175	66	163	
0.3	13347	891	348	940	
0.2	45545	3354	1725		
-0.2	10537	901	474	317	
-0.3	1965	155	71	51	
-0.4	367	24	13.7	10.6	
-0.5	78	4.3	3.5	3.0	
HOURS:	10767	2319	21612	1845	

REFERENCE: C-141A, (WRAMA-70-WRNE-282), (ASD-TR-69-10), (ASD-TR-67-1)

HOURS REFERS TO AMOUNT OF RECORDED DATA

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS			LOGISTICS MISSION PHASE DATA			
ΔNZ	LOGISTICS <4 HRS ASCENT	LOGISTICS <4 HRS CRUISE	LOGISTICS <4 HRS DESCENT	LOGISTICS 4-10 HRS ASCENT	LOGISTICS 4-10 HRS CRUISE	LOGISTICS 4-10 HRS DESCENT
1.6	7.6		3.6	1.9	.2	
1.4	12.4		7.8	6.2	.8	
1.2	27	7.9	21.7	20.9	3.0	10.1
1.0		23	105	62	7.2	51
0.9		83	485	277	25	311
0.8		373	2485	1555	127	1732
0.7		1402	9276	7342	635	7518
0.6						
0.5						
0.4						
0.3						
0.2						
-0.2	2740	384	2477	1951	164	2140
-0.3	436	81	359	267	27	288
-0.4	76	12.9	47	42	5.6	38
-0.5	19.0	2.8		11.4	1.3	6.3
-0.6						
HOURS:	264	1779	276	1051	13347	794

TABLE 9

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS TRAINING MISSION PHASE DATA

Δ NZ	ASCENT	CRUISE	DESCENT		
1.6			6.4		
1.4	1.9		15.5		
1.2	5.6		39		
1.0	18.5	5.6	104		
0.9	37	17.5	180		
0.8	90	42	287		
0.7	194	158	479		
0.6	521	609	793		
0.5	1500	1400	1500		
0.4	4444	4489	3551		
0.3	18294	13934	11849		
0.2	62836	43302	37499		
-0.2	23840	7167	9646		
-0.3	5325	1229	1878		
-0.4	1089	198	404		
-0.5	227	32	98		
-0.6					
HOURS:	866	3400	1501		

REFERENCE: C-141A, (WRAMA-70-WRNE-282), (ASD-TR-69-10)

HOURS REFERS TO AMOUNT OF RECORDED DATA

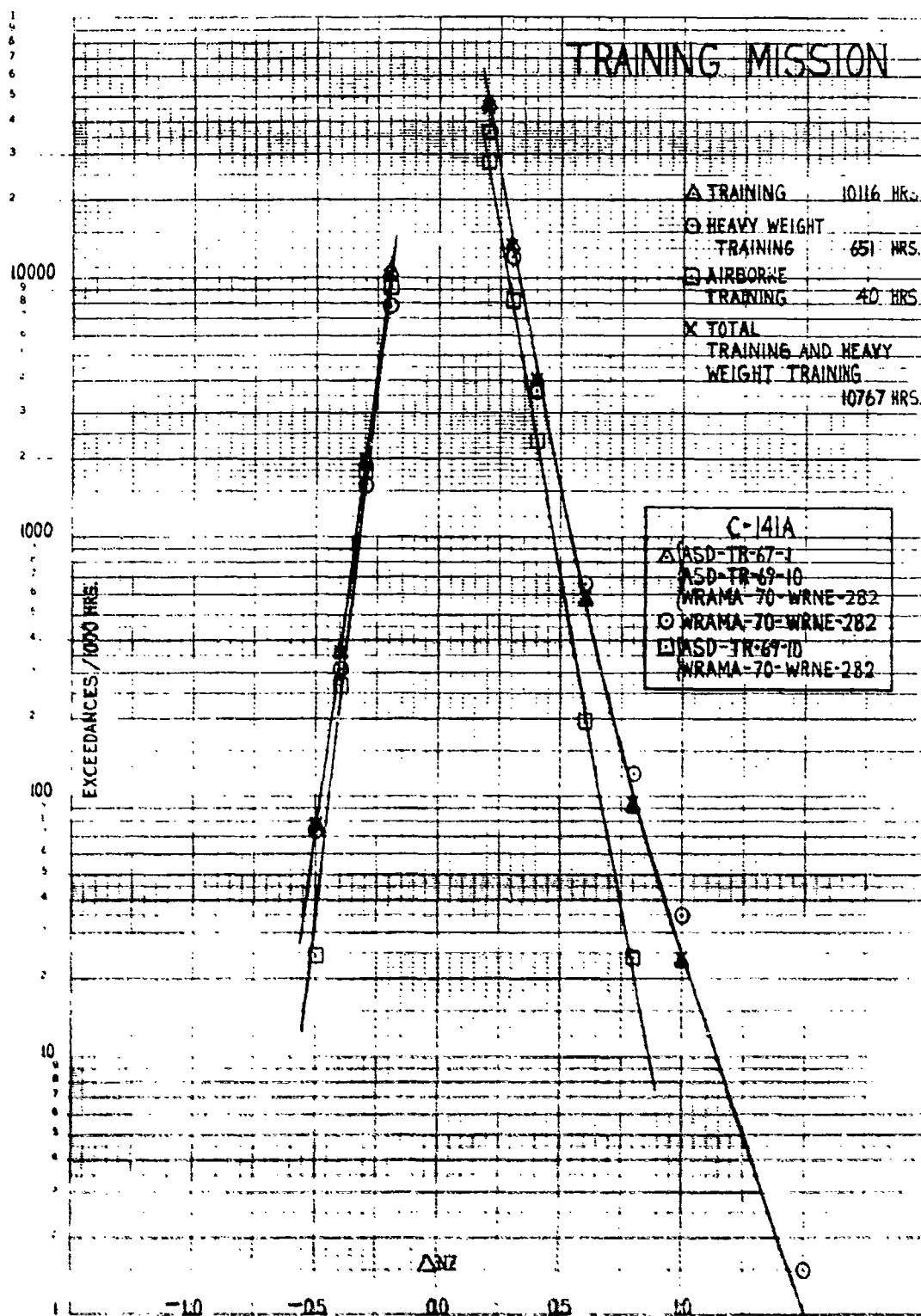


FIGURE 21

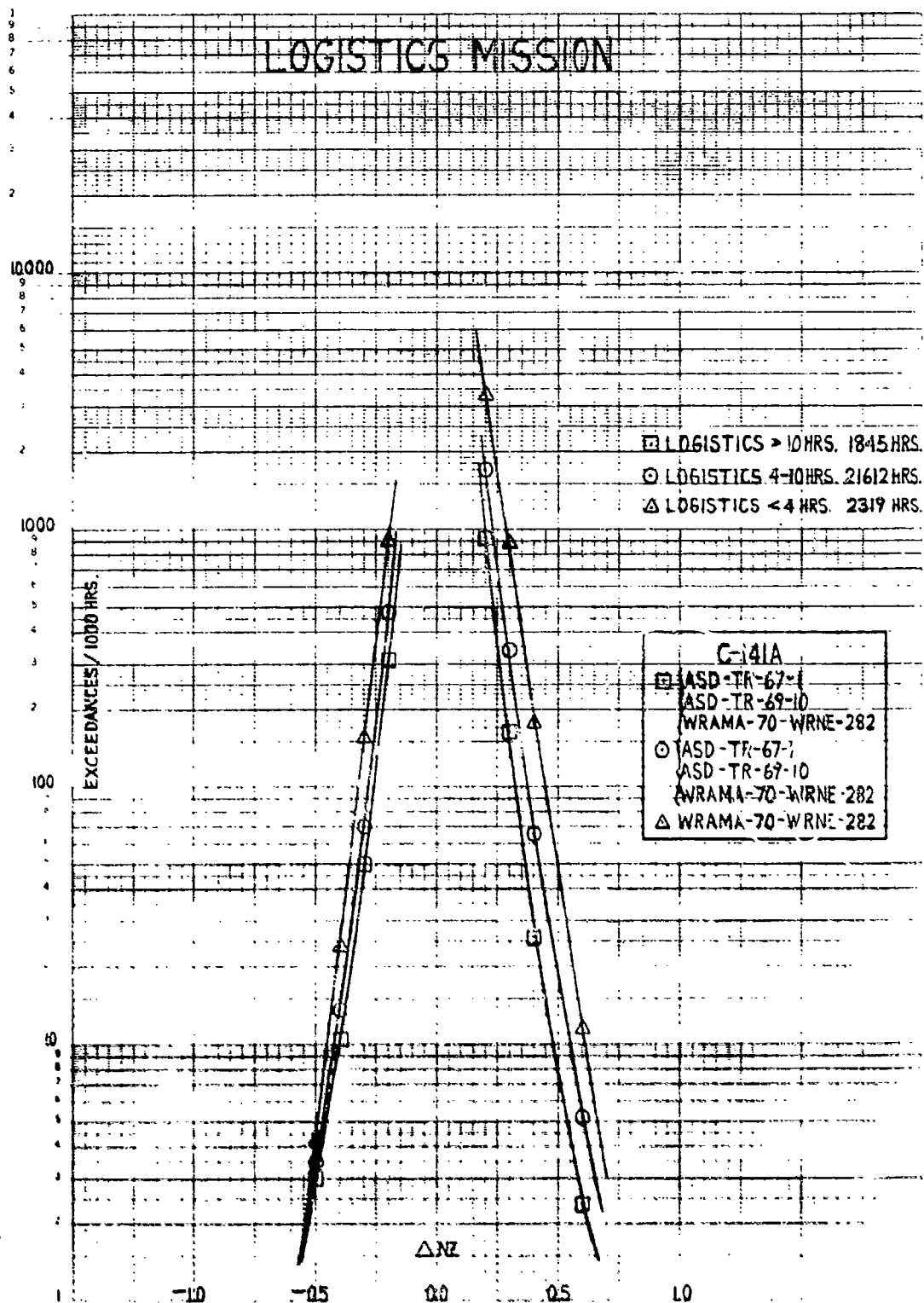


FIGURE 22

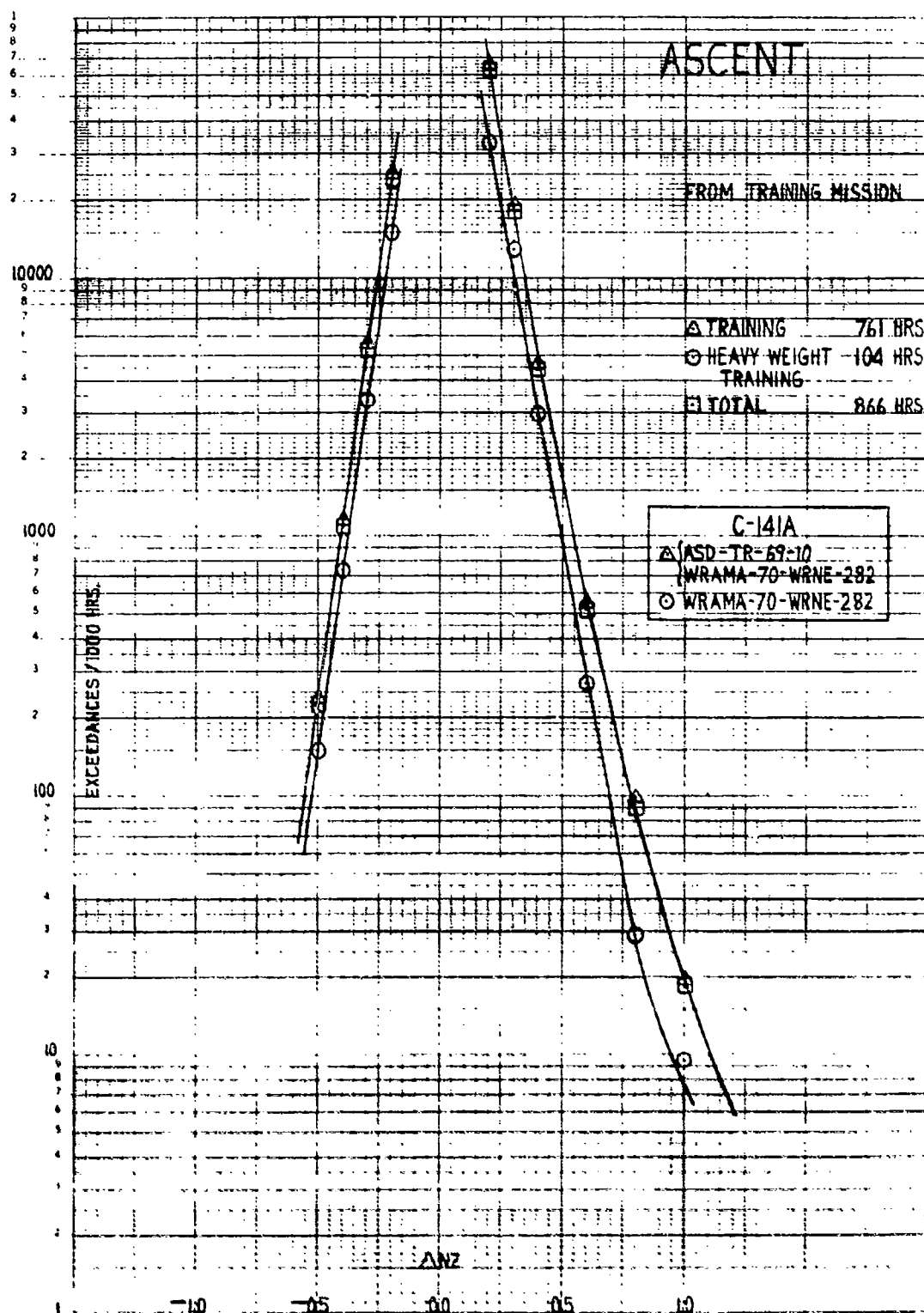


FIGURE 23

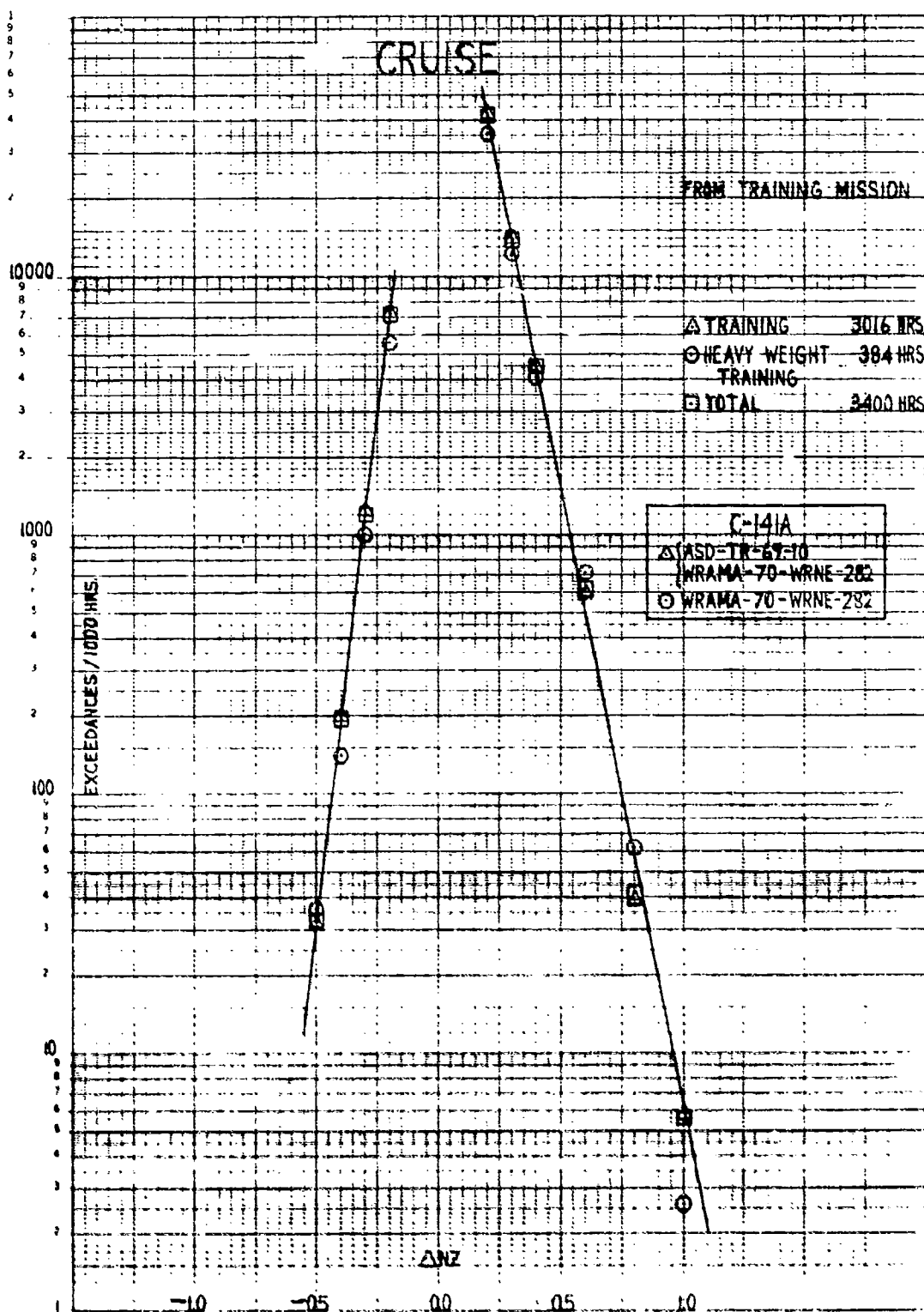


FIGURE 24

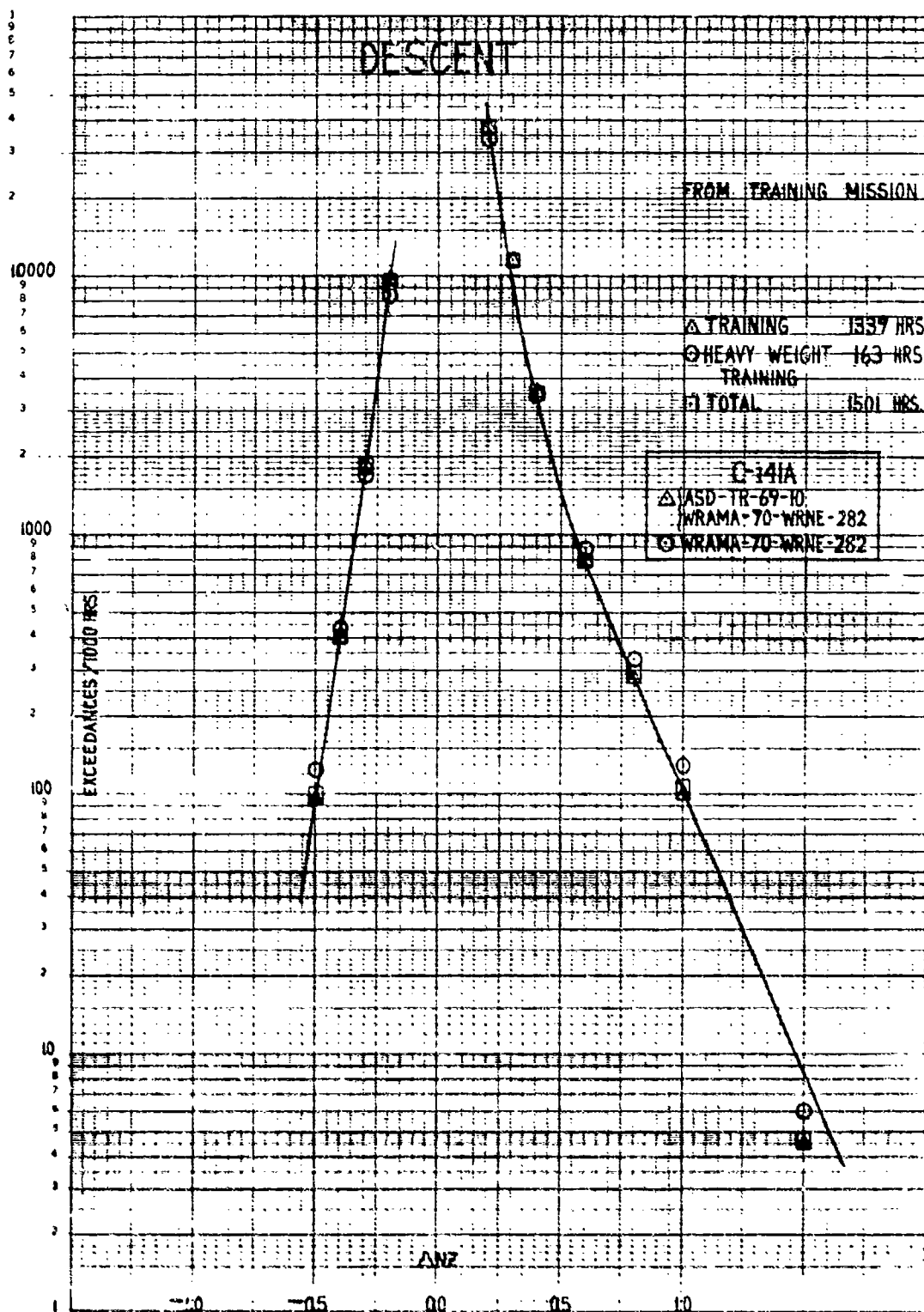


FIGURE 25

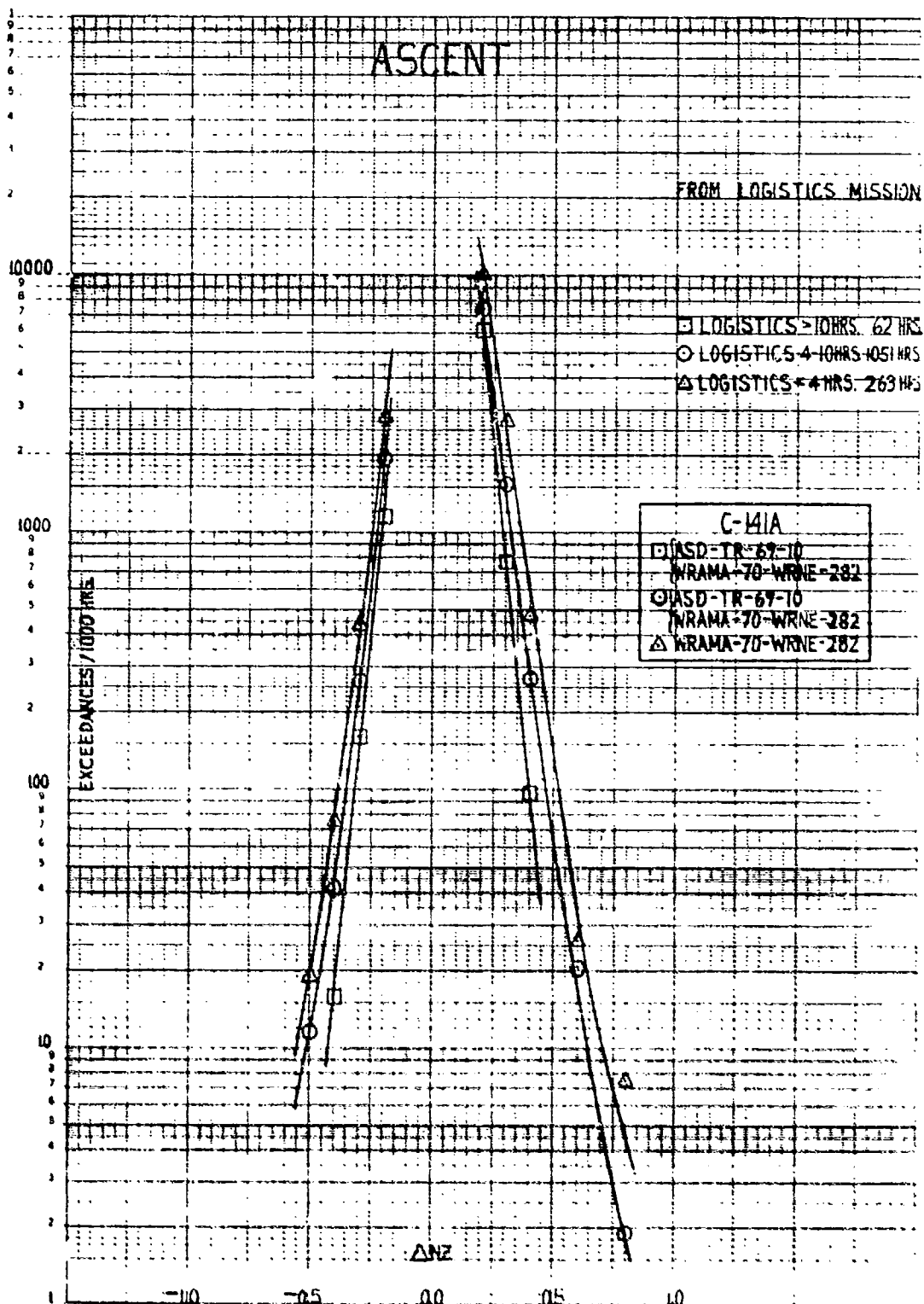


FIGURE 26

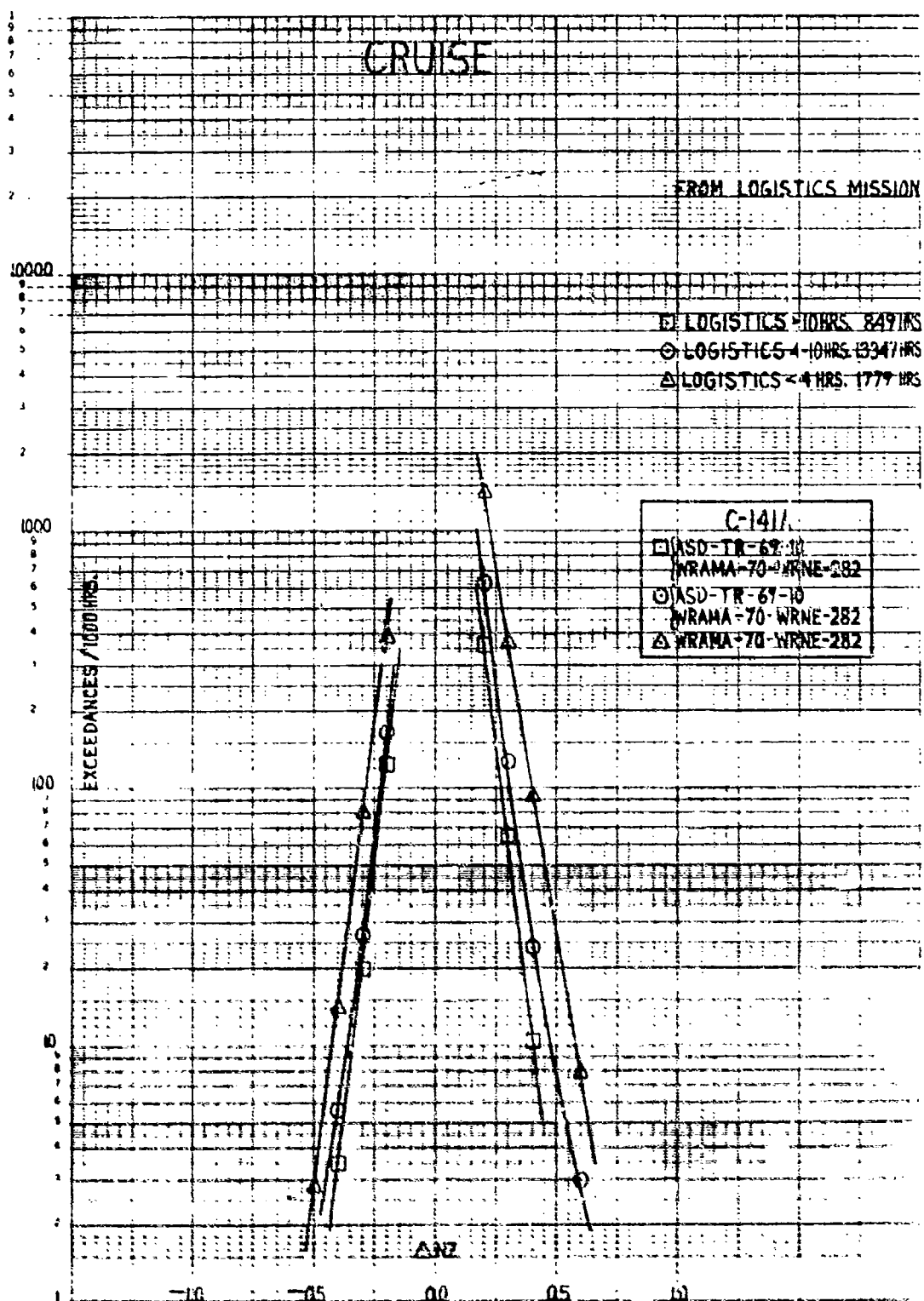


FIGURE 27

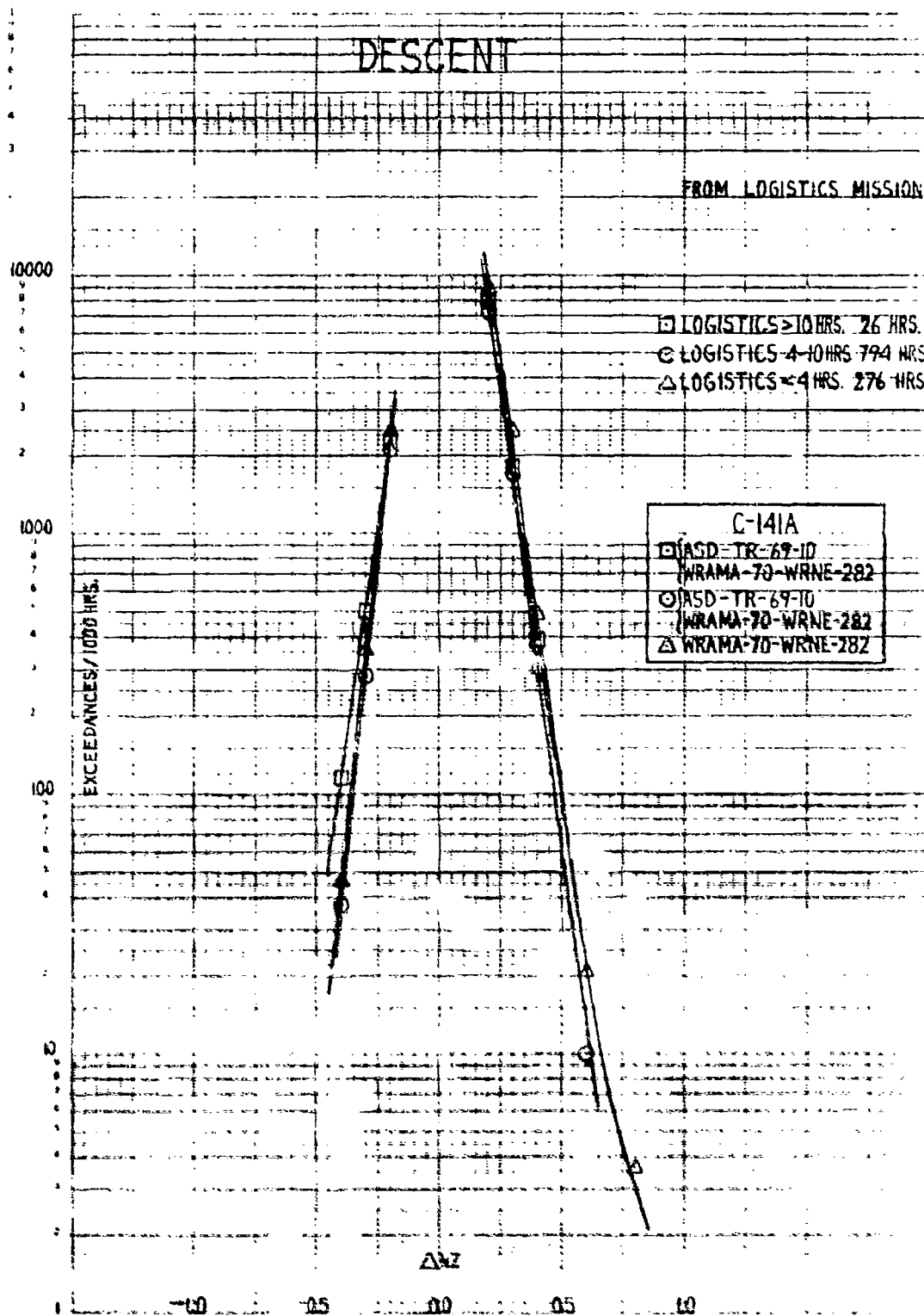


FIGURE 28

TABLE 10
MANEUVER N2 EXCEEDANCES PER 1000 HOURS

CARGO CLASS MISSION DATA

ΔN2	TRAINING	LOGISTICS SHORT RANGE	LOGISTICS MEDIUM RANGE	LOGISTICS LONG RANGE	
1.0					
0.9					
0.8					
0.7					
0.6	4	7	10	2	
0.5	46	75	38	11	
0.4	320	390	210	125	
0.3	2400	2400	1050	740	
0.2	15000				
	6400	1400	560	450	
-0.2	980	175	85	63	
-0.3	130	35	18	4	
-0.4	29	5	3		
-0.5	8	2			
-0.6					
-0.7					
-0.8					
HOURS:	237	504	1202	547	

TABLE 11

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

CARGO CLASS LOGISTICS MISSION PHASE DATA WITH AERIAL REFUELING

Δ NZ	ASCENT	CRUISE	DESCENT	AERIAL REFUELING
1.0	19	5	25	2
0.9	51	33	130	7
0.8	430	190	1150	23
0.7	3600	1150	5400	82
0.6				290
0.5				1250
0.4				4200
0.3				16000
0.2				93000
-0.2	1750	720	2200	93000
-0.3	320	96	300	16000
-0.4	38	20	33	4200
-0.5	5	4	17	1230
-0.6			9	285
-0.7				95
-0.8				23
HOURS:	204	2268	119	136

REFERENCE: C-5A, (LOCKHEED LDIGI-S-3570-4), (LOCKHEED LG77ER011)

HOURS REFERS TO AMOUNT OF RECORDED DATA

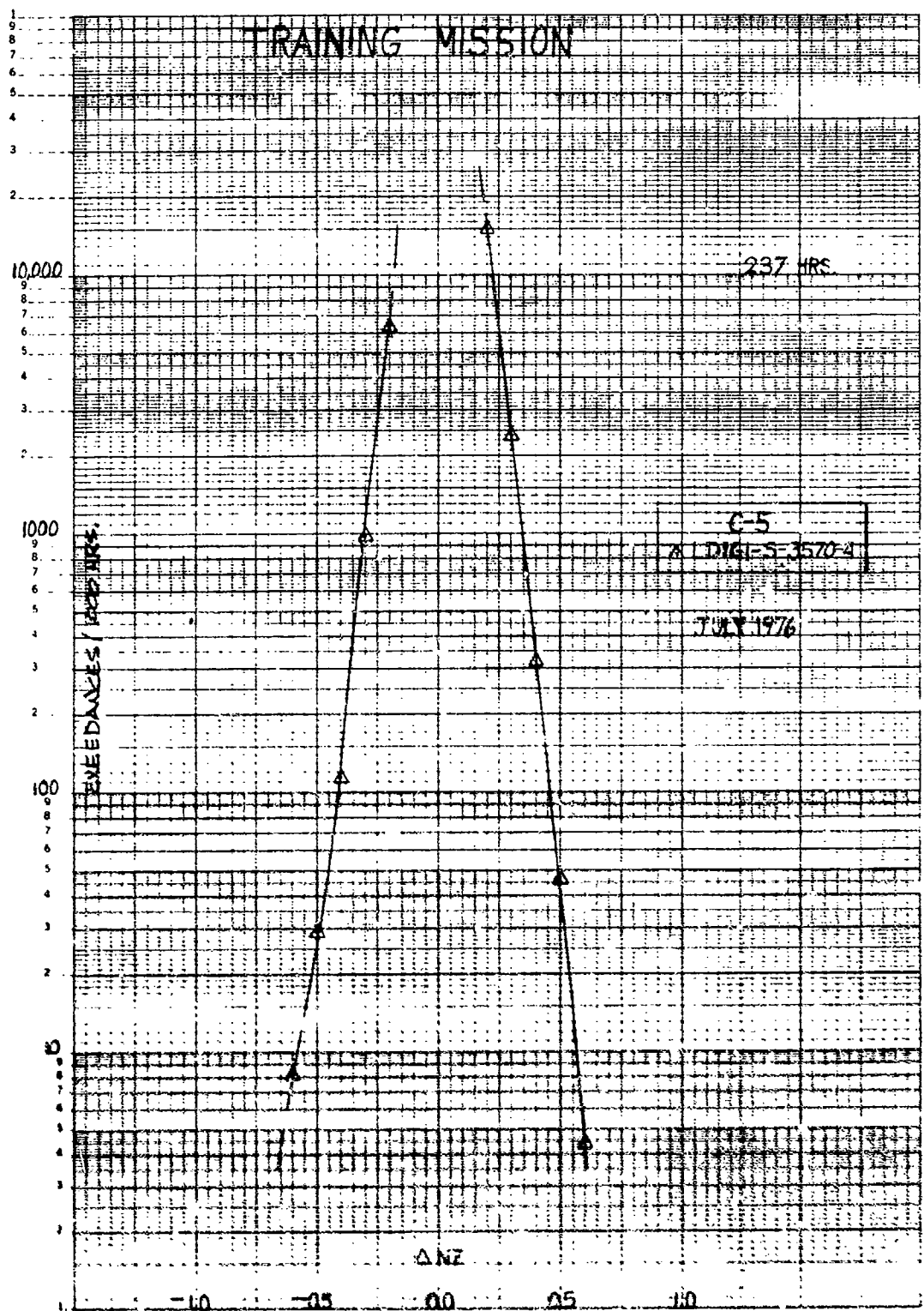


FIGURE 29

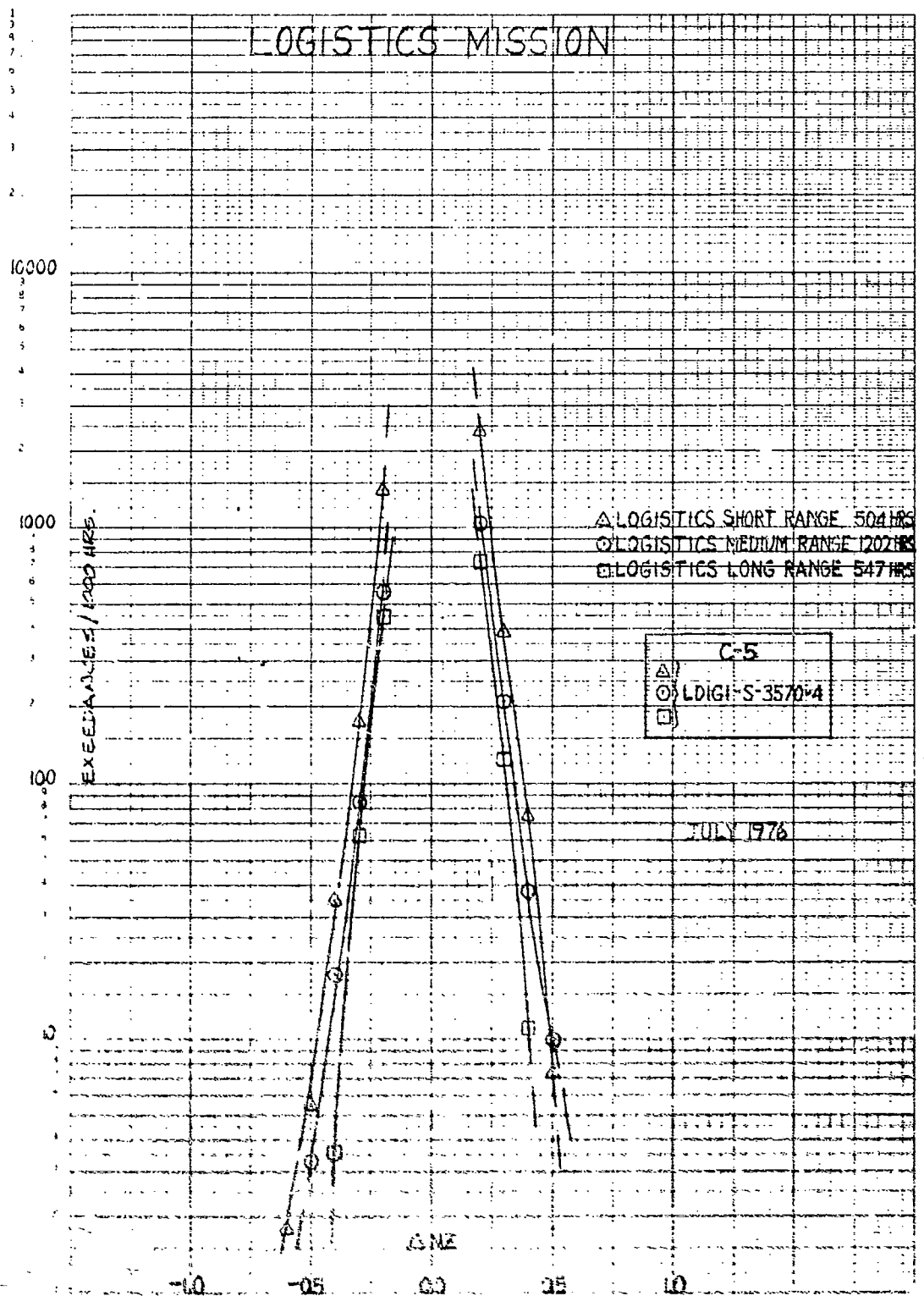


FIGURE 30

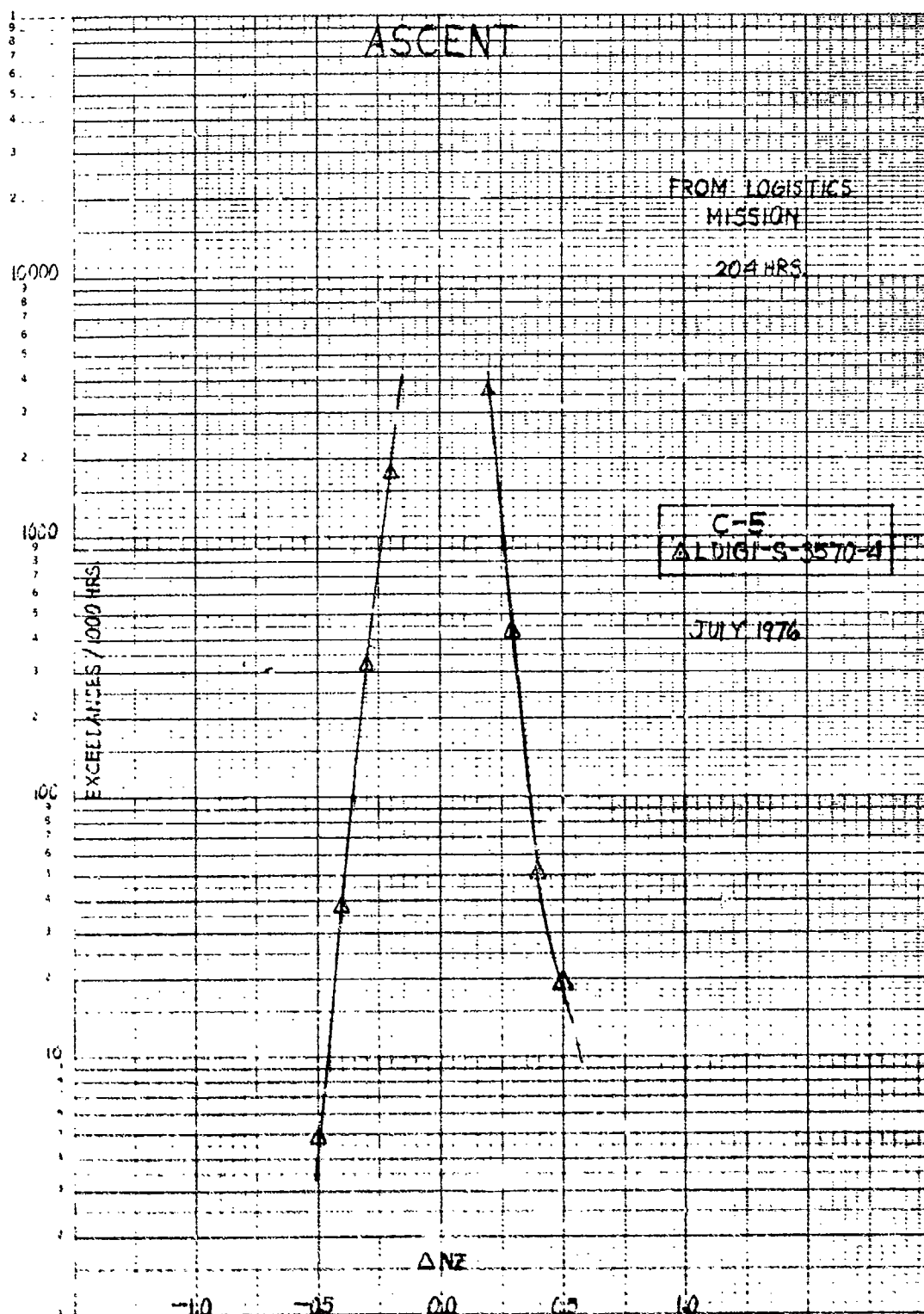


FIGURE 31

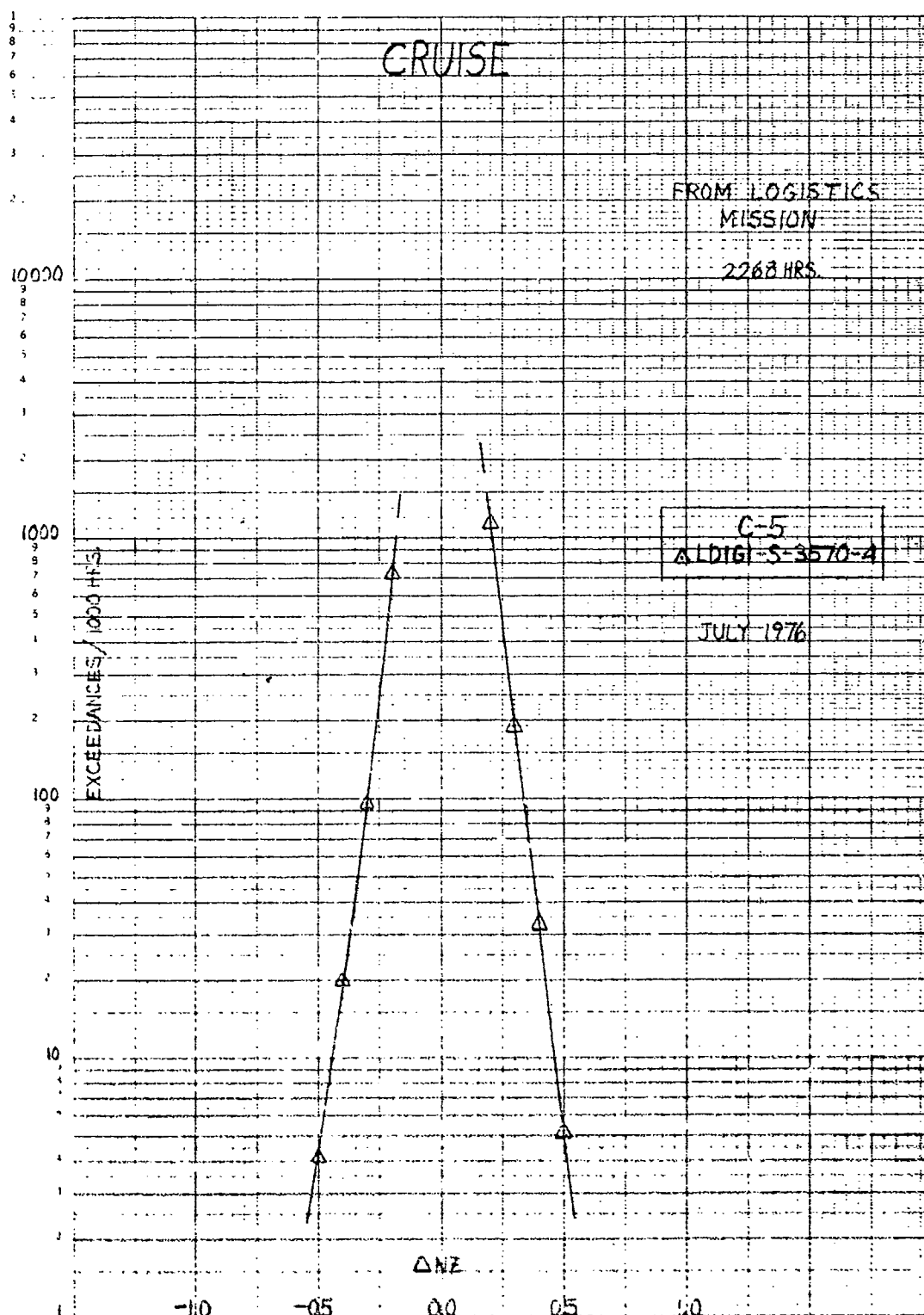


FIGURE 32

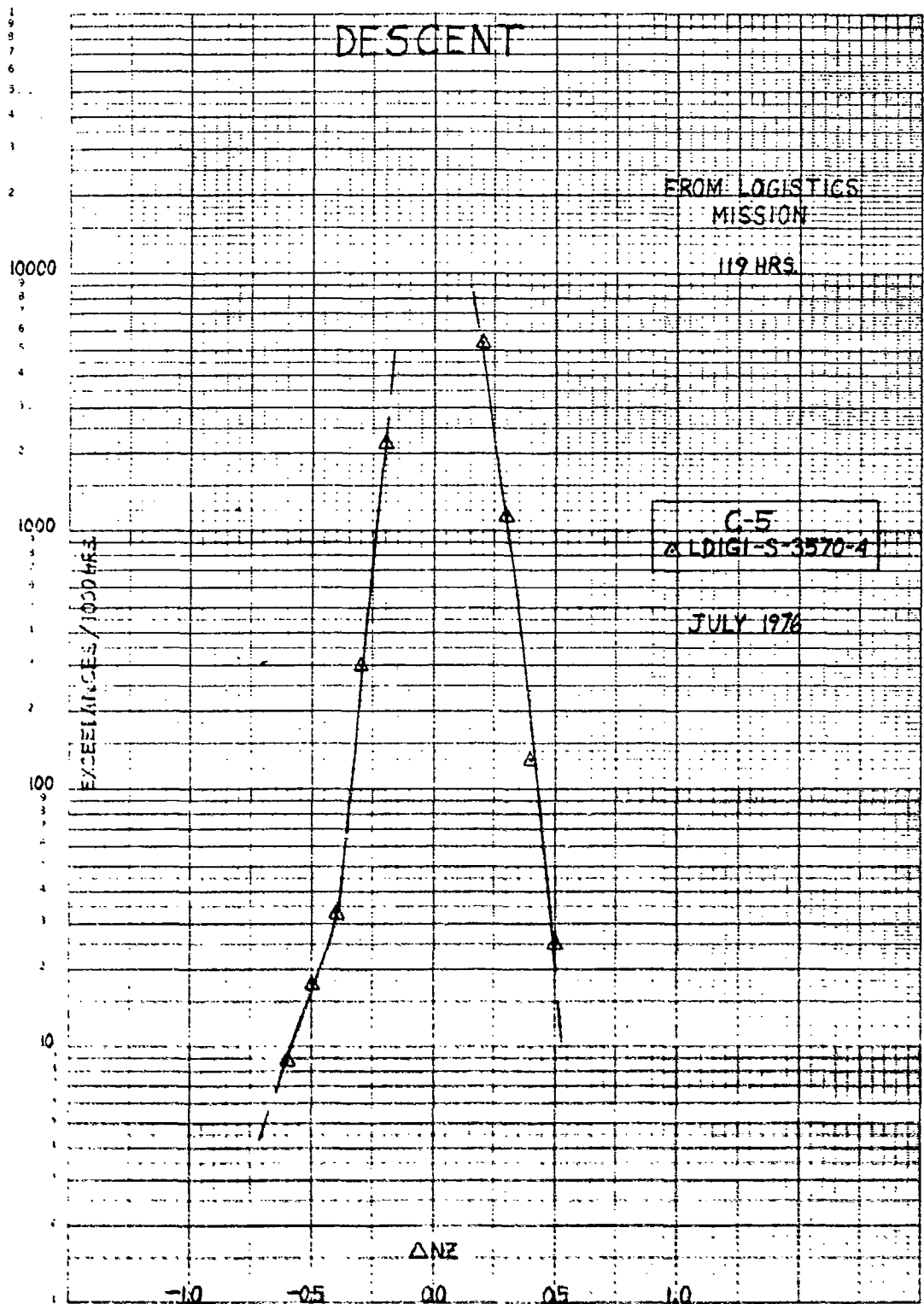


FIGURE 33

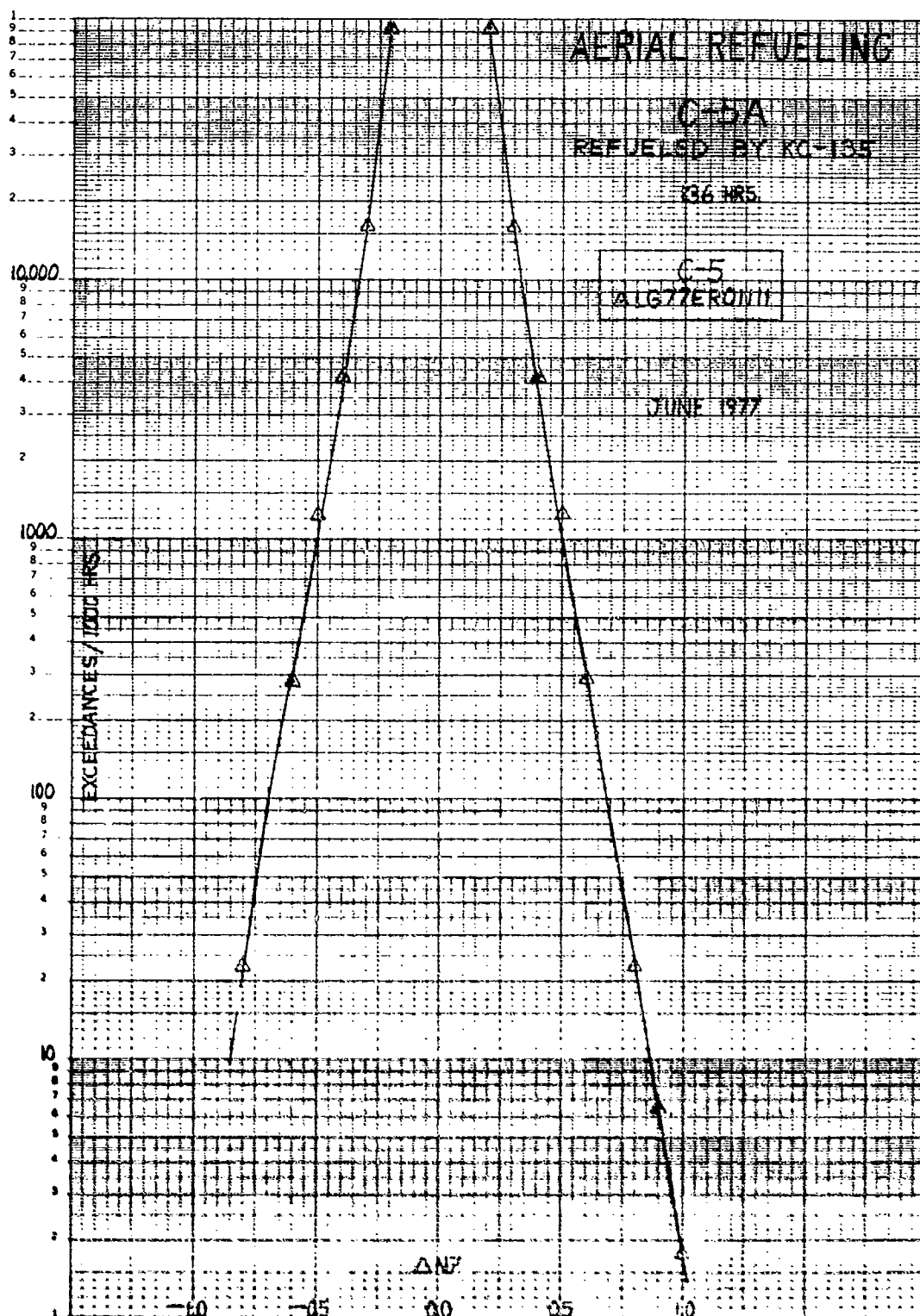


FIGURE 34

TABLE 12

MANEUVER NZ EXCEEDANCES PER 1000 FLIGHTS

CARGO CLASS

GROUND DATA

NZ	LANDING IMPACT	TAXI	TAKE-OFF RUN	LANDING ROLL-OUT	TOUCH-AND-GO ROLL
	6935 FLIGHTS	6264 FLIGHTS	3348 FLIGHTS	3242 FLIGHTS	3693 FLIGHTS
1.0	4.9		.6		.3
0.9	7.7		1.4		.7
0.8	17.4		3.4		2.0
0.7	36		9.3	3.1	5.4
0.6	85		24	12.0	14.5
0.5	201		72	47	37
0.4	508	.5	223	197	133
0.3	1280	8.6	867	1040	691
0.2	4090	35	5910	6830	5470
		314			
-0.2	2410	217	5400	5700	4770
-0.3	580	17.9	988	712	766
-0.4	179	3.0	296	132	189
-0.5	67	.6	111	36	60
-0.6	26		45	11.7	23
-0.7	11.1		18.2	4.9	10.3
-0.8	5.1		8.2		4.6
-0.9	2.6		4.0		2.4
-1.0	1.4		2.1		1.4
HOURS:	5.8	764	28.5	46.2	20.2

HOURS REFERS TO AMOUNT OF RECORDED DATA

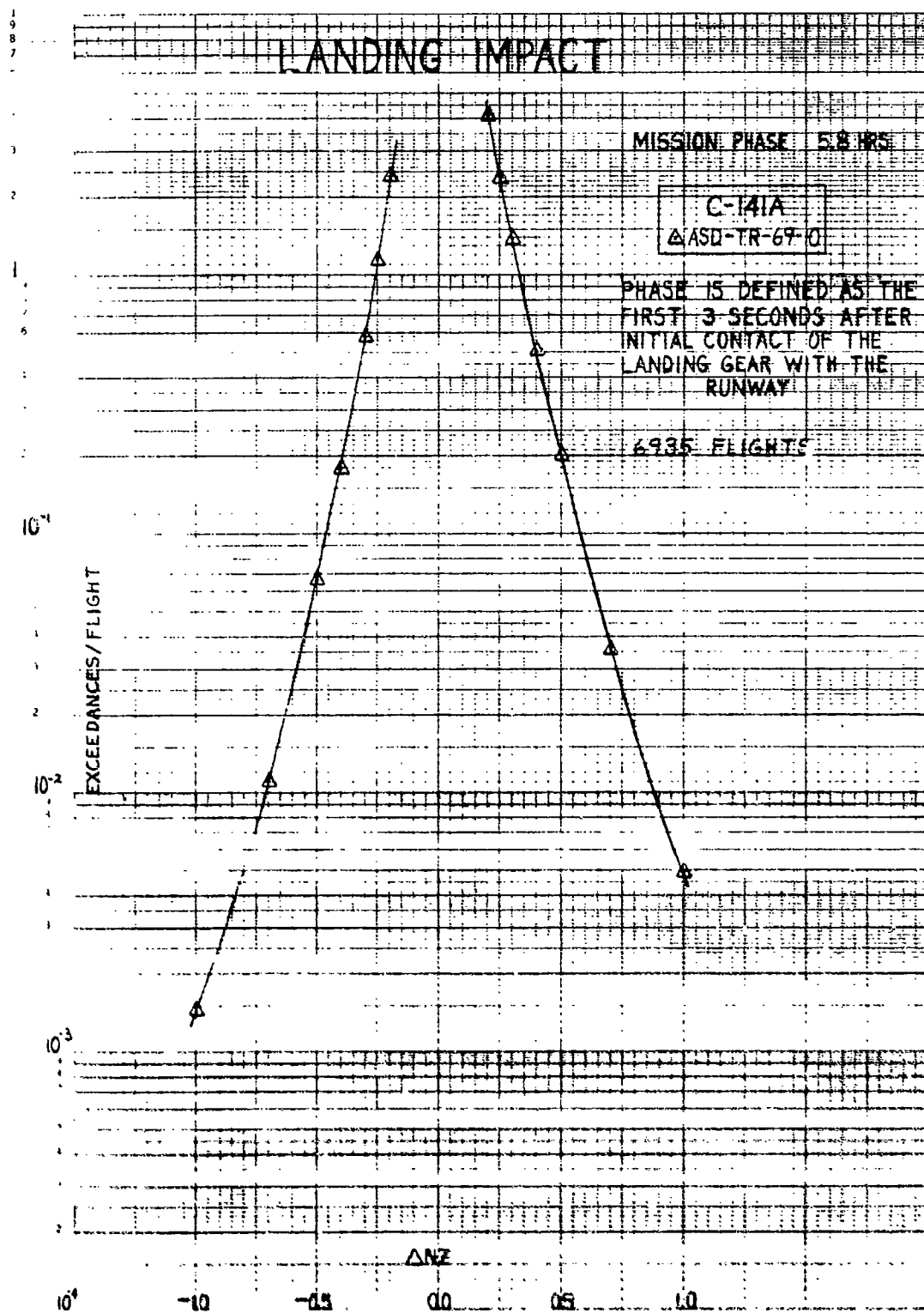


FIGURE 35

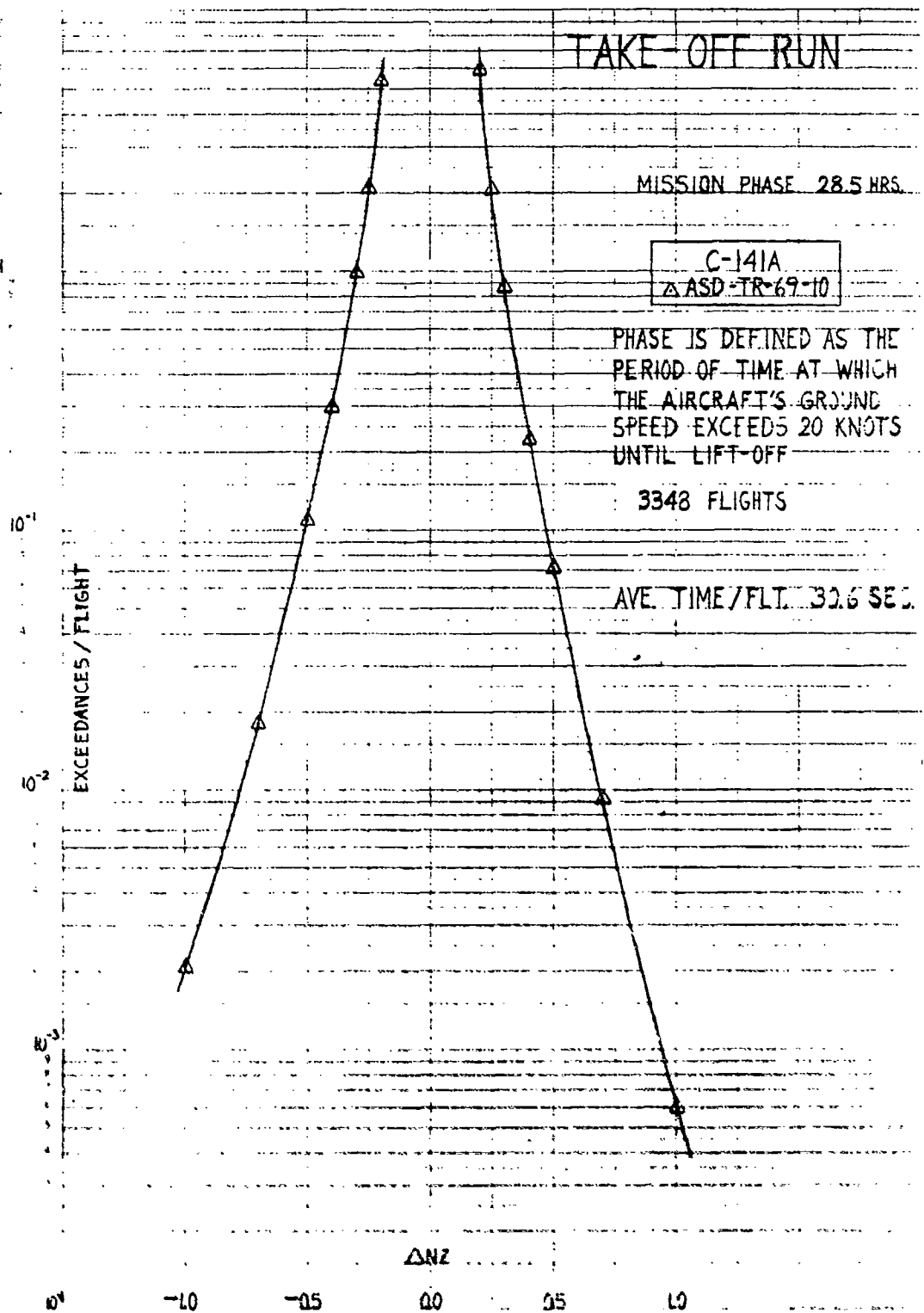


FIGURE 36

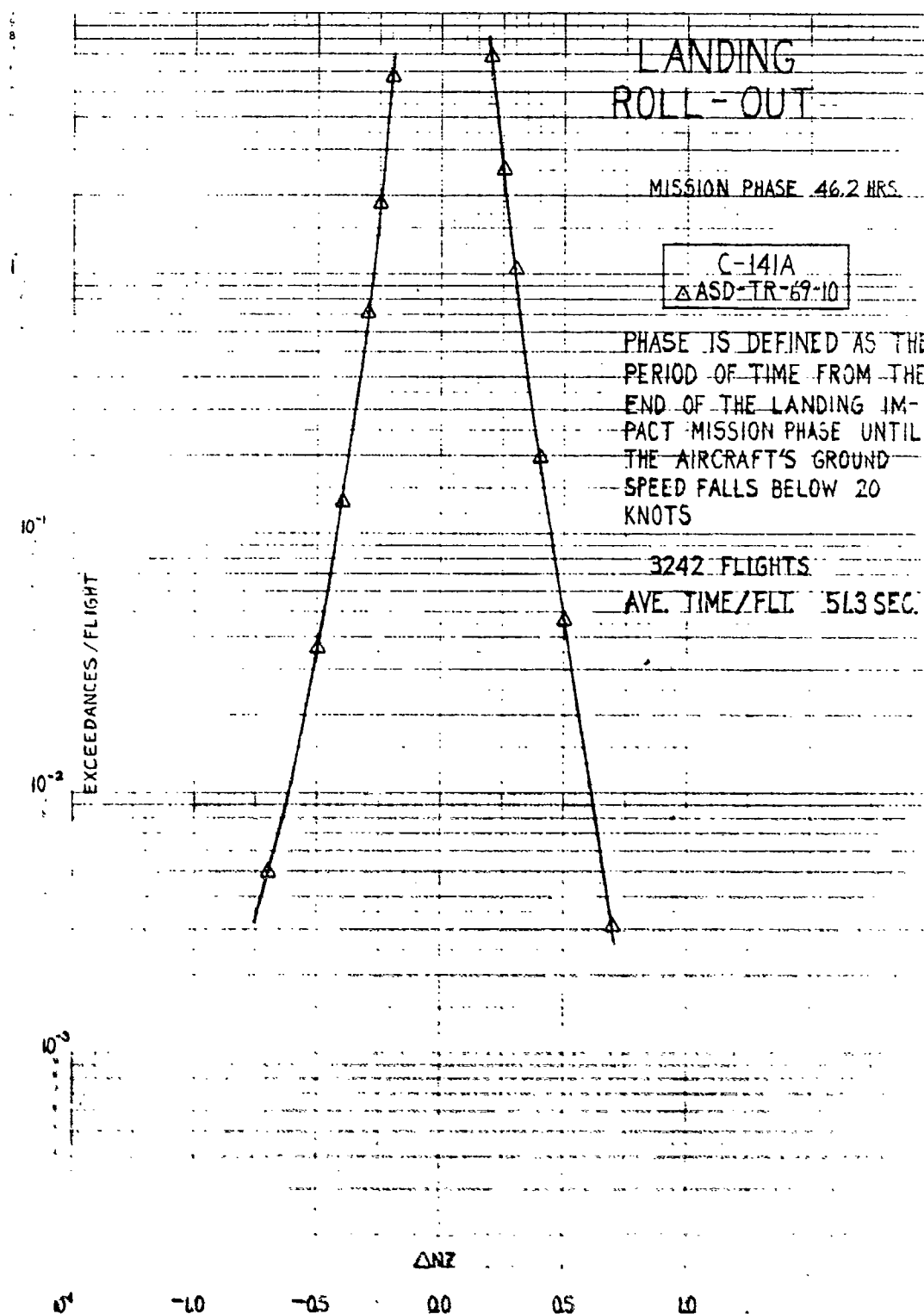


FIGURE 37

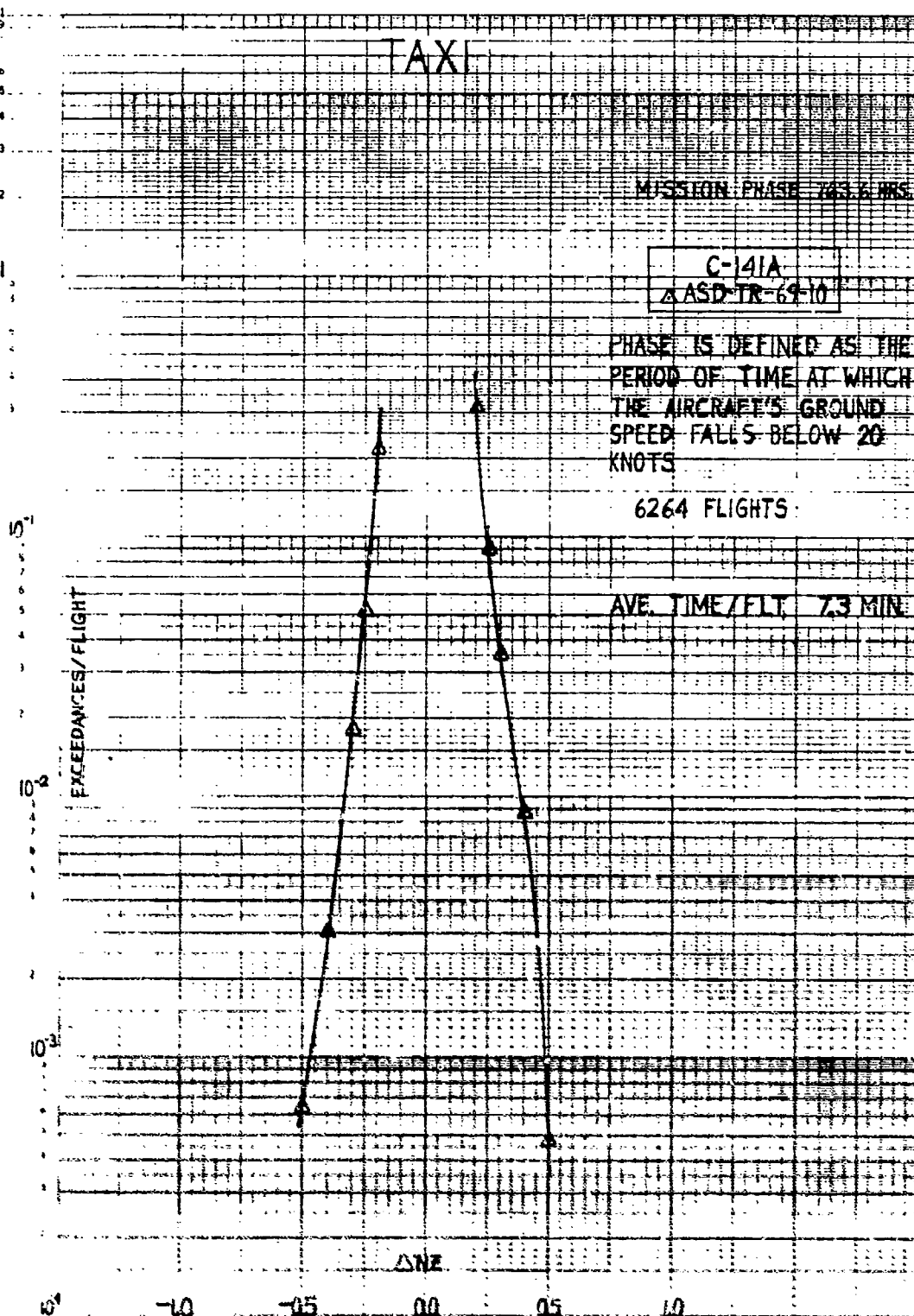


FIGURE 38

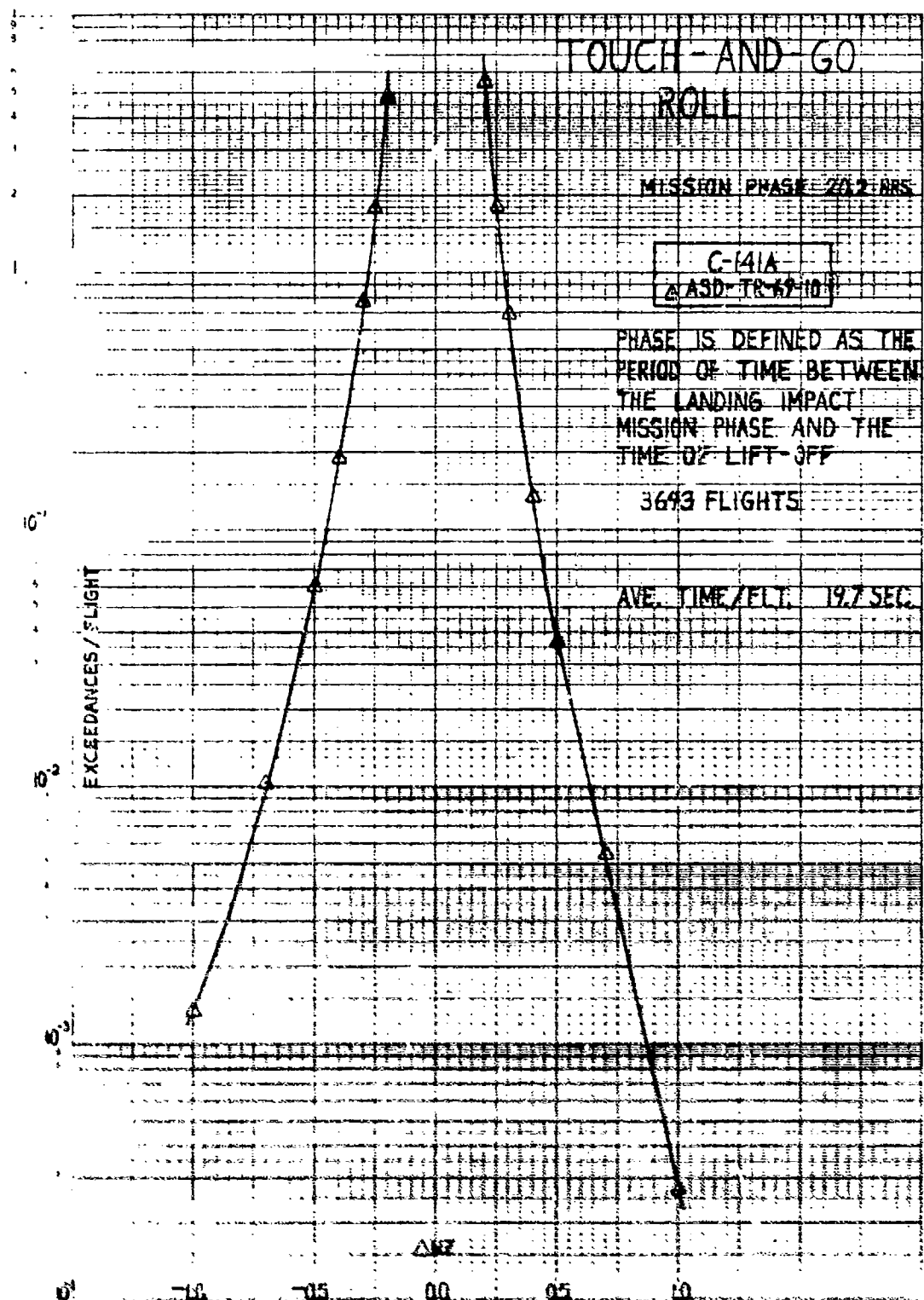


FIGURE 39

TABLE 13

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

FIGHTER CLASS

MISSION DATA

NZ	F-4C/D AIR TO AIR	F-4C/D AIR TO GROUND	F-4C/D INST & NAV.	F-4E AIR TO AIR	F-4E AIR TO GROUND	F-4E INST & NAV.
8.0	17	3		55	2	
7.5	50	11	1	133	10	
7.0	140	40	2	309	47	
6.5	356	130	6	684	175	82
6.0	857	400	15	1420	500	170
5.5	1820	1110	36	2702	1200	320
5.0	3260	2030	85	4563	2430	525
4.5	5235	5100	131	6688	4400	840
4.0	7665	8300	395	9913	7400	1340
3.5	11160	13500	778	14594	11600	2150
3.0	16500	21500	1615	21100	18100	3600
2.5	24680	32630	3470	29231	27000	5500
2.0	37080	44800	7684	37147	40500	8700
0.0	3400	820	195	5200	1400	680
-0.5	550	90	11	1267	170	92
-1.0	130	15	1	316	29	16
-1.5	40	4		86	1	7
-2.0	11	2		26		2
-2.5	5	1		9		
-3.0	2			3		
HOURS:	2016	1900	1096	562	1053	249

PE. UNCE: F-4C/D, F-4E, (ASIMIS REPORT, 1973-4, 1974-5)

HOURS REFERS TO AMOUNT OF RECORDED DATA

TABLE 14

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

FIGHTER CLASS MISSION PHASE DATA

NZ	ASCENT	CRUISE/INTERCEPT	CRUISE	MANEUVER AIR TO AIR	MANEUVER AIR TO GROUND	MANEUVER RECON, INST & NAV & TEST
8.0				56	9	11
7.5				150	30	46
7.0				380	100	114
6.5				945	320	290
6.0		4		2240	980	730
5.5		11		4900	2790	1850
5.0		30		9570	7020	4150
4.5		90	36	16270	15320	8300
4.0	3	260	105	22210	26620	14300
3.5	37	760	310	31600	38580	22500
3.0	180	2180	903	44970	55490	33705
2.5	880	5920	2450	63260	77950	50500
2.0	4470	13790	5730	86070	103770	74000
0.0				8300	1880	4200
-0.5				1630	370	880
-1.0				390	90	189
-1.5				110	25	43
-2.0				36	8	10
-2.5				13	3	
-3.0				5	1	
HOURS:	272	665	1777	685	716	106

REFERENCE: F-4C/D (ASIMIS REPORT 1973-74)

HOURS REFERS TO AMOUNT OF RECORDED DATA

TABLE 15

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

FIGHTER CLASS CONUS MISSION PHASE DATA

NZ	PRACTICE LANDING	DESCENT			
8.0					
7.5					
7.0					
6.5					
6.0					
5.5	5	2			
5.0	12	37			
4.5	30	307			
4.0	85	894			
3.5	260	2000			
3.0	880	4246			
2.5	3560	7992			
2.0	18060				
0.0					
-0.5					
-1.0					
-1.5					
-2.0					
-2.5					
-3.0					
HOURS:	476	714			

TABLE 16

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

FIGHTER CLASS SEA MISSION DATA

NZ	RECONNAISSANCE					
7.0						
6.5	1					
6.0	6					
5.5	23					
5.0	61					
4.5	130					
4.0	255					
3.5	510					
3.0	1150					
2.5	2300					
2.0	5650					
0.0	200					
-0.5	15					
-1.0	4					
-1.5	1					
HOURS:		1217				

HOURS REFERS TO AMOUNT OF RECORDED DATA

REFERENCE: RF-4C ASD-TR-74-2

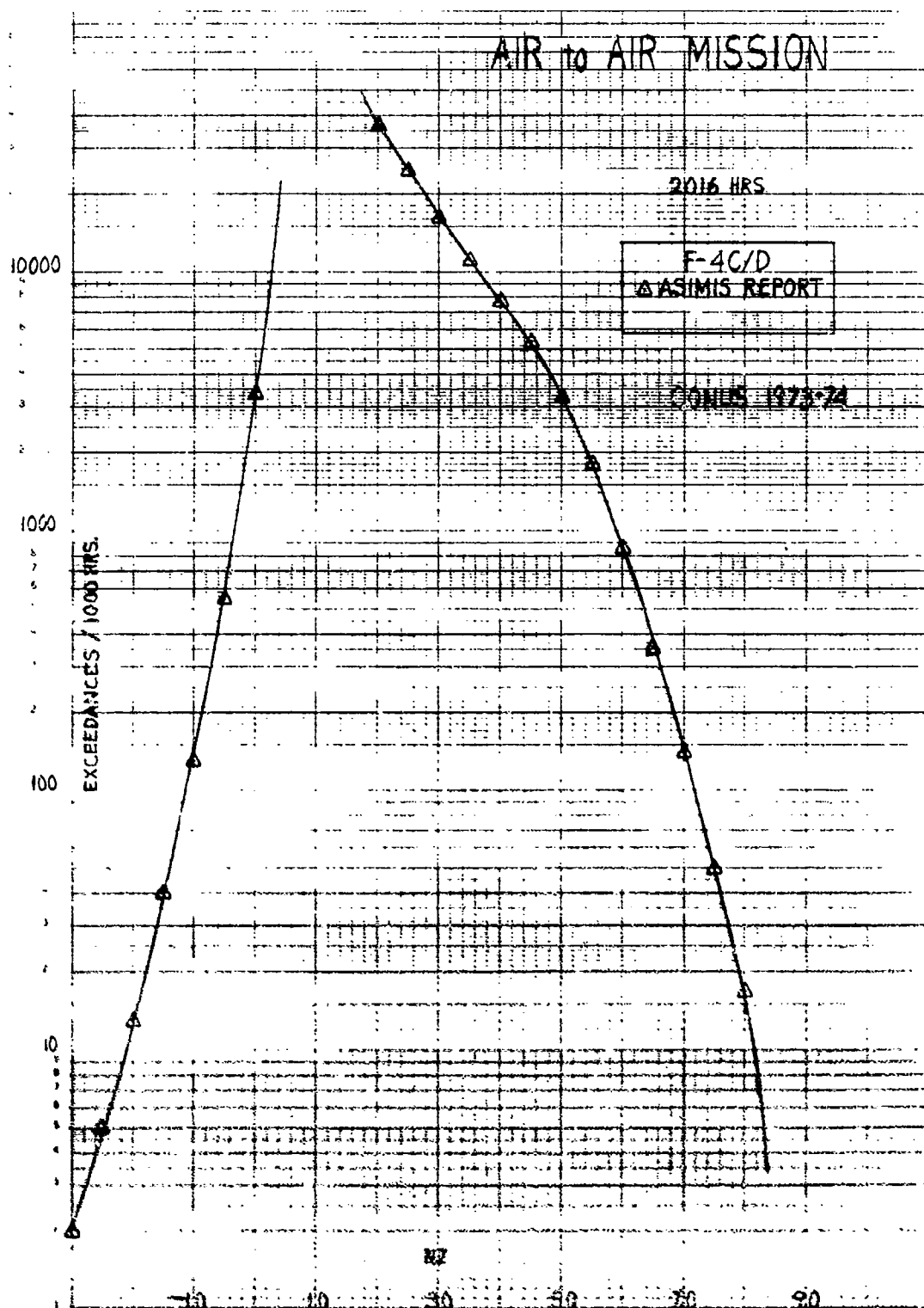


FIGURE 40

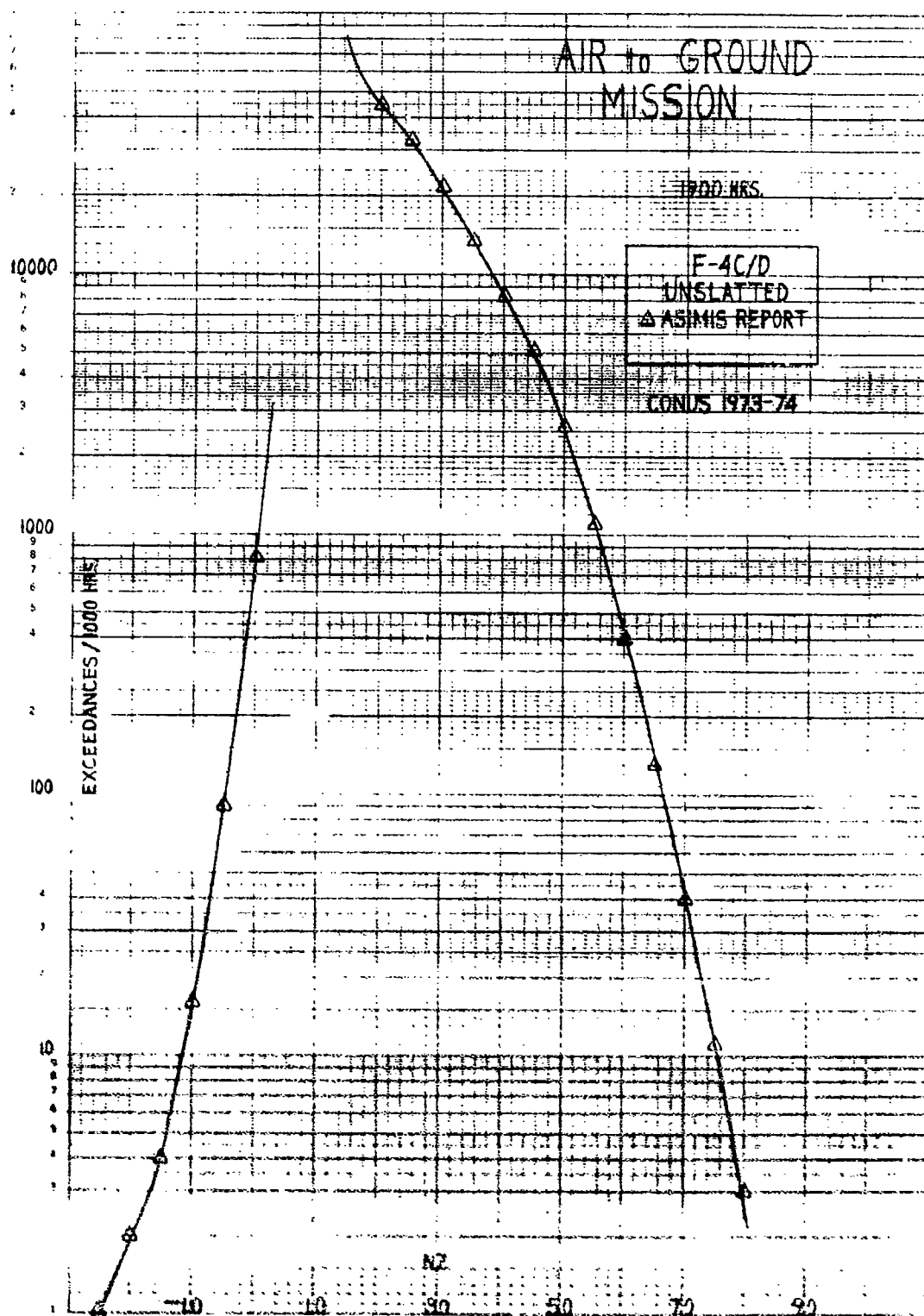


FIGURE 41

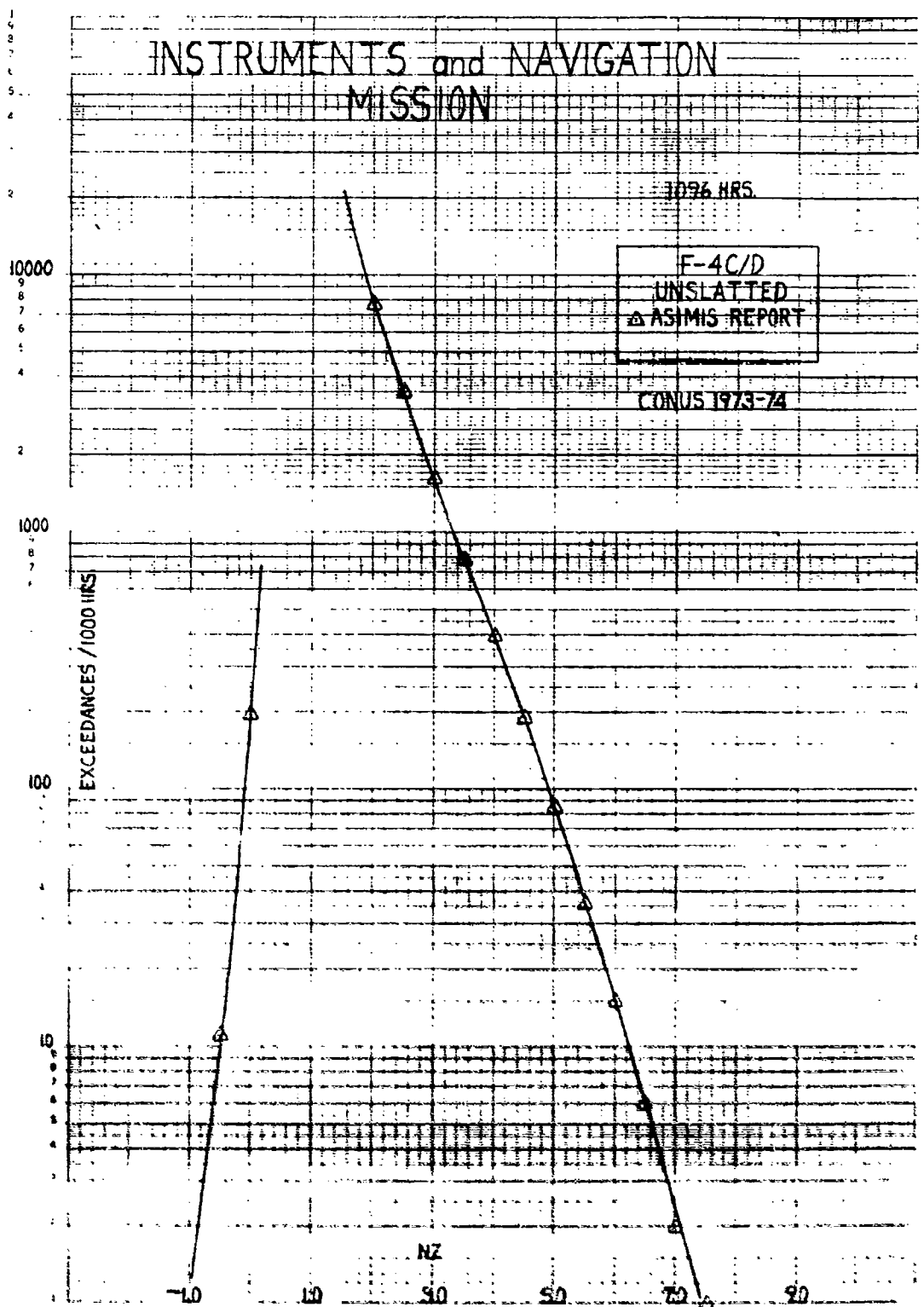


FIGURE 42

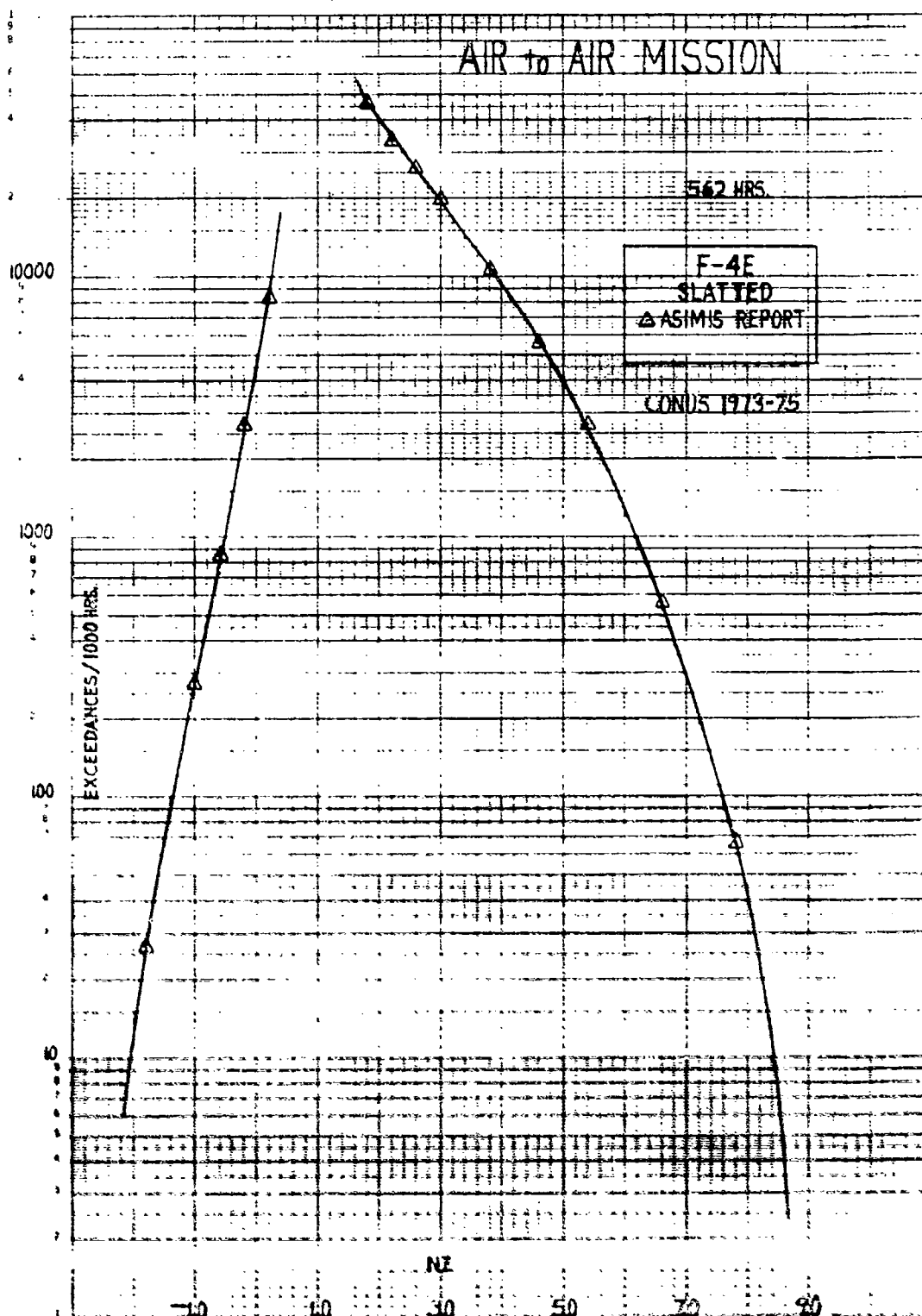


FIGURE 43

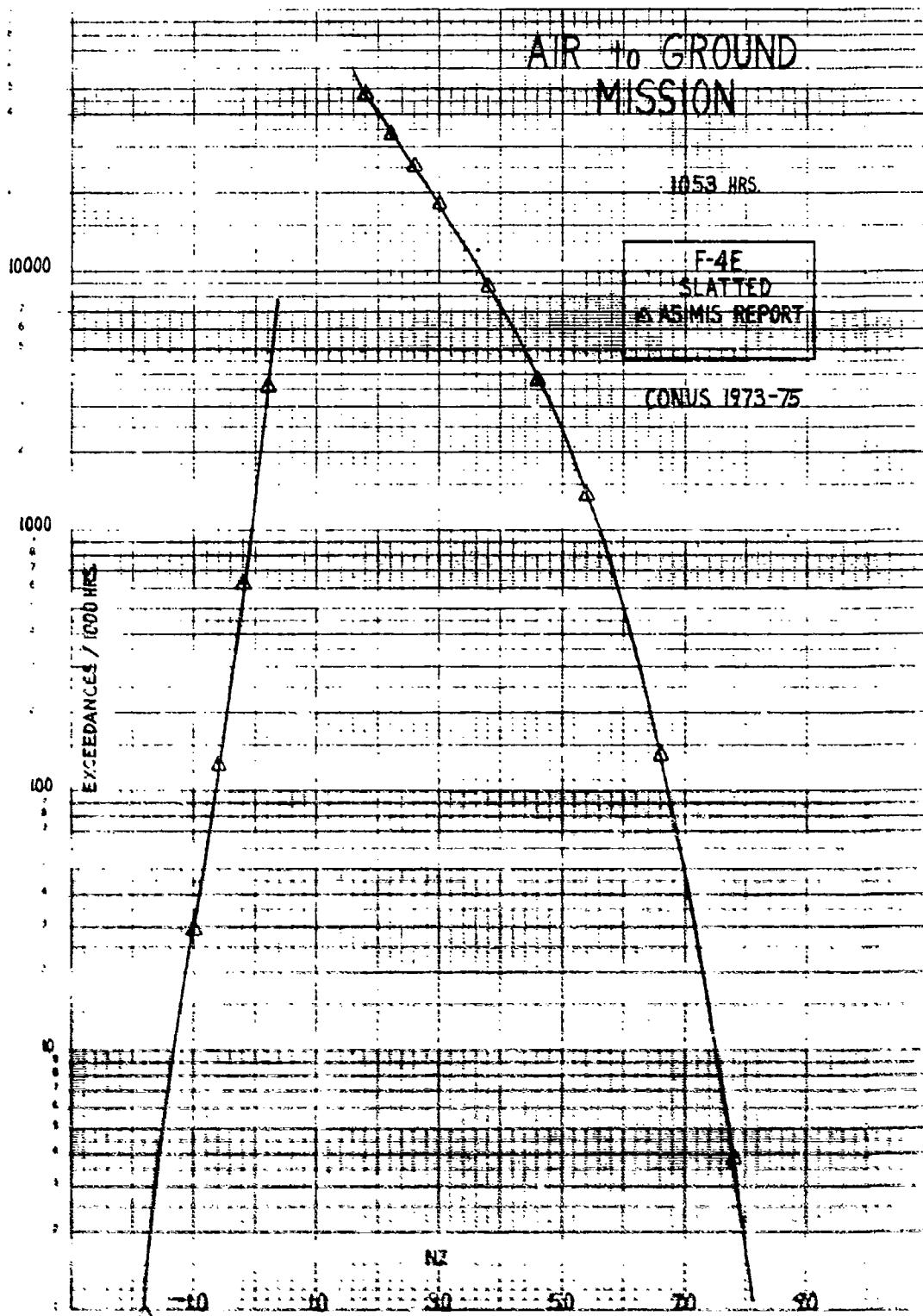


FIGURE 44

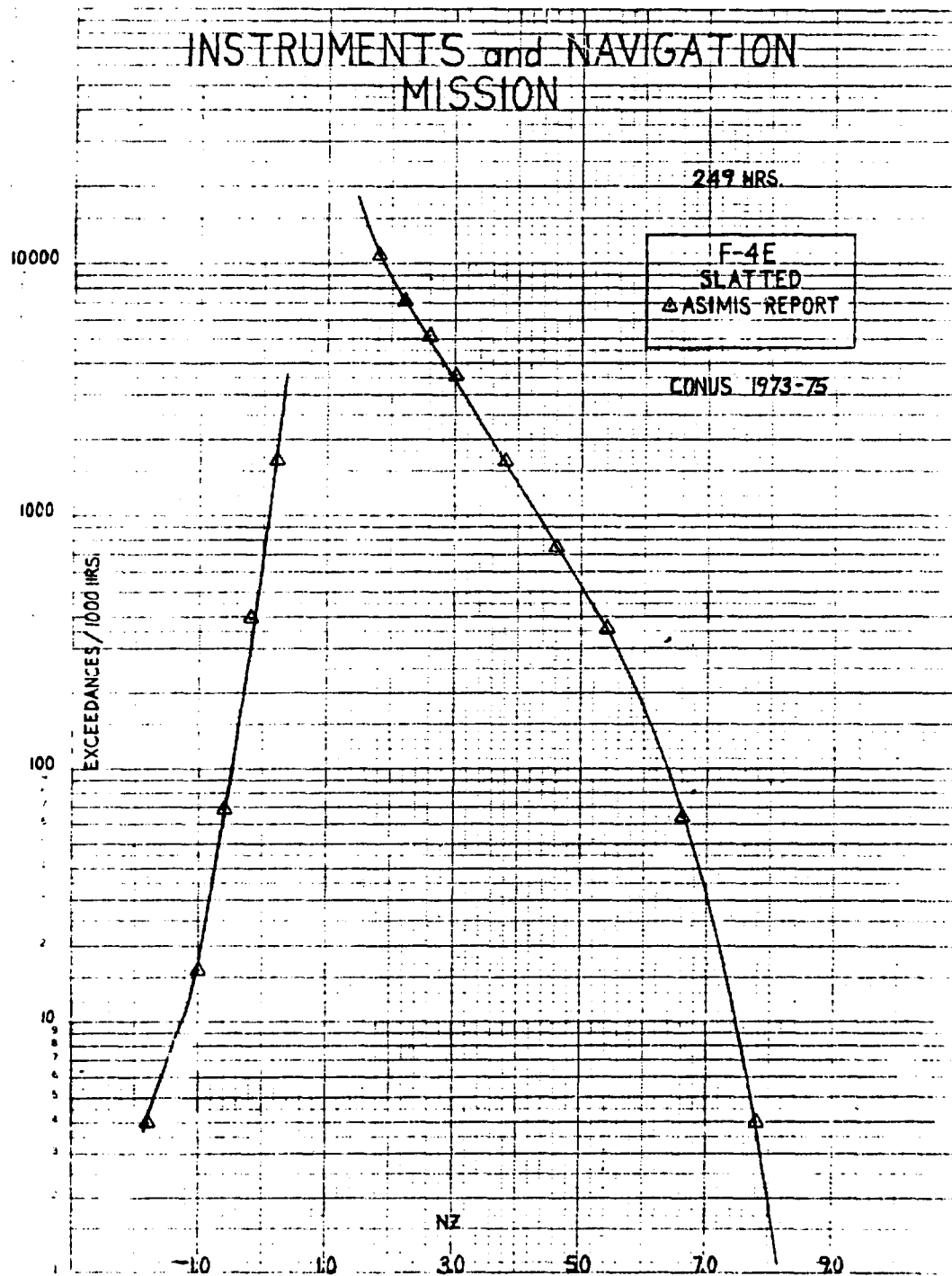


FIGURE 45

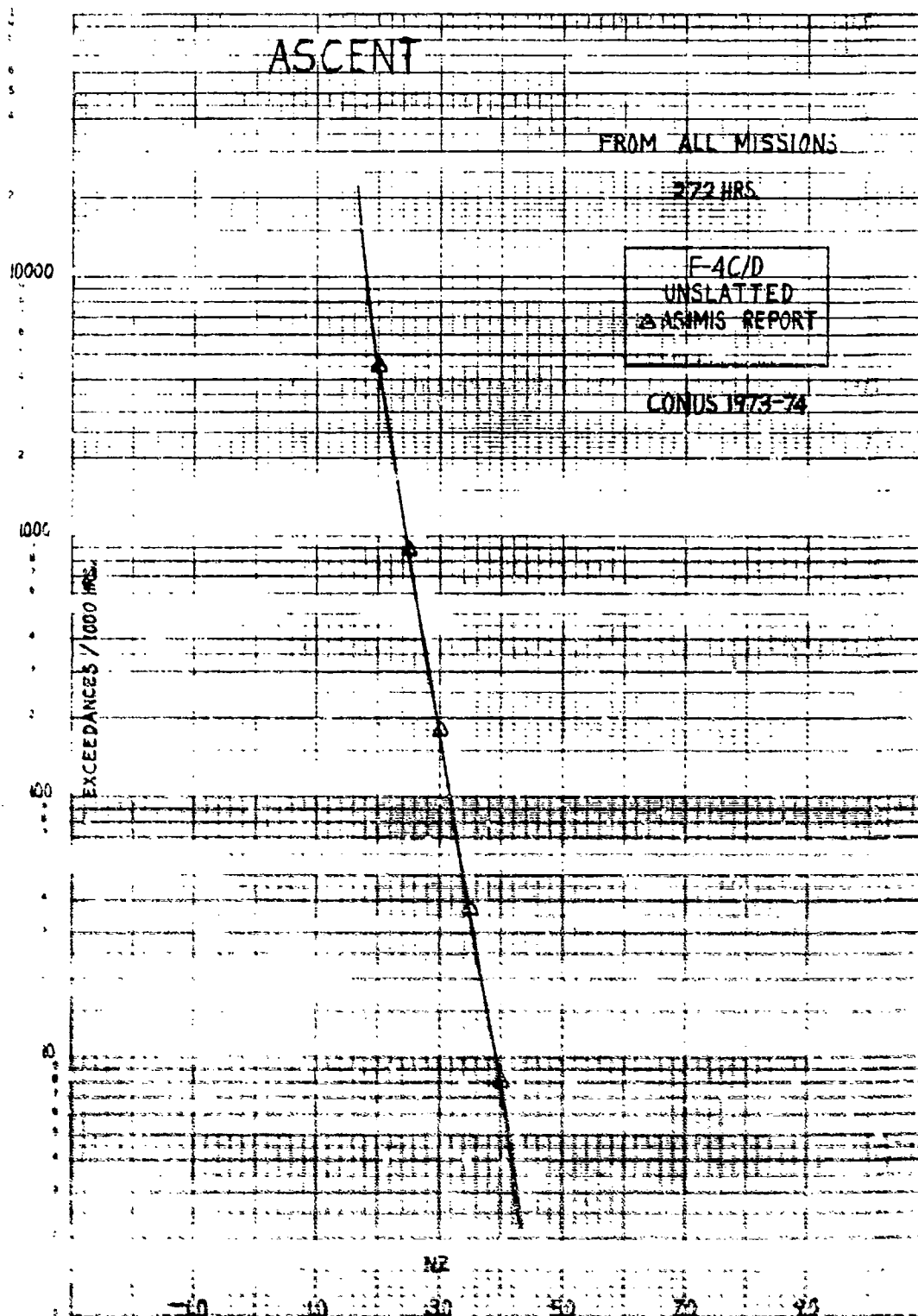


FIGURE 46

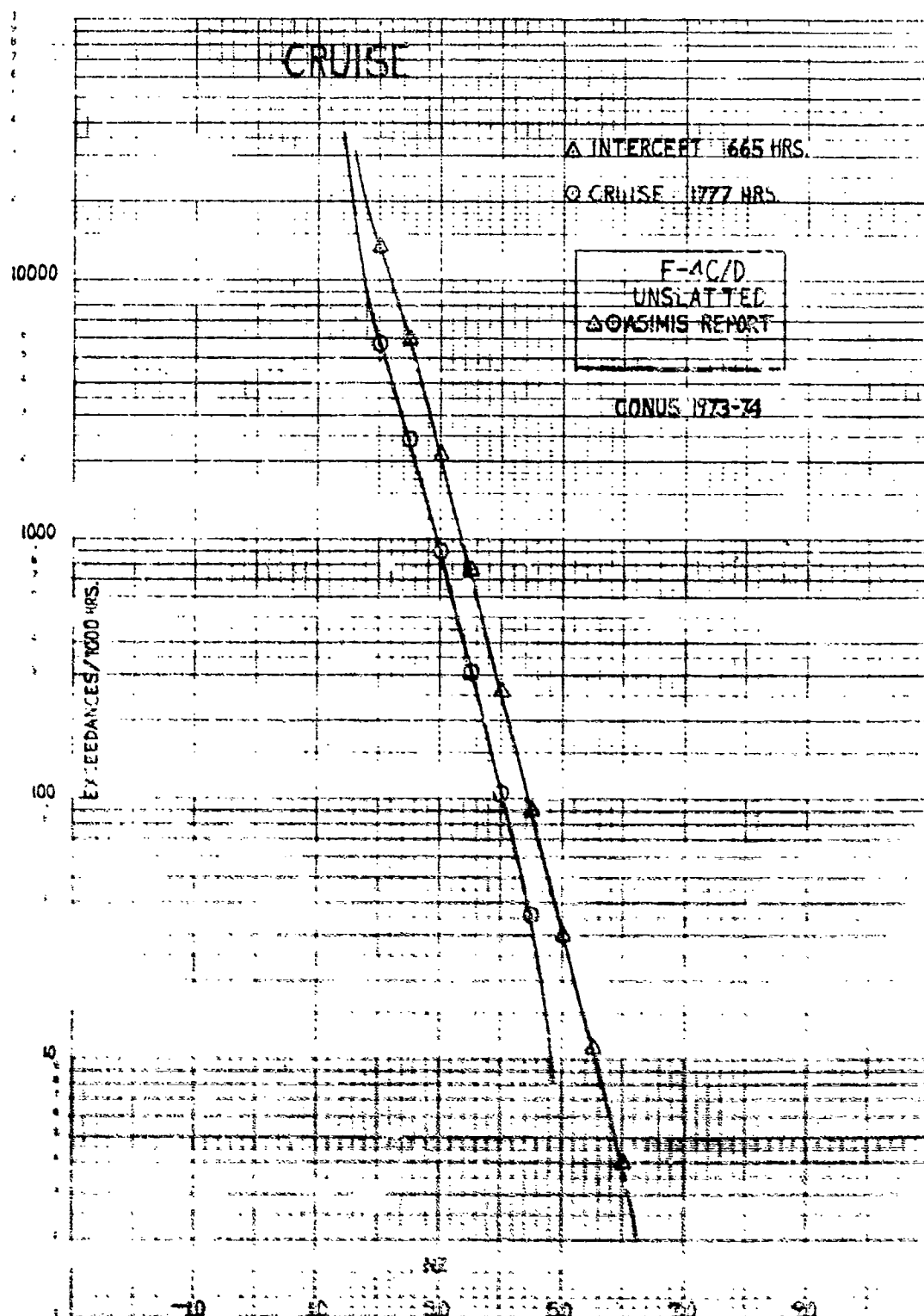


FIGURE 47

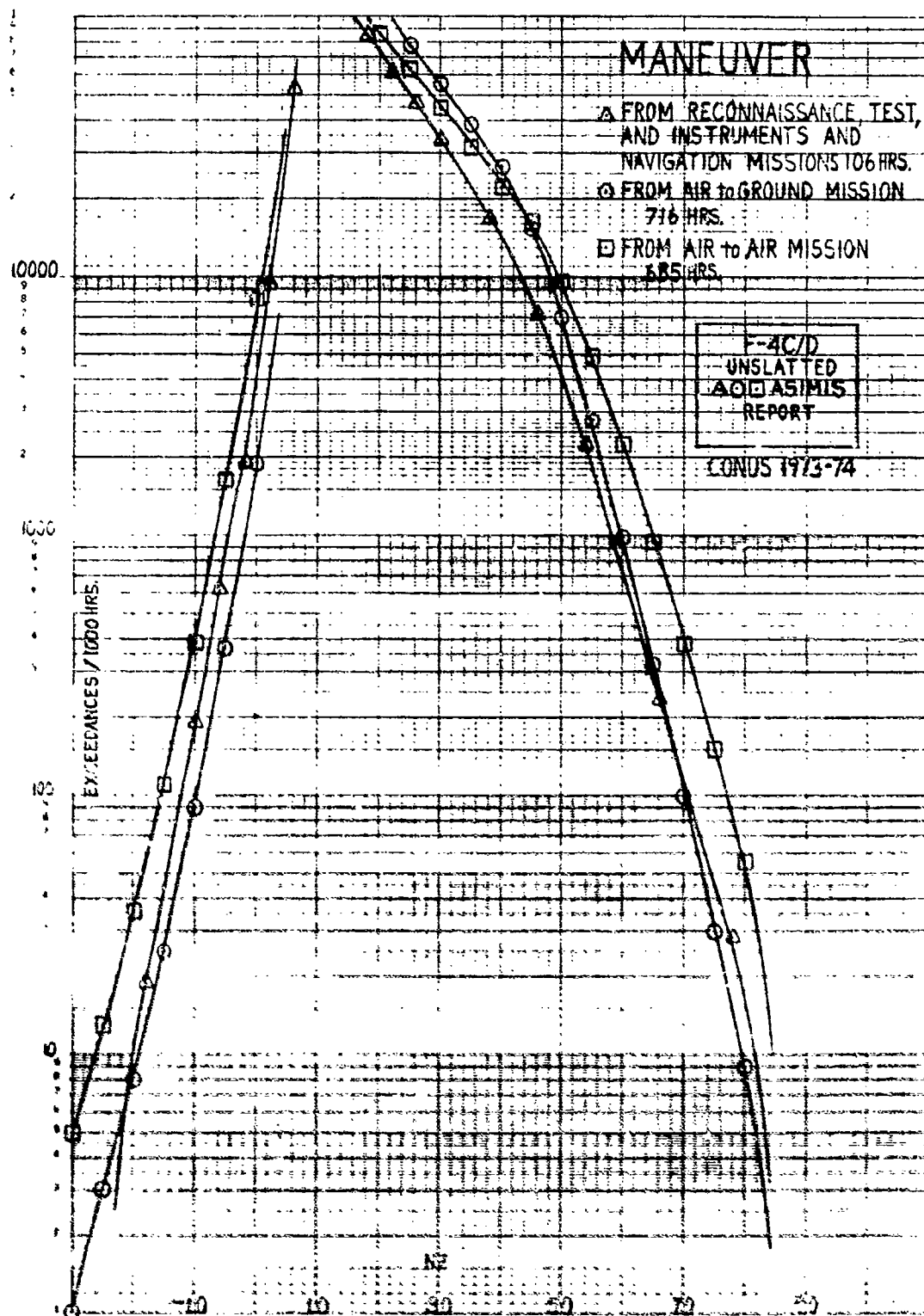


FIGURE 48

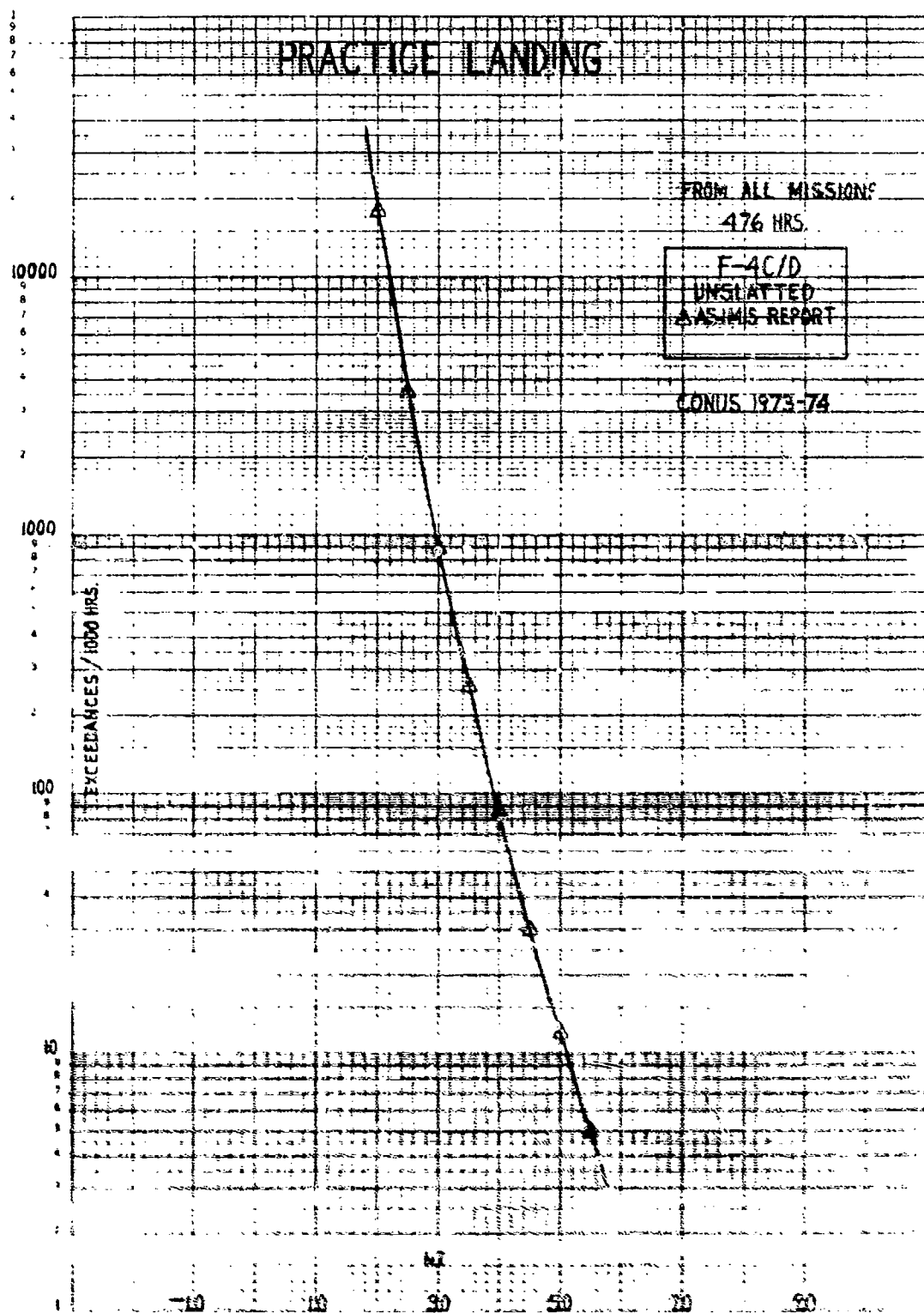


FIGURE 49

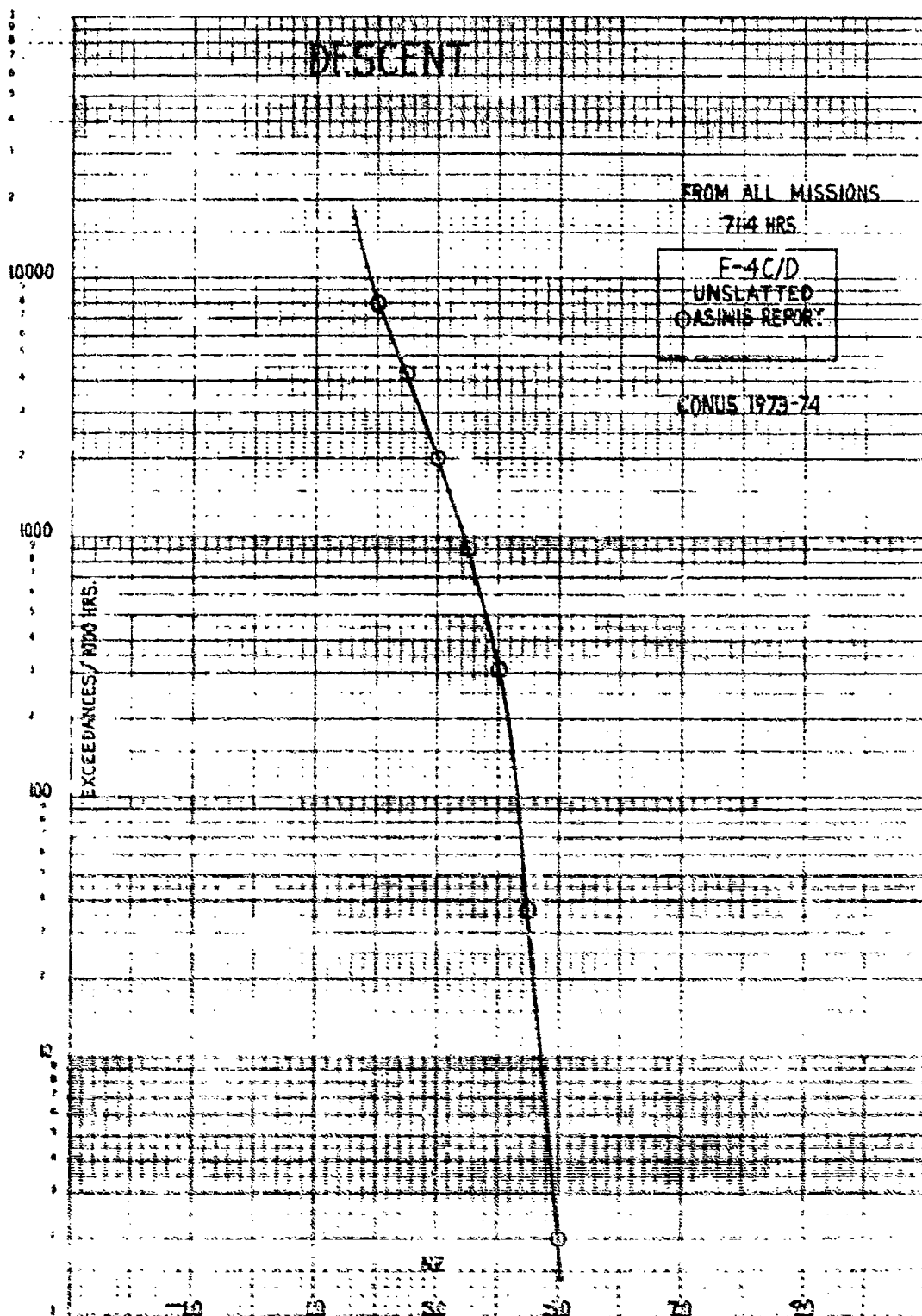


FIGURE 50

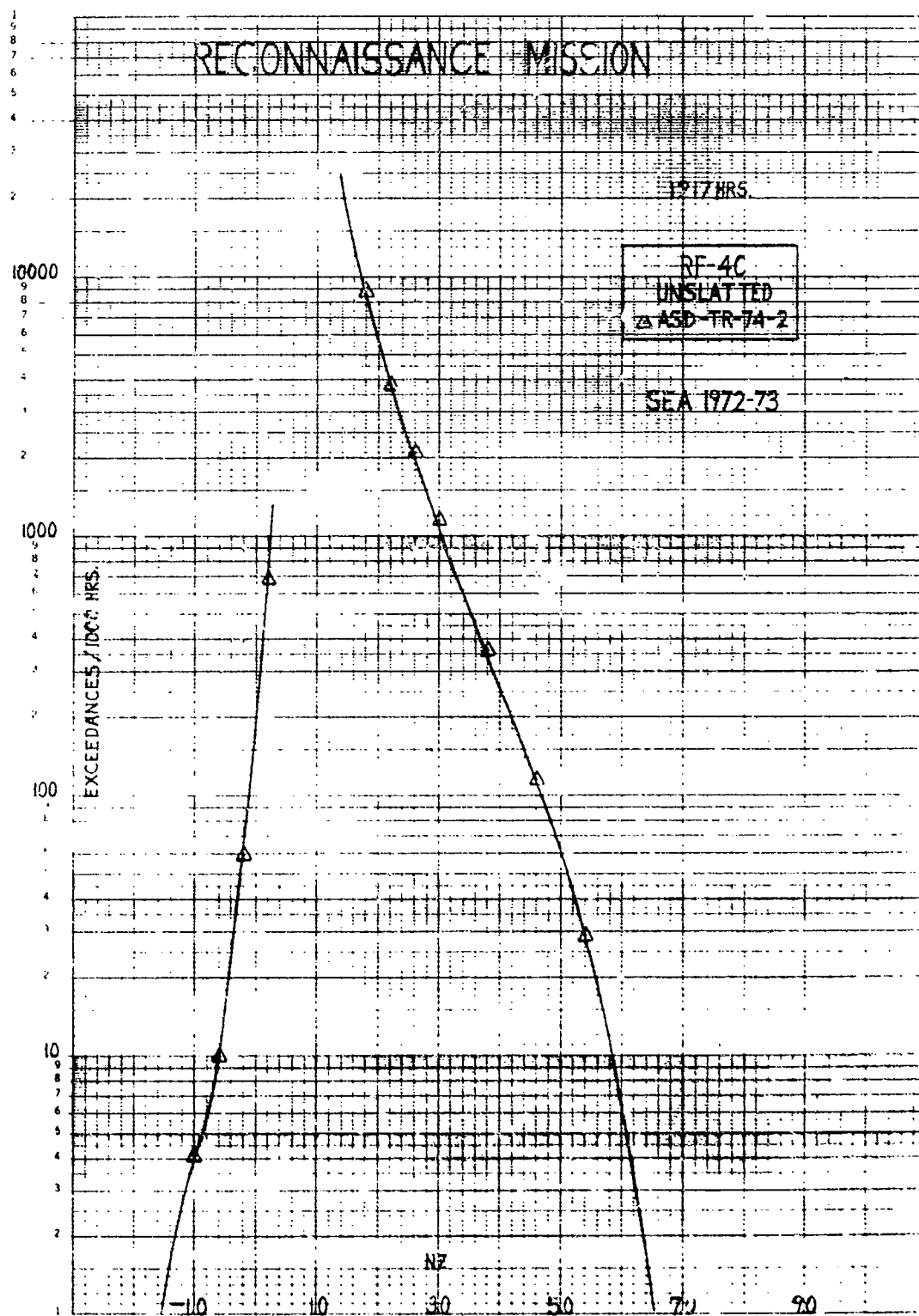


FIGURE 51

TABLE 17

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

FIGHTER/ATTACK CLASS MISSION DATA

NZ	TRANSITION	GROUND ATTACK	SURFACE ATTACK	SURFACE ATTACK TACTICS	TEST
9.0		1	1		2
8.5		11	11		10
8.0	5	80	47	1	38
7.5	18	284	92	11	109
7.0	54	717	263	45	256
6.5	127	1428	615	159	571
6.0	267	2396	1156	407	1072
5.5	535	3522	1905	875	1728
5.0	1003	4711	2845	1710	2730
4.5	1840	6198	4180	3024	4431
4.0	3371	8298	6341	5068	7213
3.5	5933	11335	9532	8425	11120
3.0	9337	15853	15578	13649	16294
2.5	13707	22136	23052	21072	29873
2.0	26780	39690	44268	41876	
0.0	38	32	17	132	33
-0.5	10			30	6
-1.0				5	2
HOURS:	509	364	471	535	425

HOURS REFERS TO AMOUNT OF RECORDED DATA

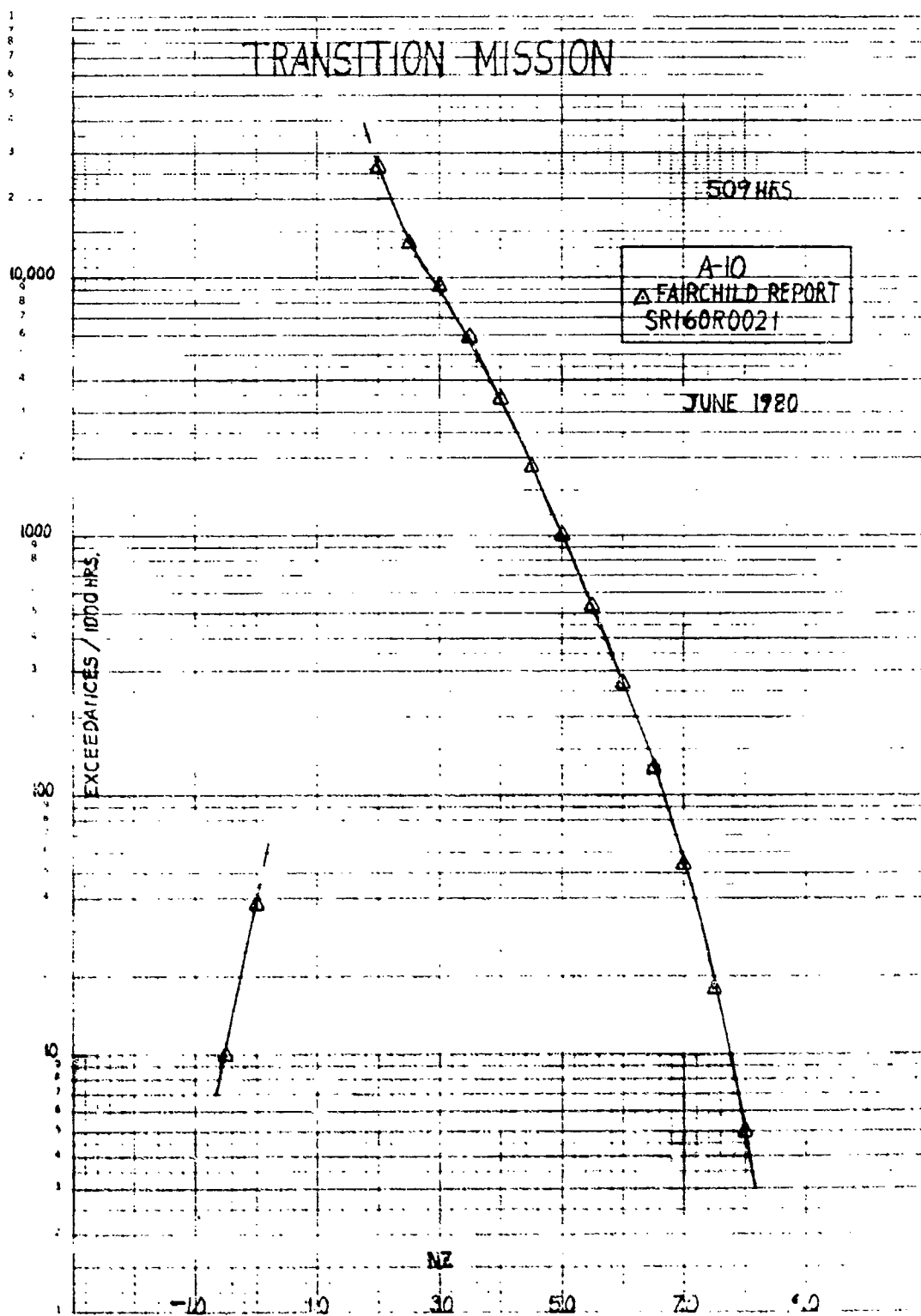


FIGURE 52

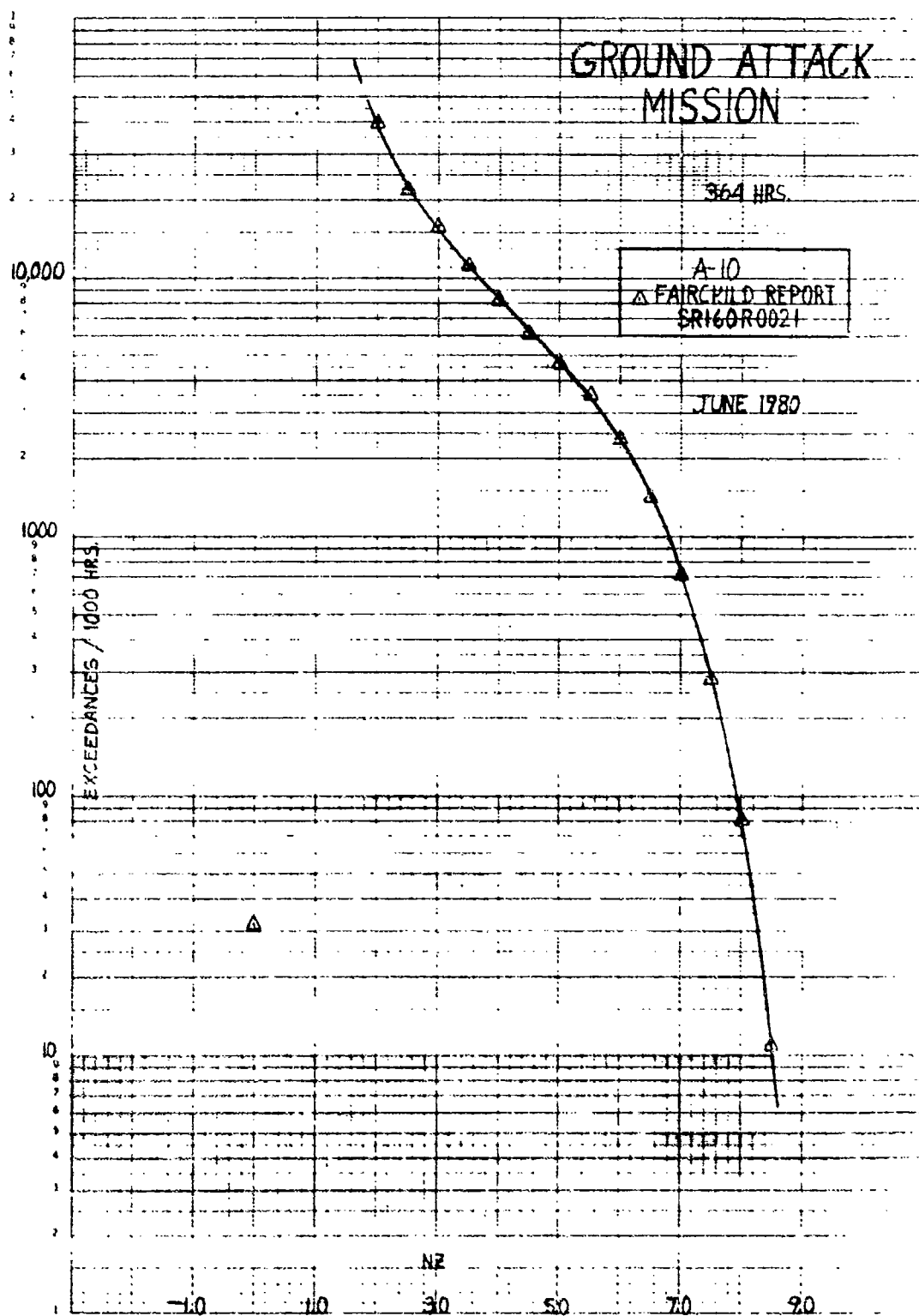


FIGURE 53

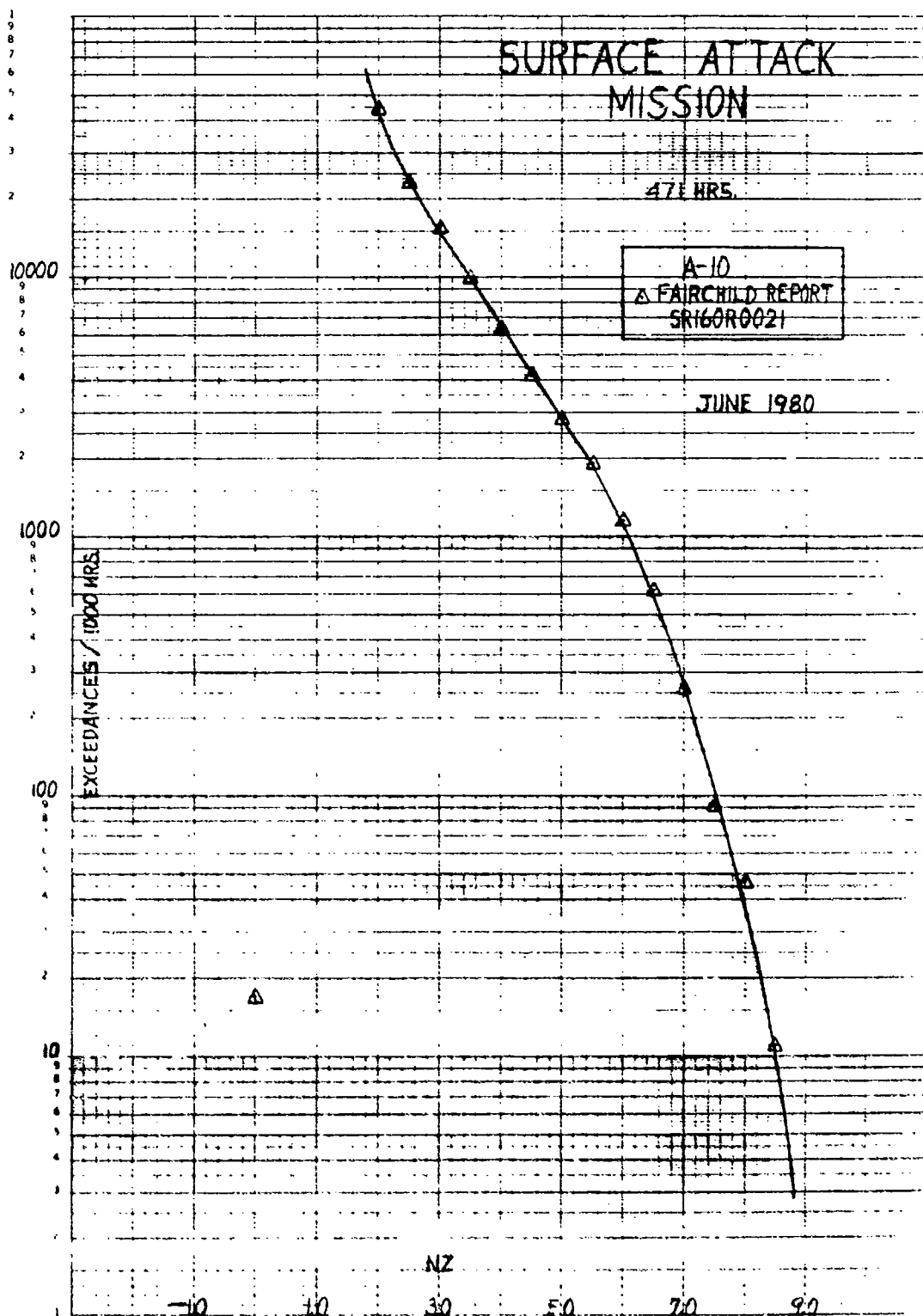


FIGURE 54

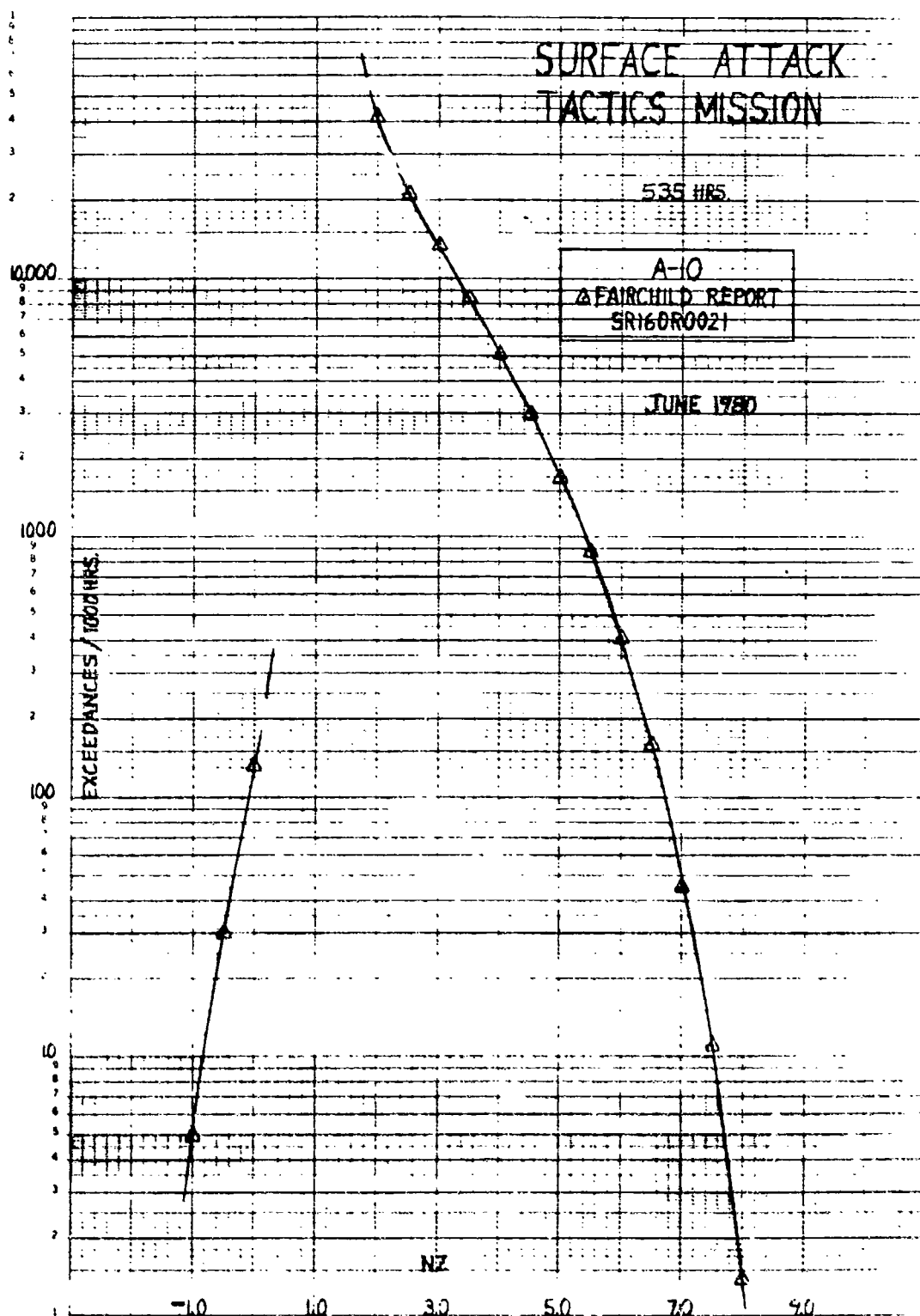


FIGURE 55

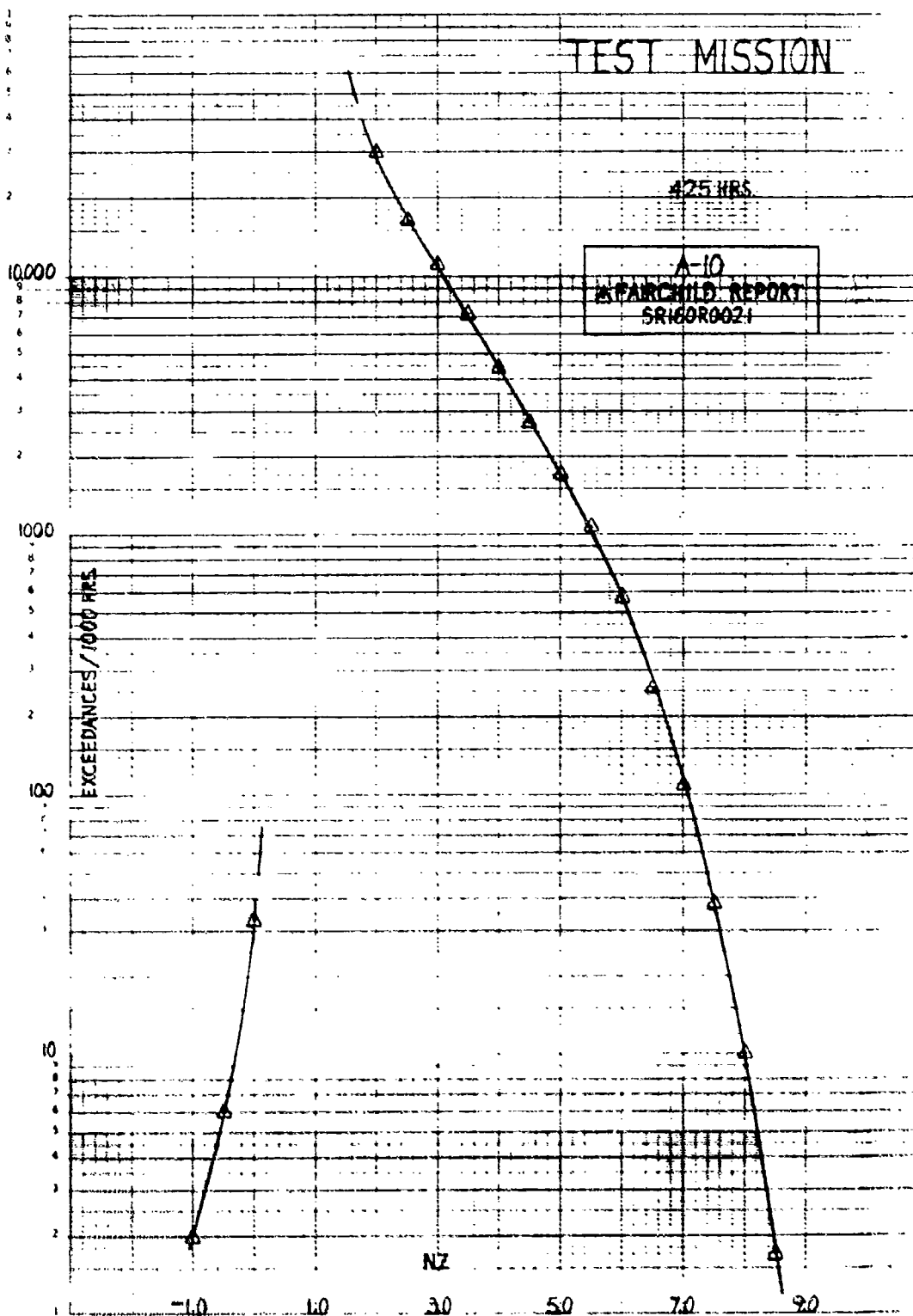


FIGURE 56

TABLE 18

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

FIGHTER CLASS CONUS MISSION DATA

NZ	TRANSITION ¹	INSTRUMENT/ FERRY	AIR COMBAT MANEUVERS	AIR TO AIR	AIR TO GROUND	
9.5				73	10.4	
9.0		29.6	26.8	109	20.9	
8.5	30.7	59	187	292	63	
8.0	245	89	669	438	125	
7.5	521	207	1620	876	417	
7.0	966	355	2396	1423	1178	
6.5	1641	444	3628	2299	1814	
6.0	2454	562	5489	3613	3233	
5.5	3635	888	7523	4964	5537	
5.0	5015	1154	9732	6642	8571	
4.5	7362	1805	13173	8431	12753	
4.0	10092	2456	17697	11277	17602	
3.5	12945	3254	22129	15146	22878	
3.0	17439	4645	28220	19927	29666	
2.5	22347	5917	34913	25620	36642	
2.0	23466	6391	36894	27847	38373	
0.0	337	89	1205	365	271	
-0.5	184	29.6	495	73	83	
-1.0	61		94	36.5	20.9	
-1.5	46		13.4		10.4	
-2.0	15.3					
HOURS:	65	34	75	27	96	

HOURS REFERS TO AMOUNT OF RECORDED DATA

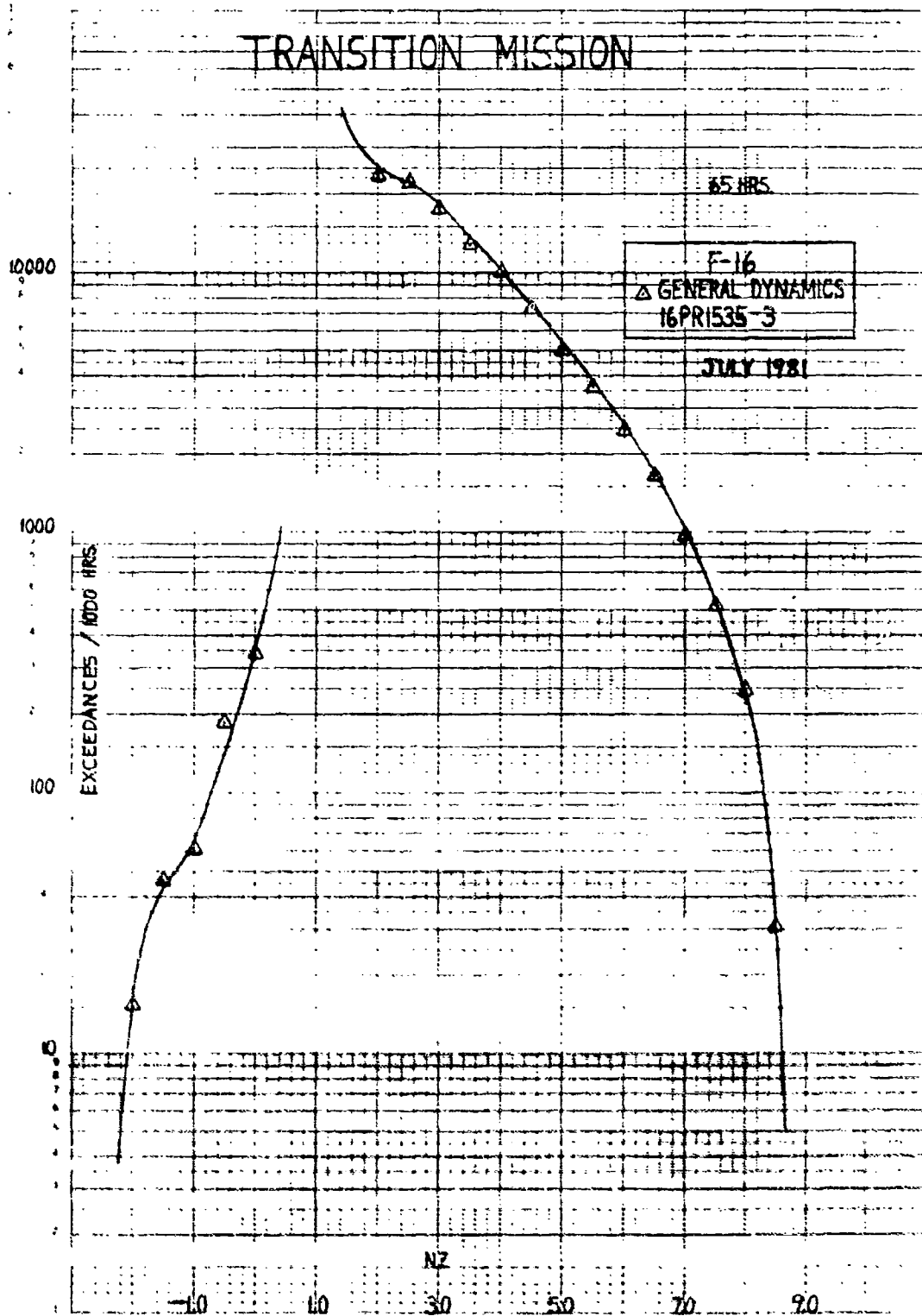


FIGURE 57

INSTRUMENT/FERRY MISSION

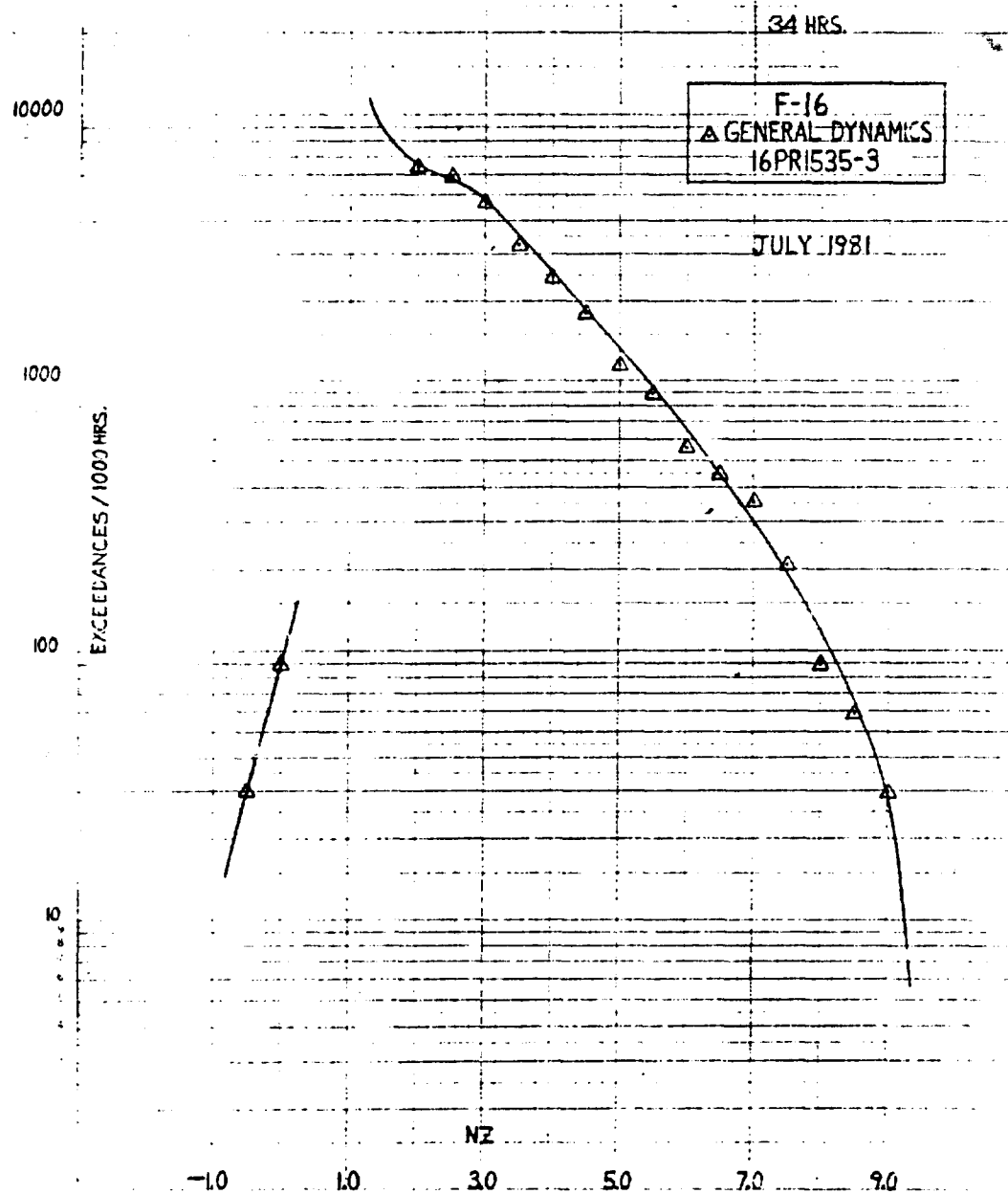


FIGURE 58

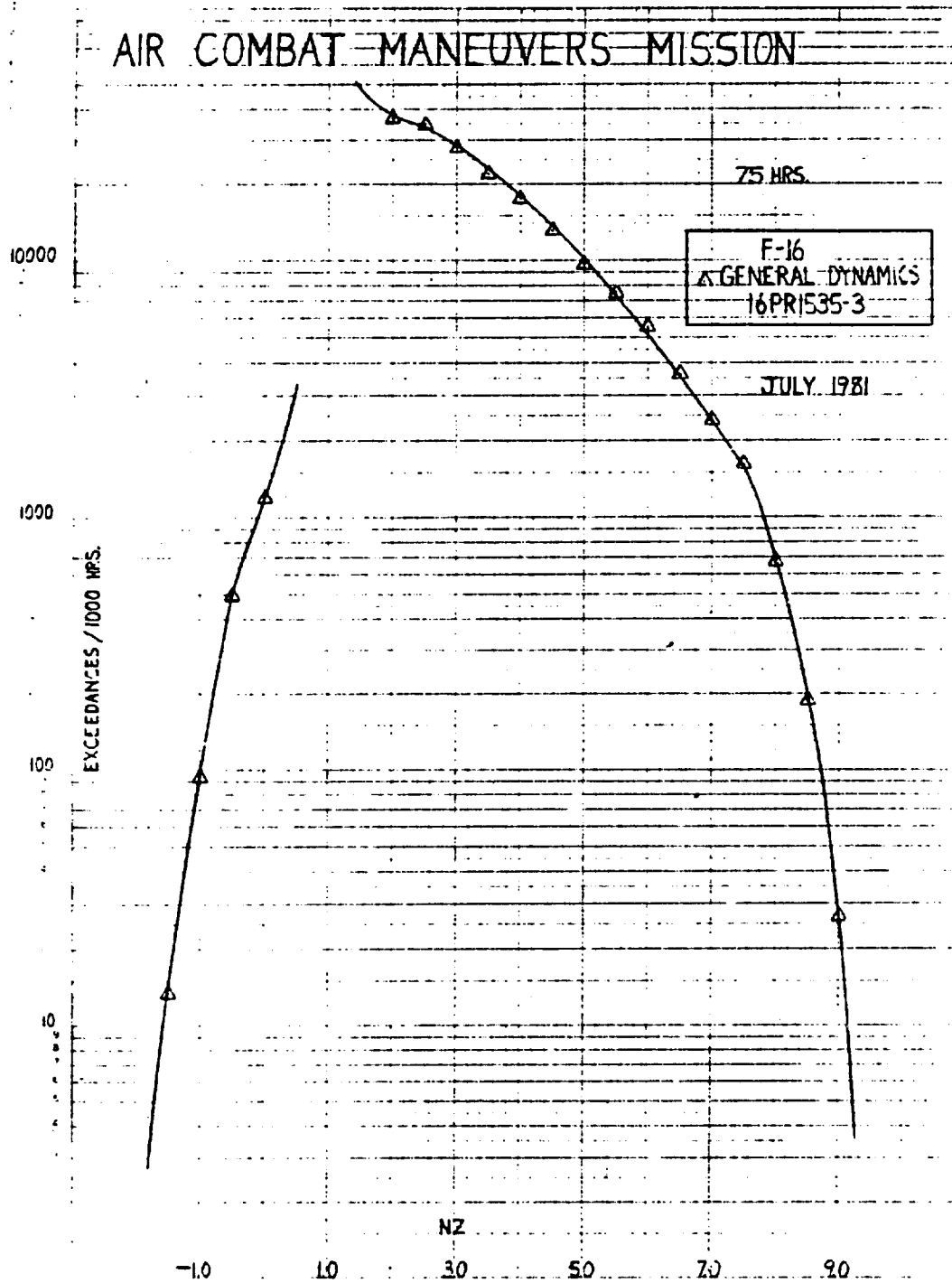


FIGURE 59

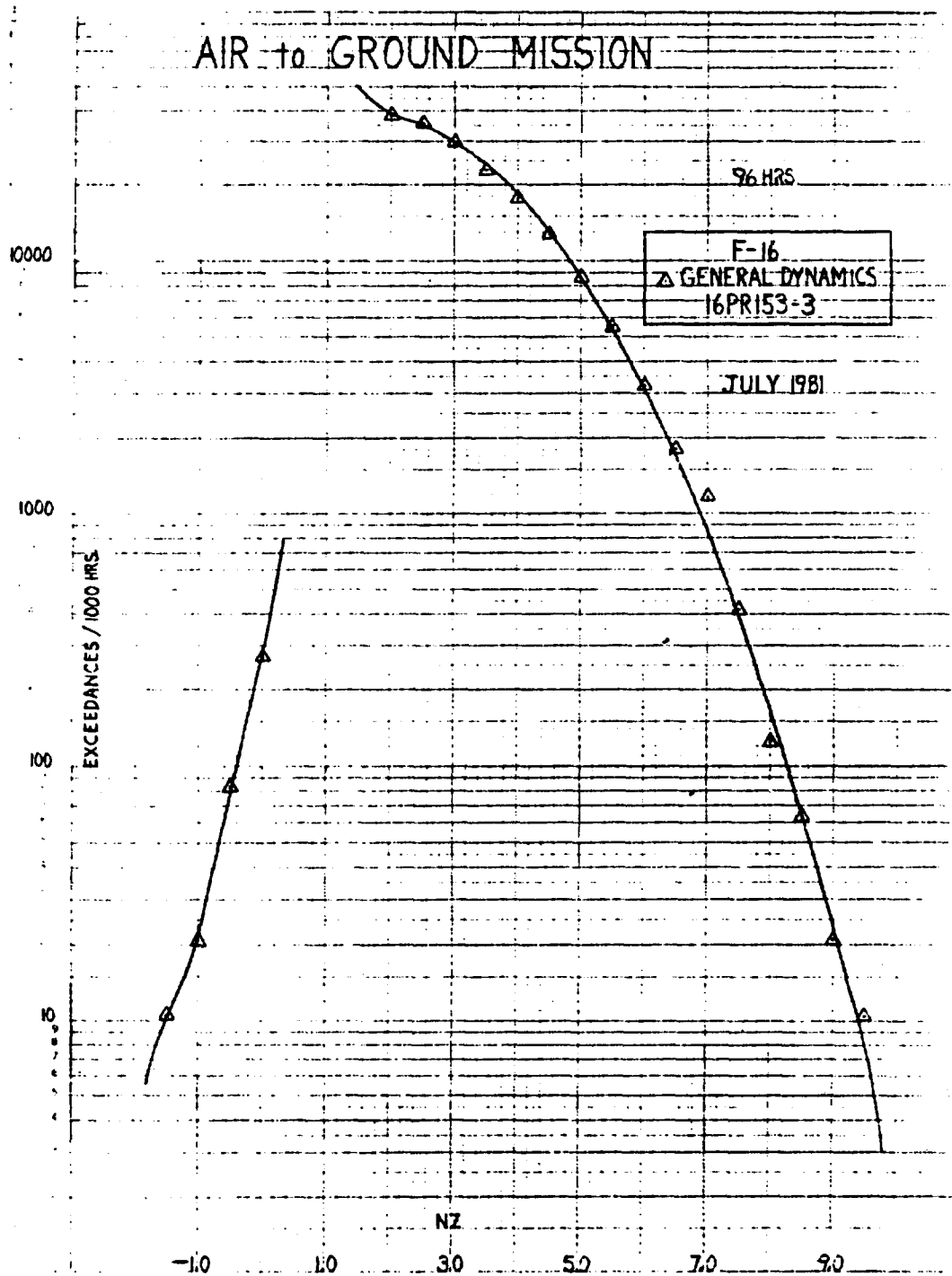


FIGURE 61

TABLE 19

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

MISSION DATA

NZ	BASIC	ADVANCED	INSTRUMENTS & NAVIGATION	FORMATION	TEST & ADMINISTRATIVE	
6.0	4	40	3		21	
5.5	13	154	9	5	43	
5.0	46	529	28	65	117	
4.5	164	1672	102	253	532	
4.0	474	4514	350	694	1342	
3.5	1368	8802	967	1834	3035	
3.0	5682	15120	2940	5390	6113	
2.5	23080	29521	8918	13018	15208	
2.0						
0.0	279	1817	206	242	596	
-0.5	38	576	12	43	197	
-1.0	19	226	2	21	75	
-1.5	4	75		5	16	
-2.0		22				
TOTAL:	262	809	577	186	188	

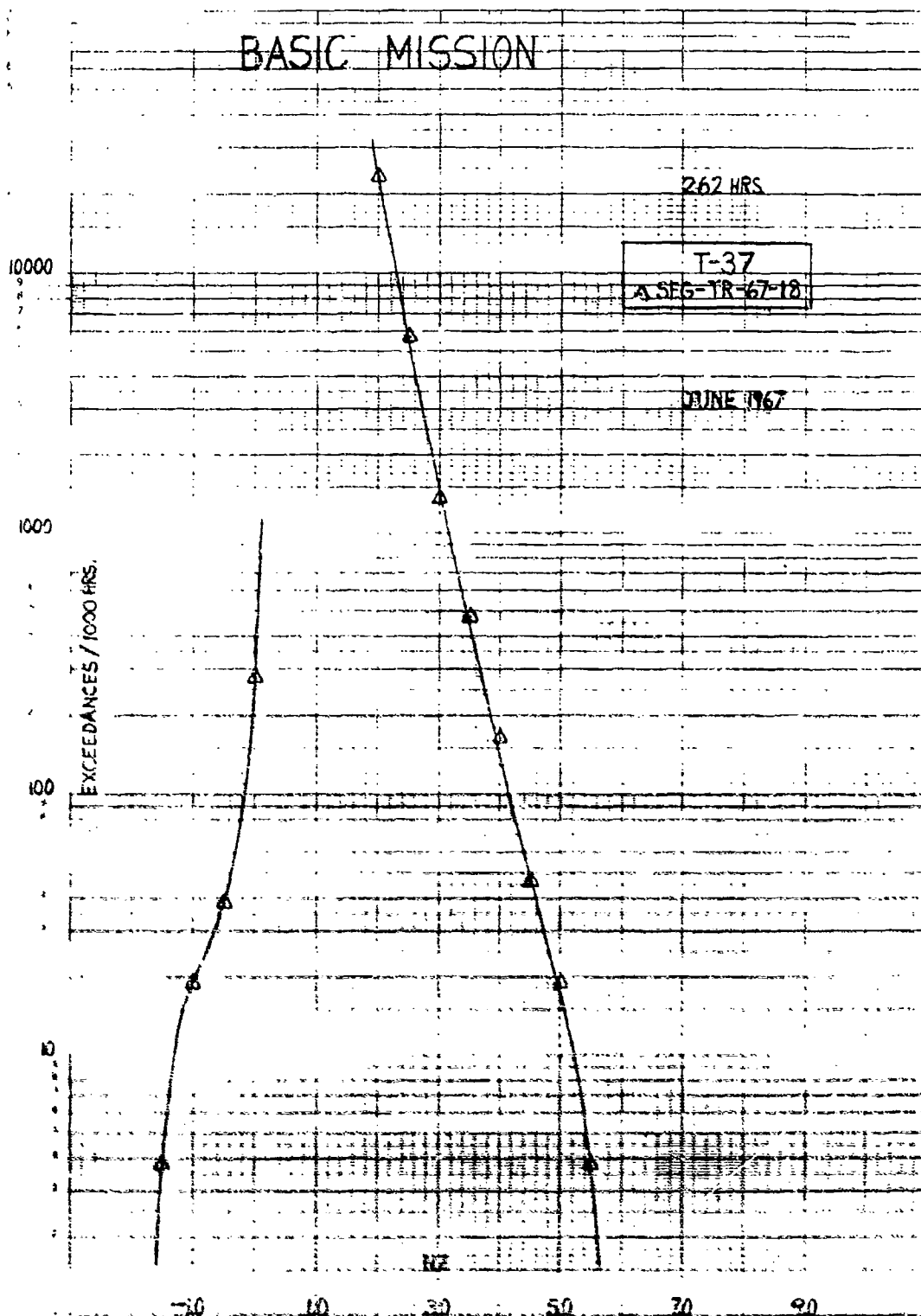


FIGURE 62

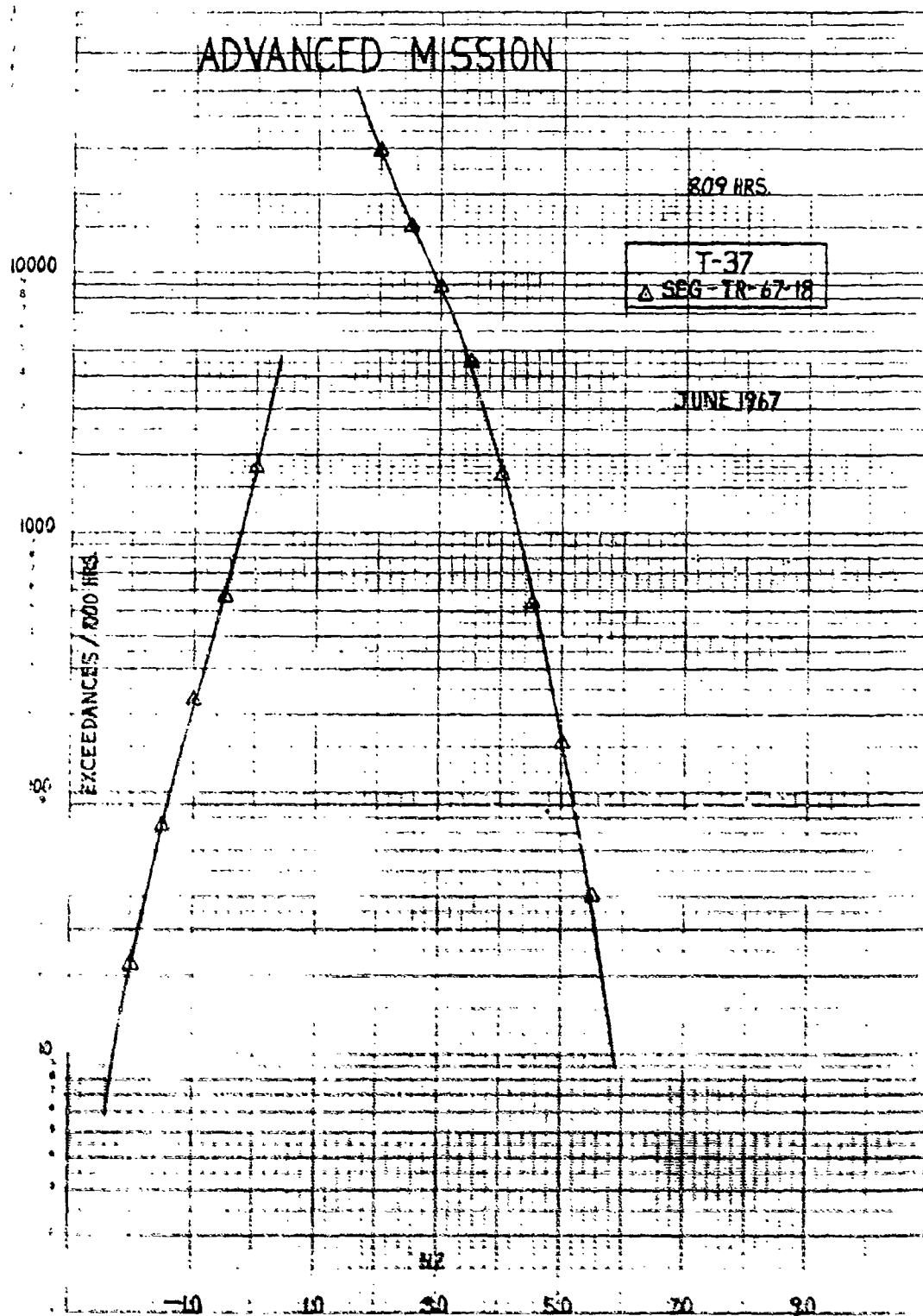


FIGURE 63

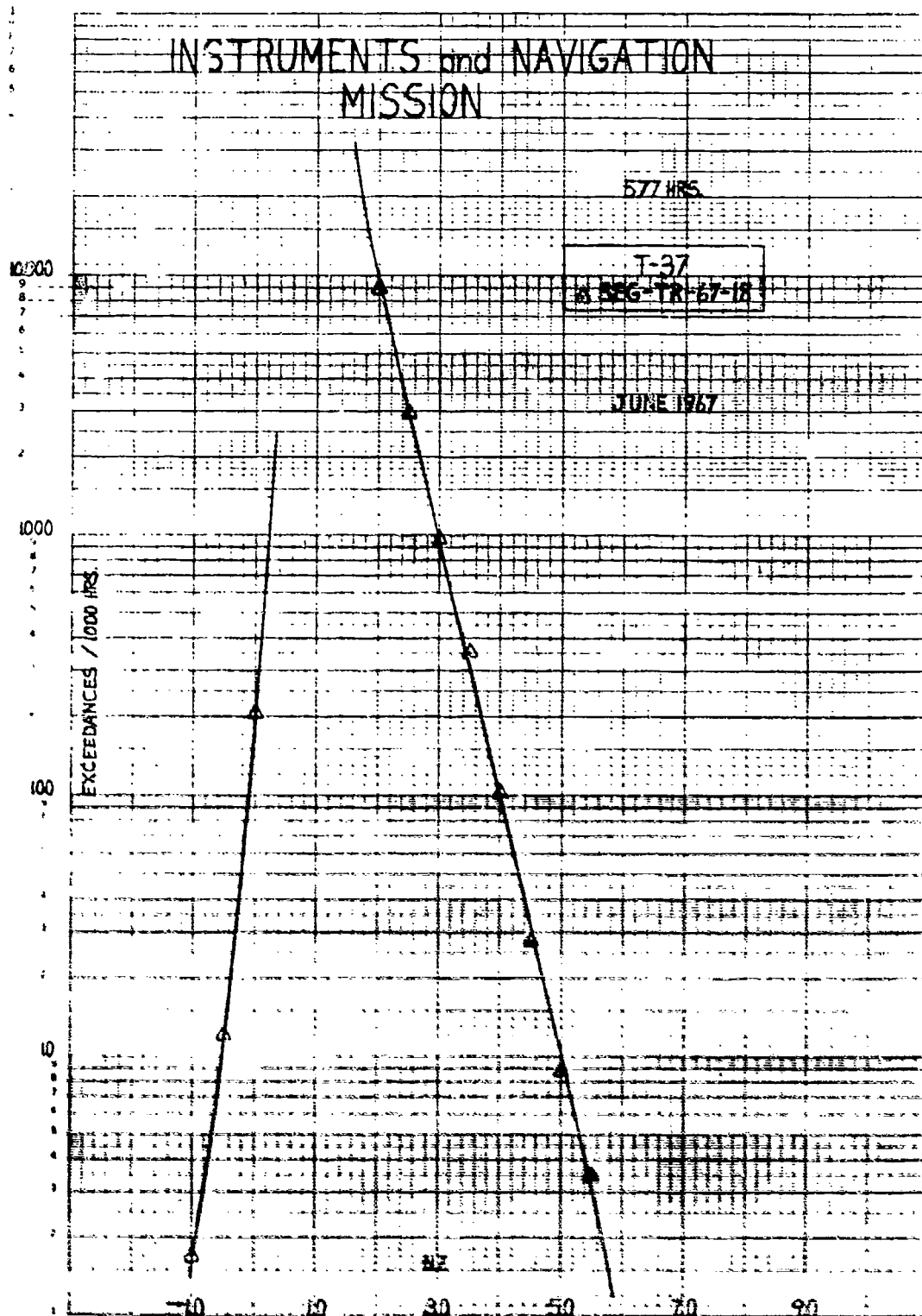


FIGURE 64

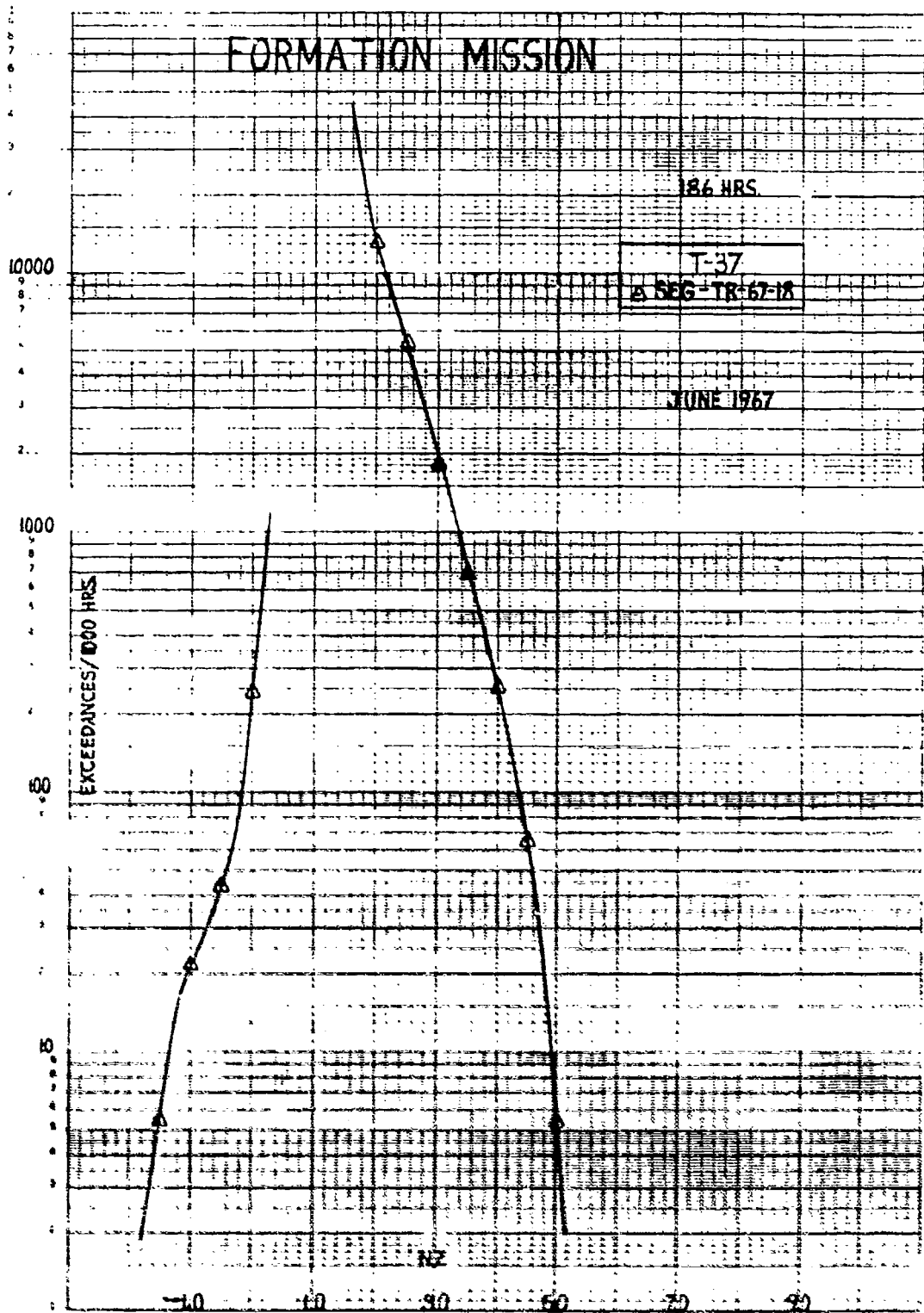


FIGURE 65

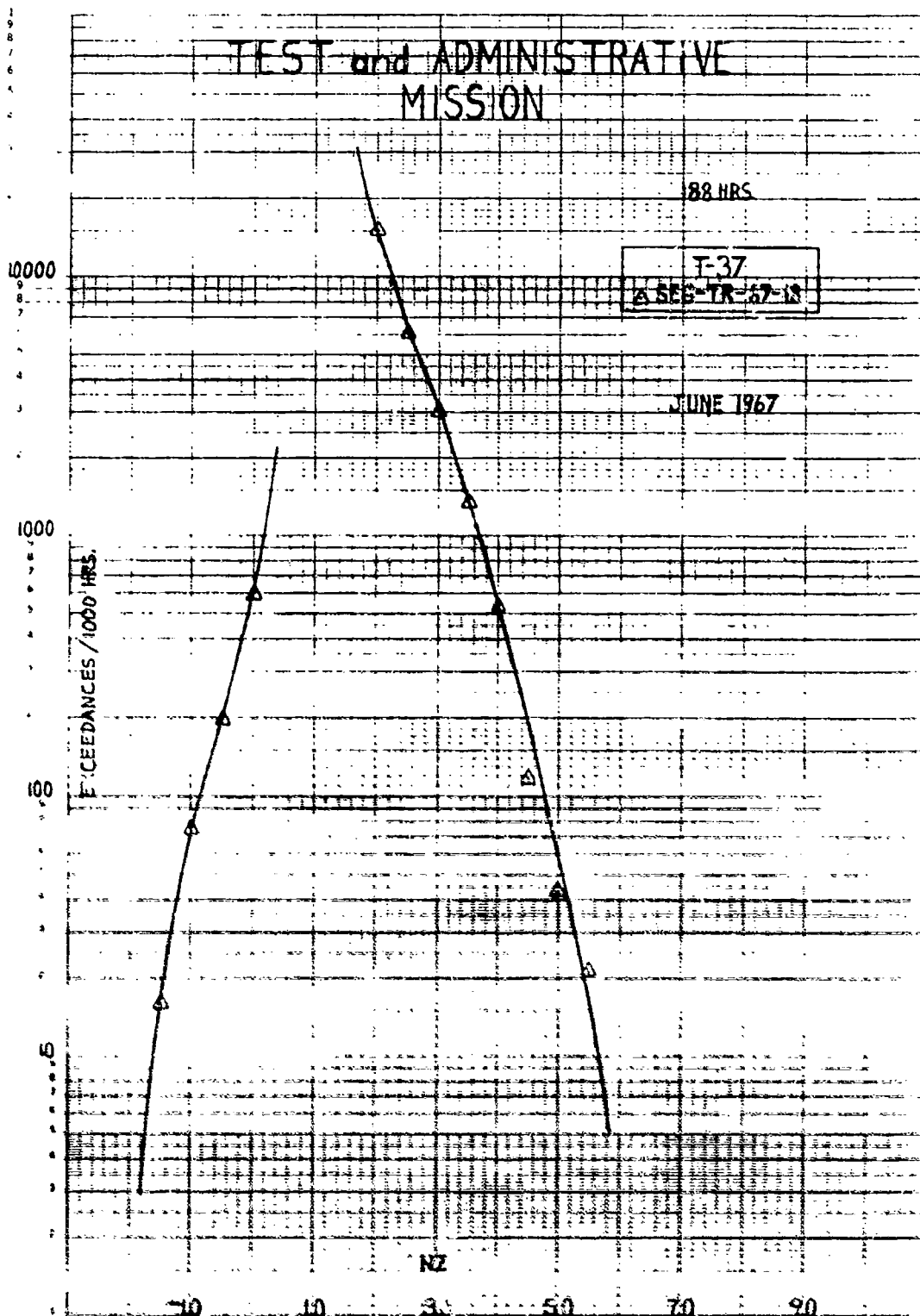


FIGURE 66

TABLE 20

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

NZ	TRAINER CLASS		MISSION DATA	
	TRAINING	FORMATION	NAVIGATION & GENERAL	ADMINISTRATIVE
8.0	3	6	2	58
7.5	13	29	5	250
7.0	52	135	17	690
6.5	202	435	56	1460
6.0	720	1030	173	2600
5.5	1630	2060	365	4076
5.0	2960	3150	670	7100
4.5	4400	4962	1367	13500
4.0	7075	9200	3600	
3.5	12500	19600	9300	
3.0	24700			
2.5				
2.0				
0.0	235	150	110	1000
-0.5	33	11	9	720
-1.0	10	4	3	446
-1.5	3	1		10
-2.0				
-2.5				
HOURS:	1933	265	1598	108

REFERENCE: T-38, (ASD-TR-72-54)

HOURS REFERS TO AMOUNT OF RECORDED DATA

TABLE 21

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

TRAINER CLASS		TRAINING MISSION PHASE DATA			
NZ	ASCENT	CRUISE	MANEUVER	DESCENT	PRACTICE LANDING
8.0			1		
7.5			5		
7.0			19		
6.5			76		
6.0			285		
5.5			1110	2	5
5.0			3500	7	17
4.5			8800	22	50
4.0		12	16300	71	260
3.5	7	90	25500	240	1628
3.0	58	554	35570	830	8900
2.5	400	3700	46500	2900	49000
2.0	2150	13200	61500	12400	
0.0	42	81	670	84	160
-0.5	7	11	153	12	4
-1.0	1	3	52	1	
-1.5			15		
-2.0			3		
-2.5					
HOURS:	174	760	345	278	355

REFERENCE: T-38, (ASD-TR-72-54) HOURS REFERS TO AMOUNT OF RECORDED DATA

TABLE 22

MANEUVER NZ EXCEEDANCES PER 1000 HOURS

TRAINER CLASS NAVIGATION AND GENERAL MISSION PHASE DATA

NZ	ASCENT	CRUISE	MANEUVER	DESCENT	PRACTICE LANDING
8.0			1		
7.5			13		
7.0			57		
6.5			177		
6.0		1	570	3	
5.5		3	1840	13	
5.0		5	5700	35	
4.5		8	12200	106	22
4.0	2	17	22500	444	265
3.5	19	72	35385	2100	1645
3.0	79	331	48500	10300	9600
2.5	320	1900	64000		31500
2.0	1700	10400			
0.0	80	92	710	74	93
-0.5	2	7	140	1	1
-1.0		2	44		
-1.5					
-2.0					
-2.5					
HOURS:	164	1048	46	288	53

HOURS REFERS TO AMOUNT OF RECORDED DATA

REFERENCE: T-38, (ASD-TR-72-54)

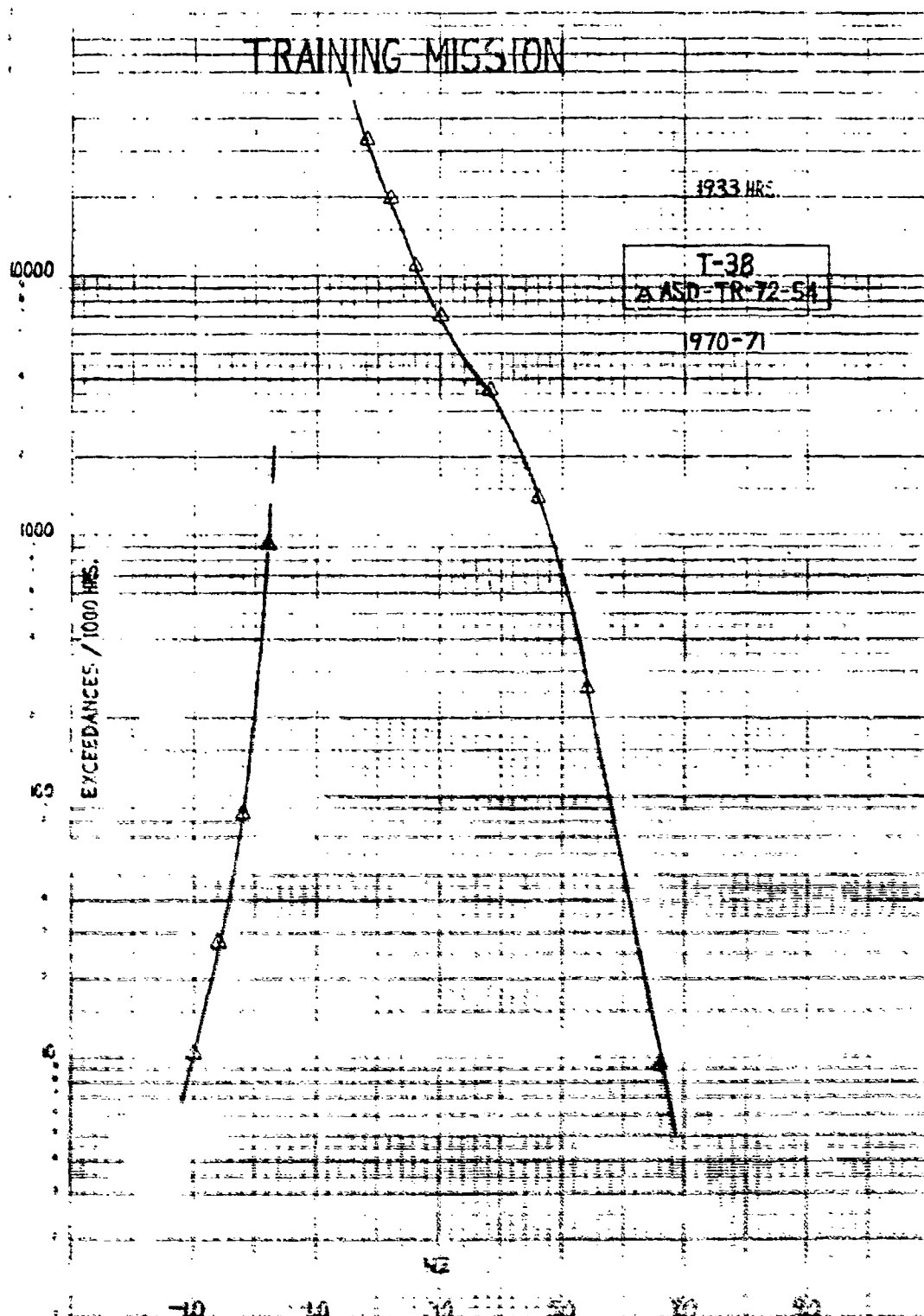


FIGURE 67

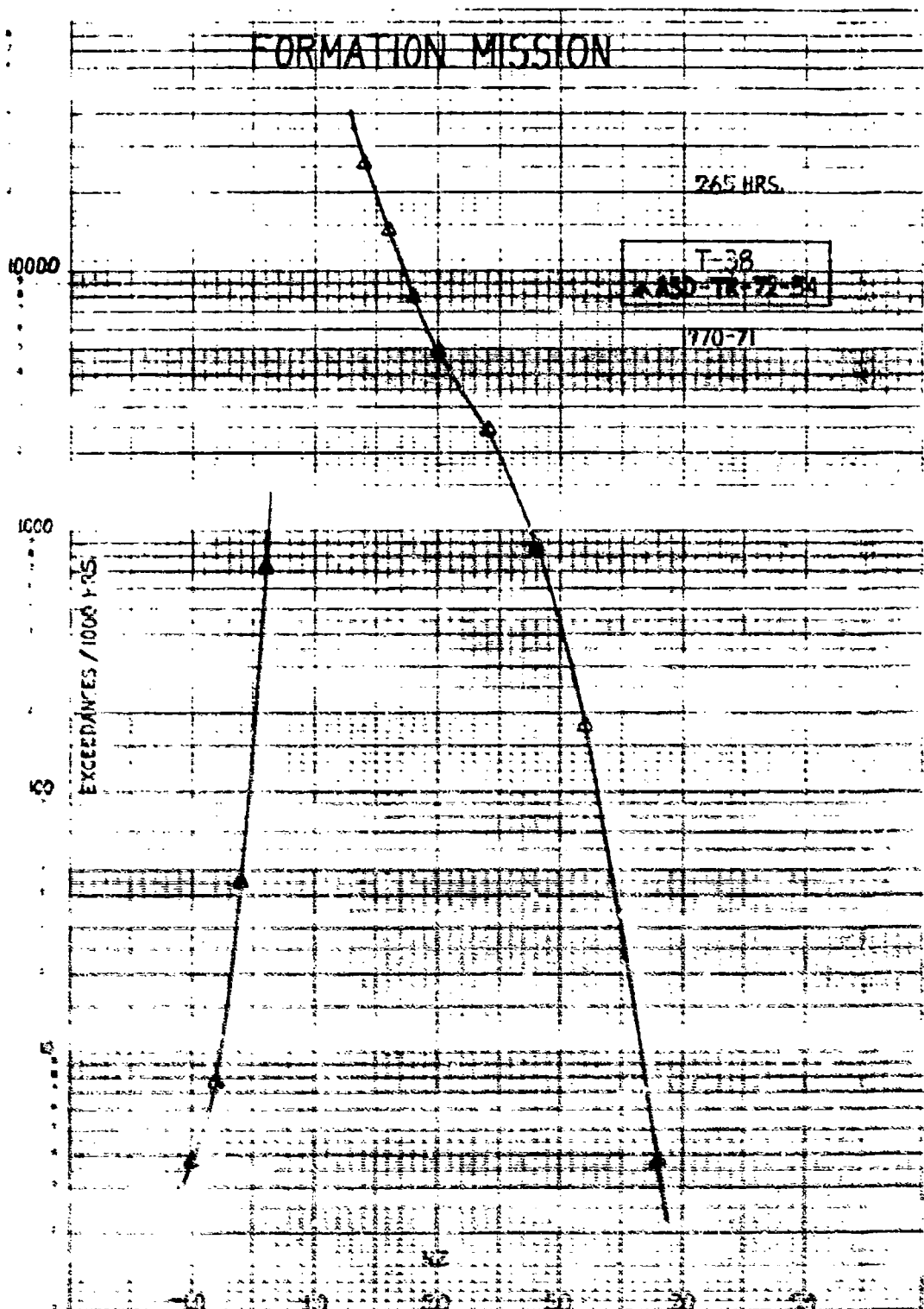


FIGURE 68

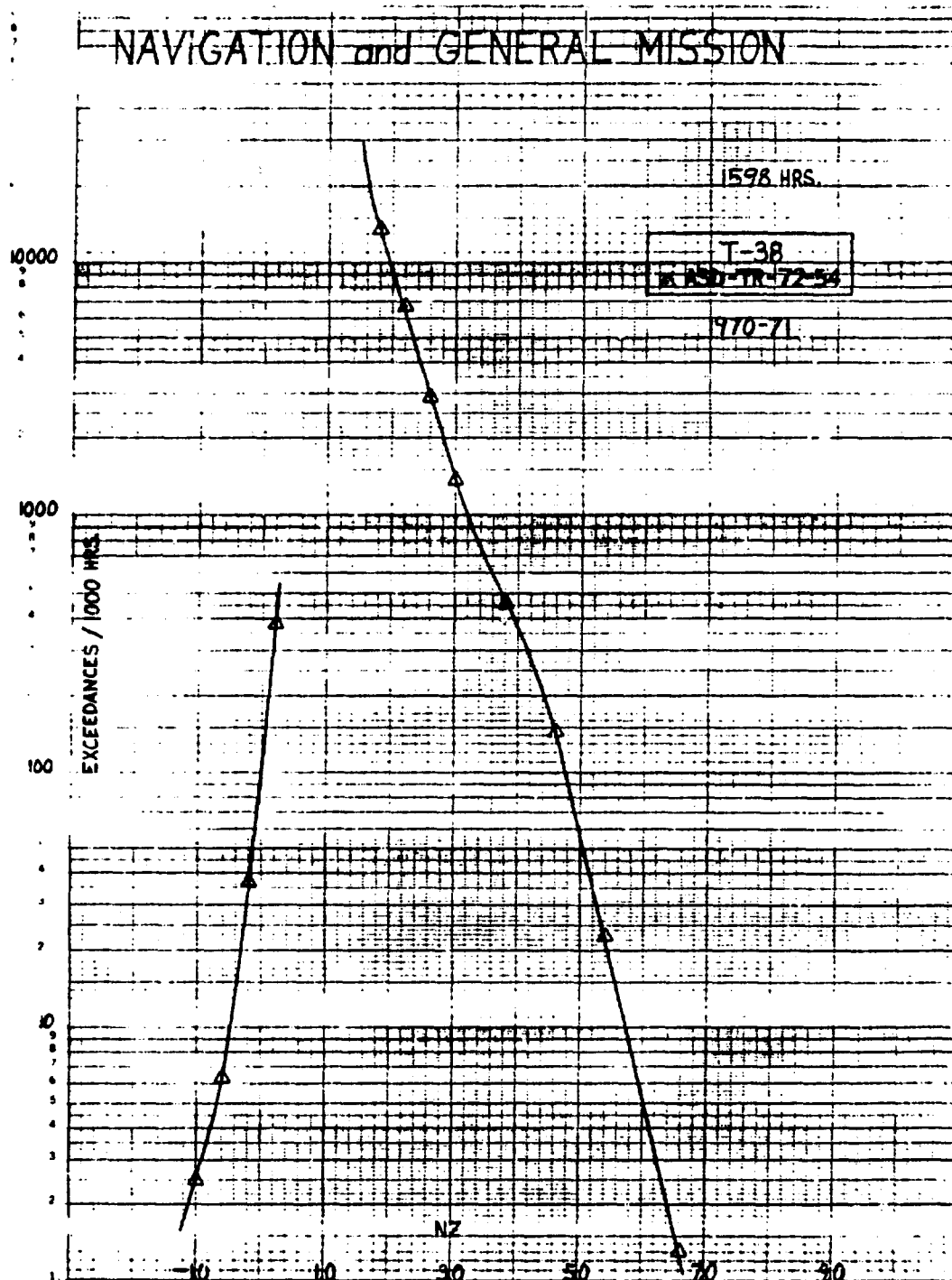


FIGURE 69

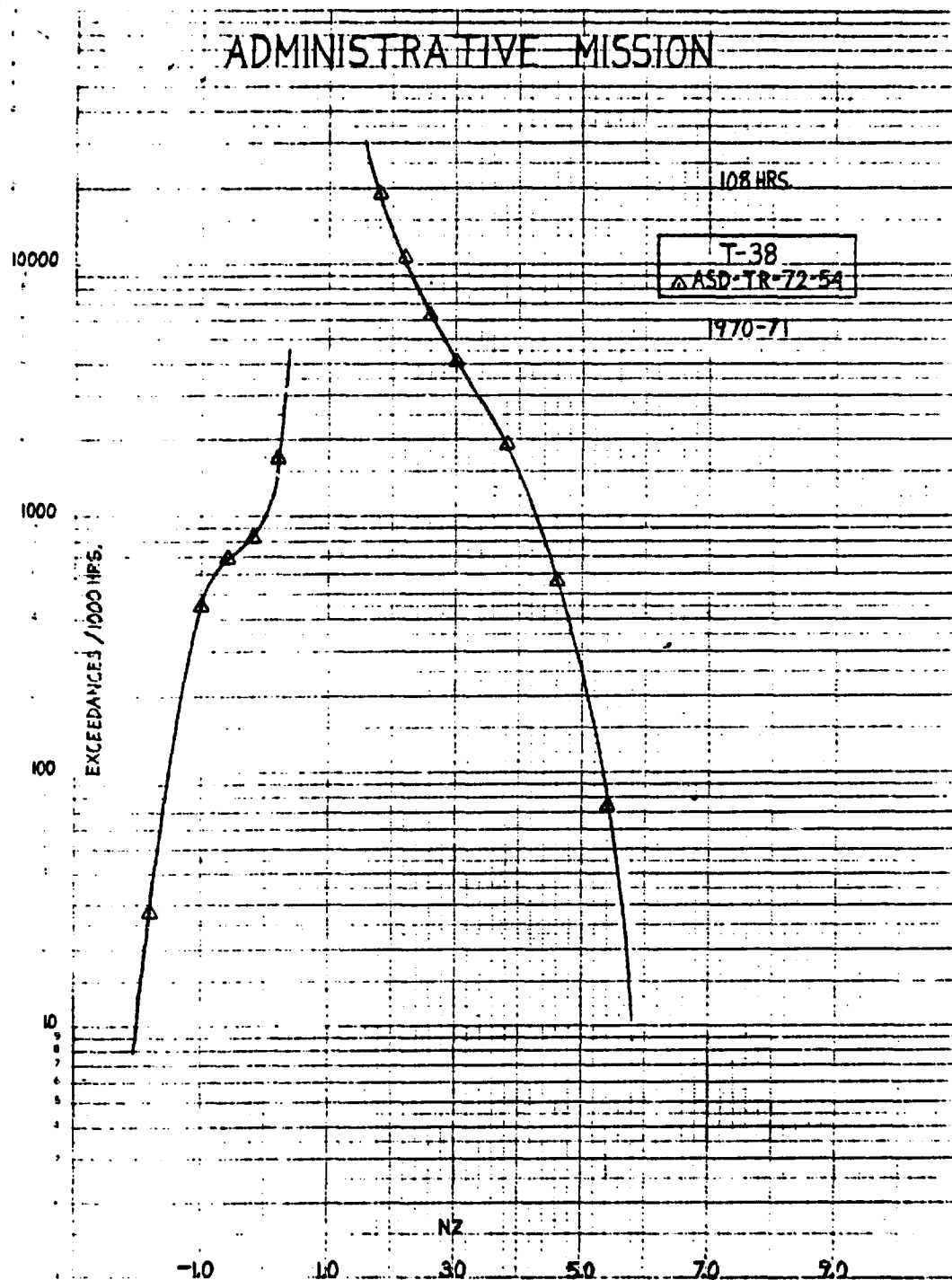


FIGURE 70

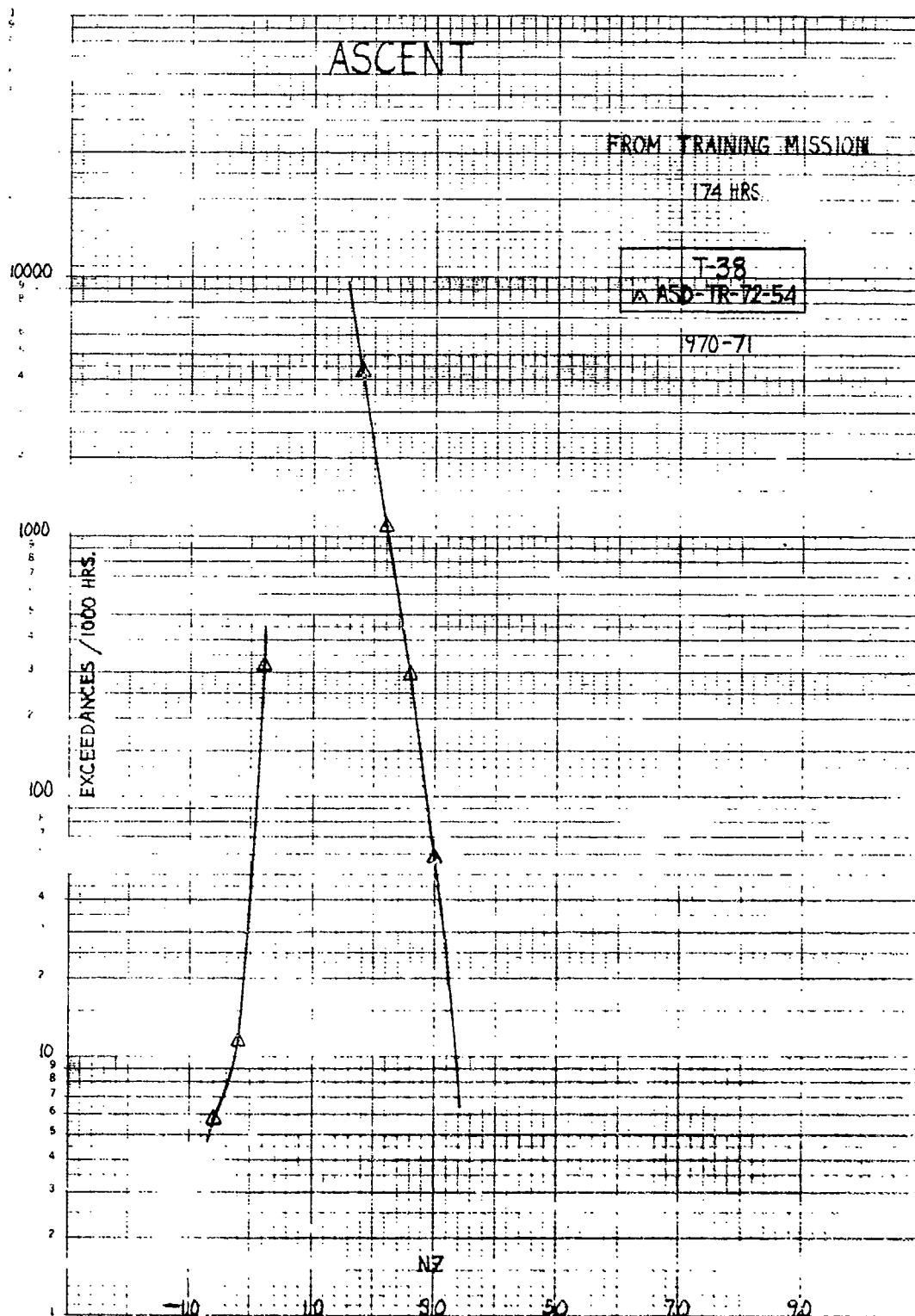


FIGURE 71

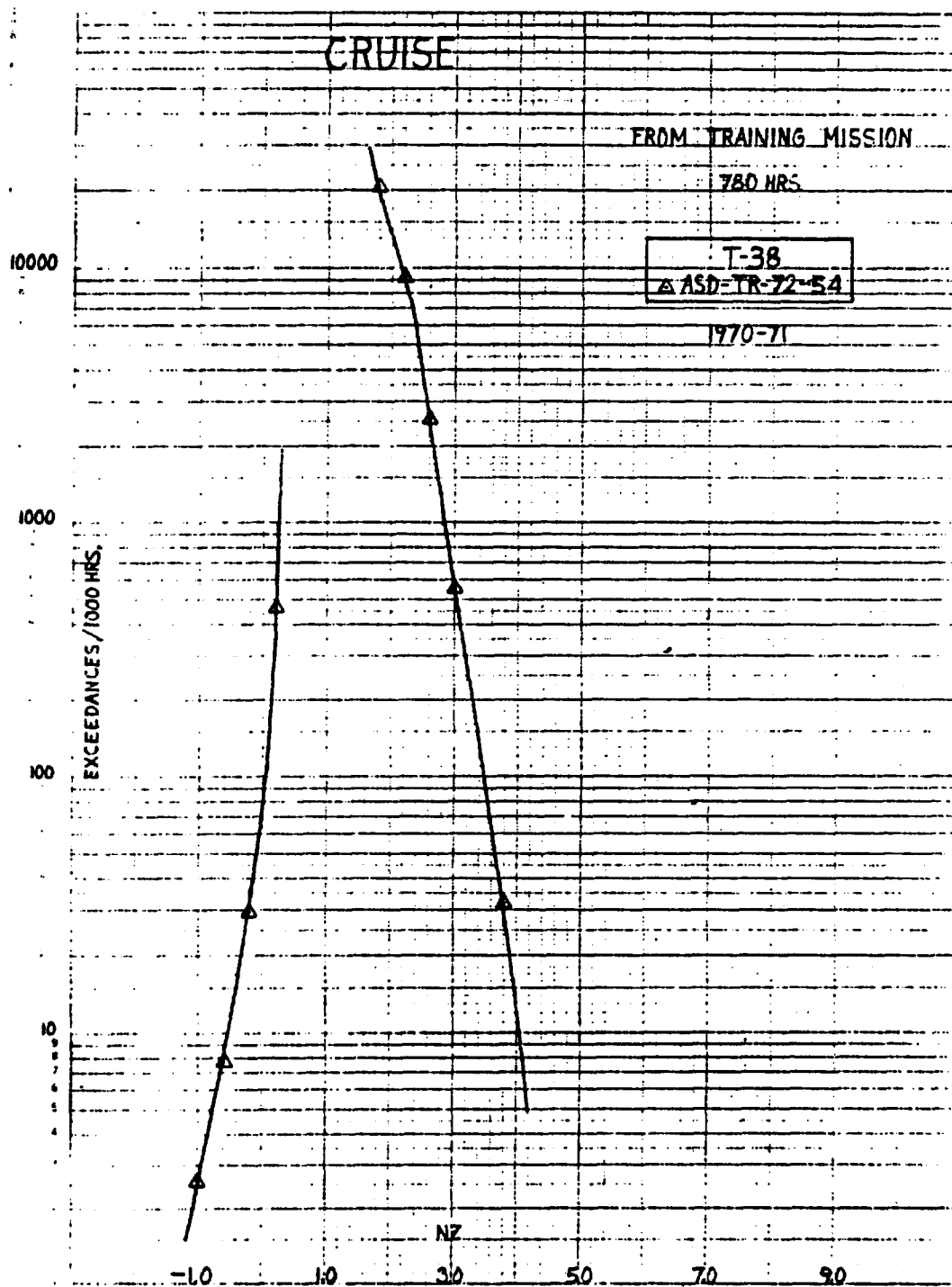


FIGURE 72

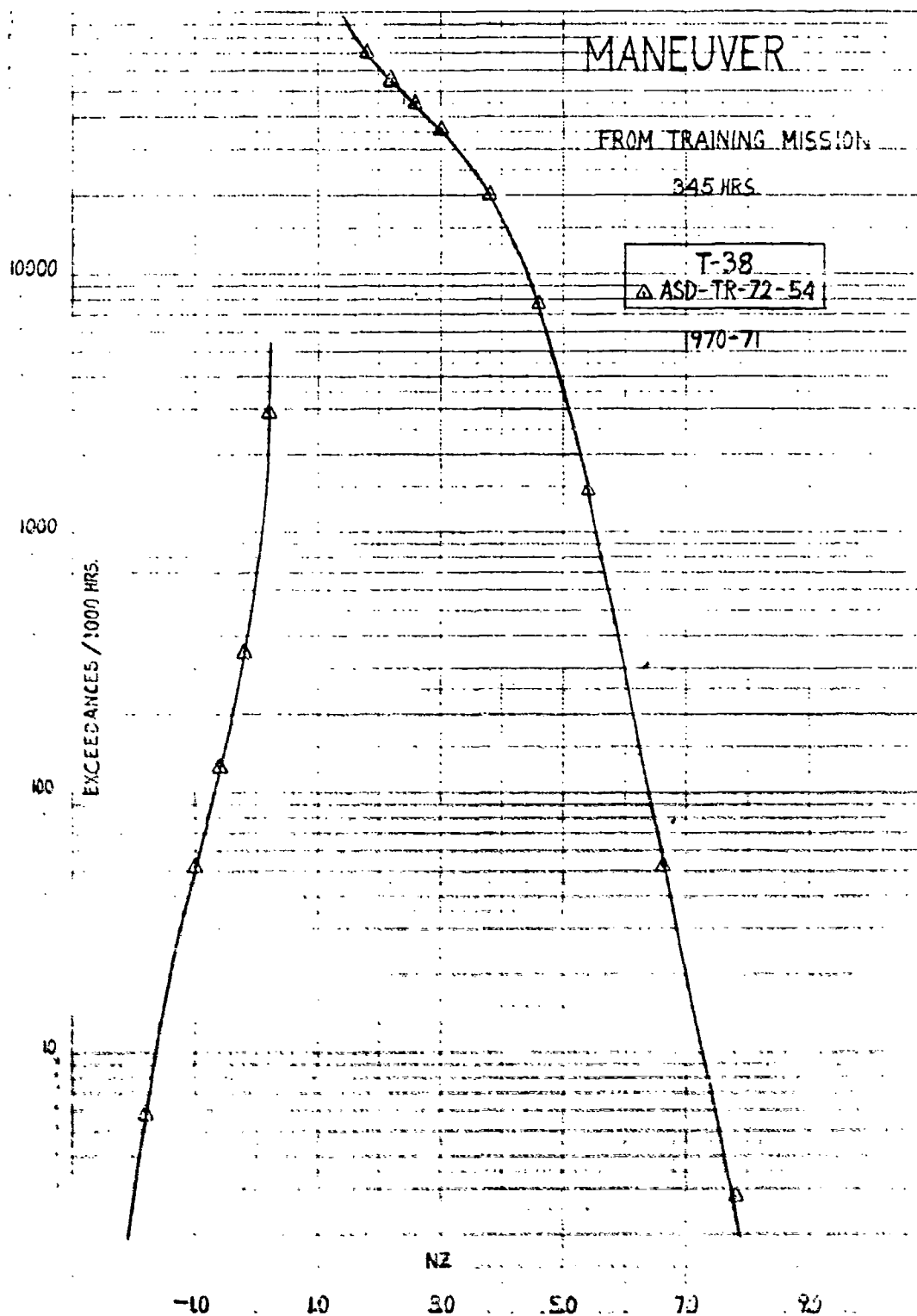


FIGURE 73

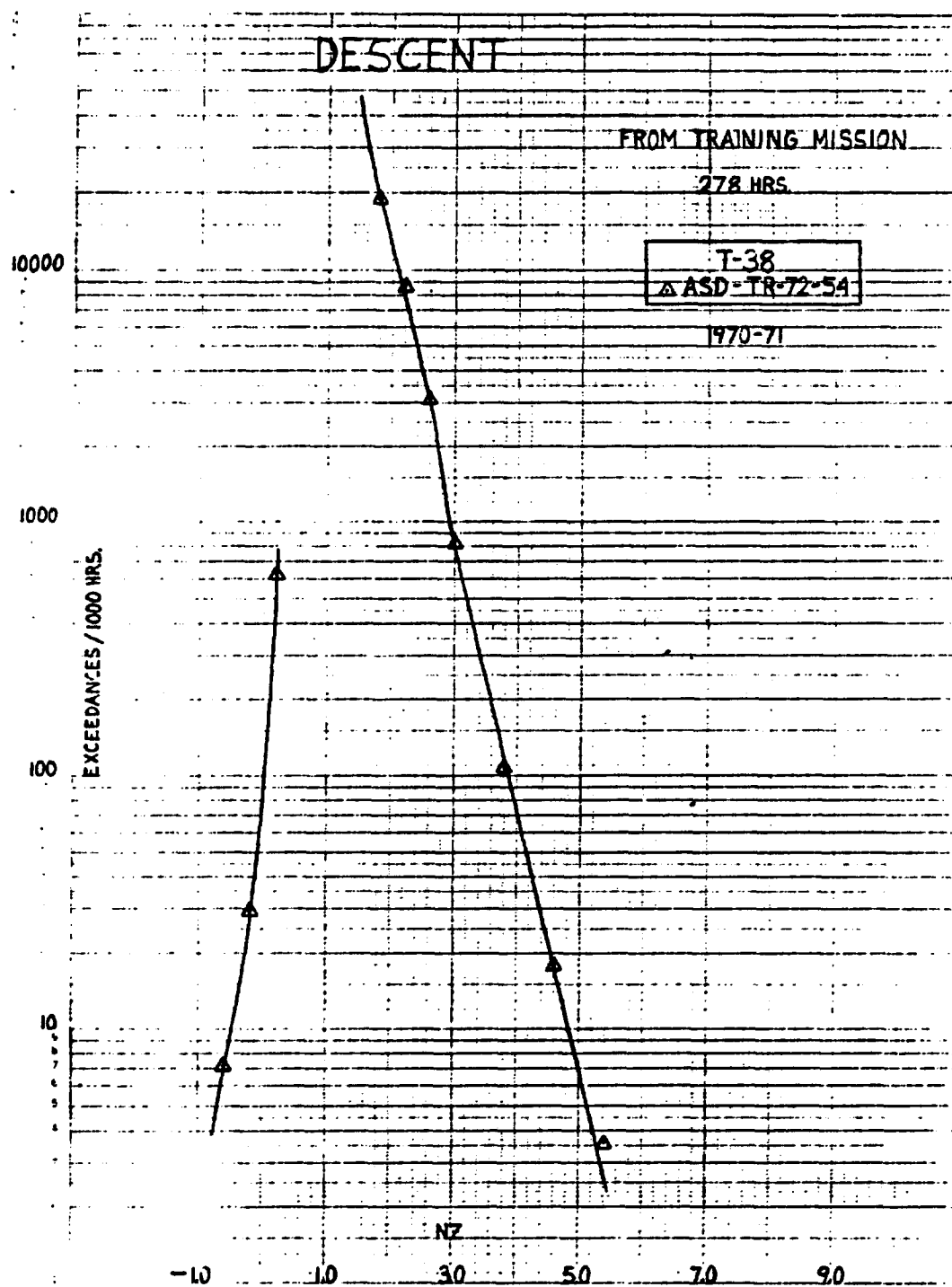


FIGURE 74

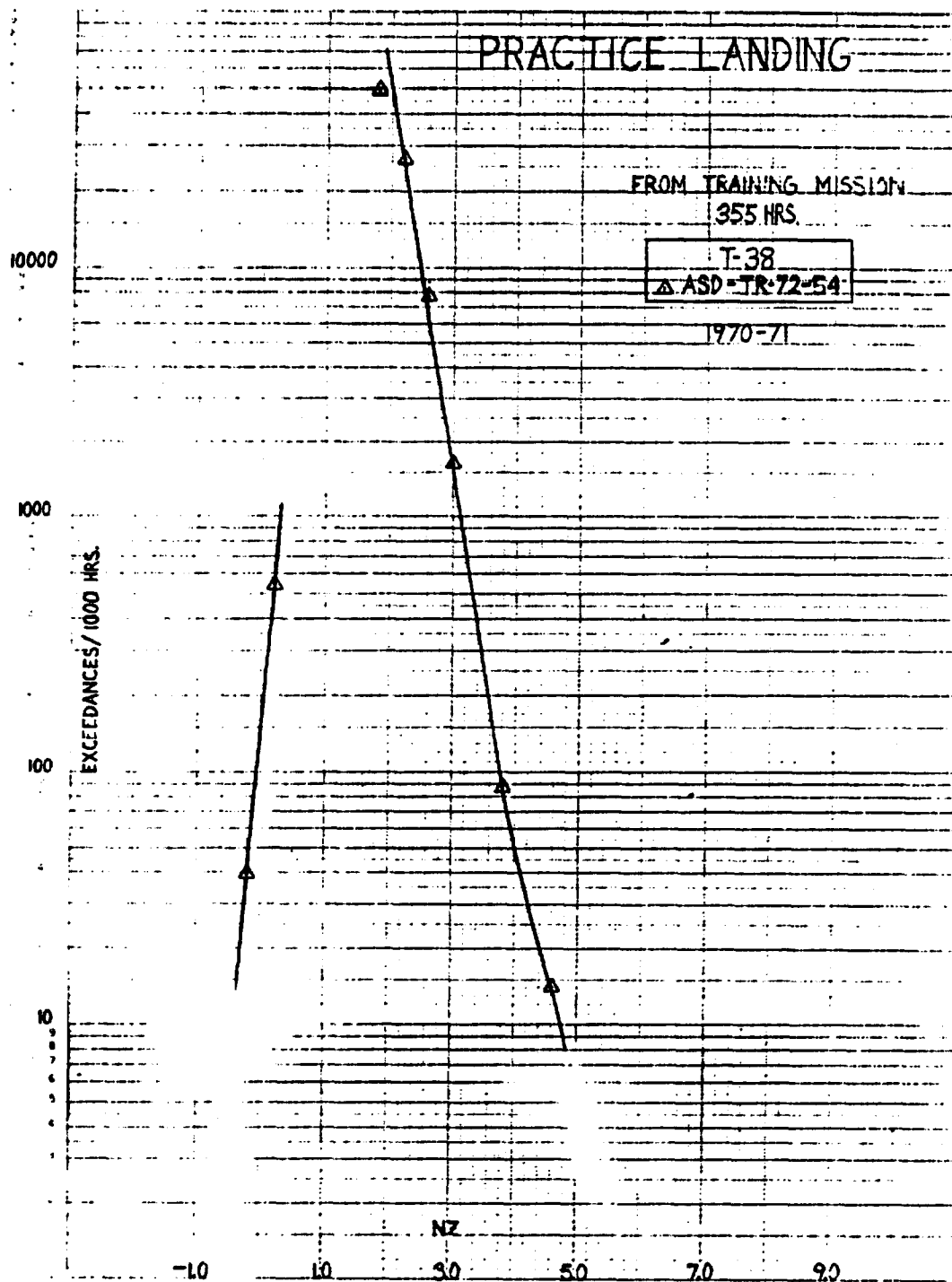


FIGURE 75

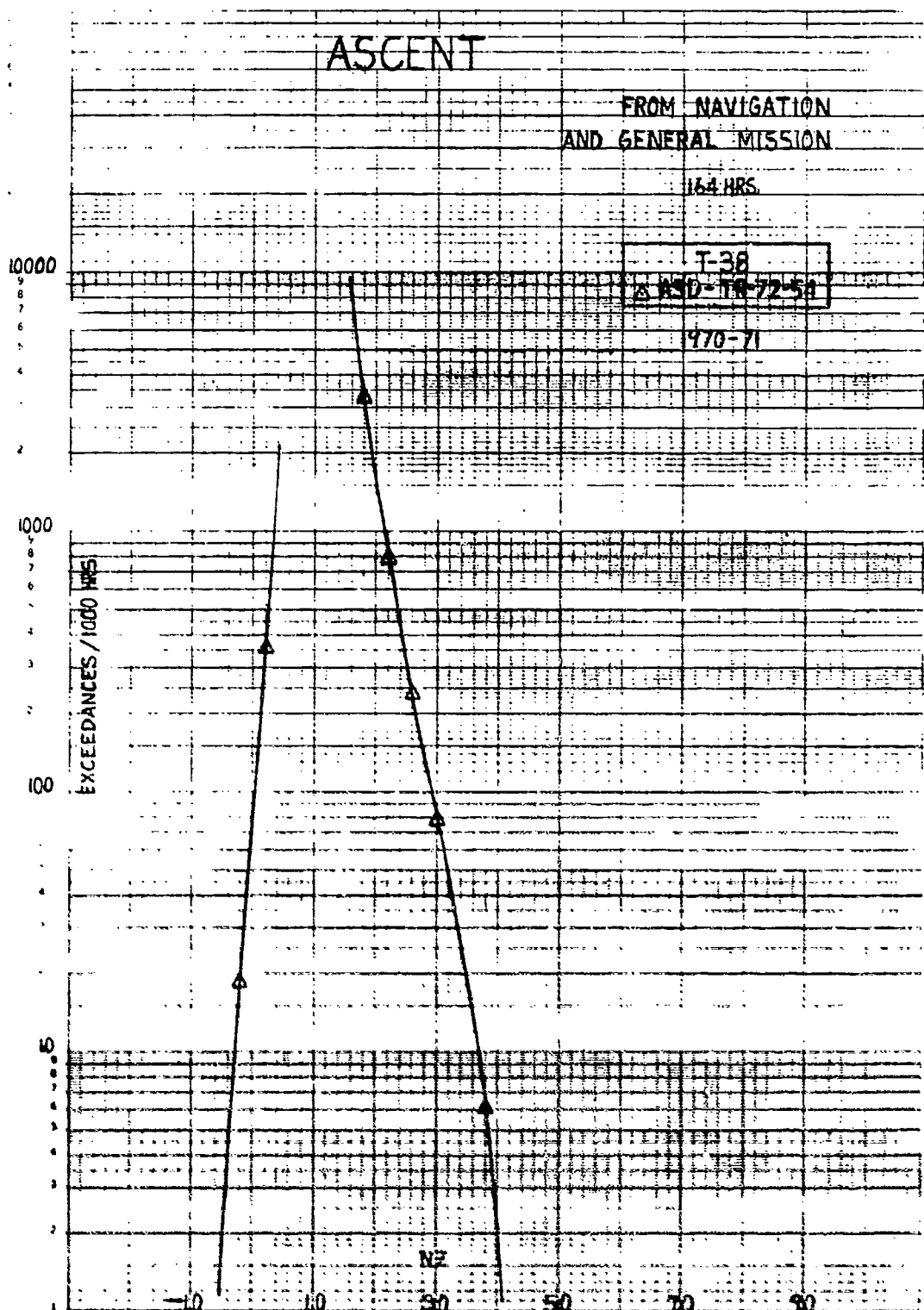


FIGURE 76

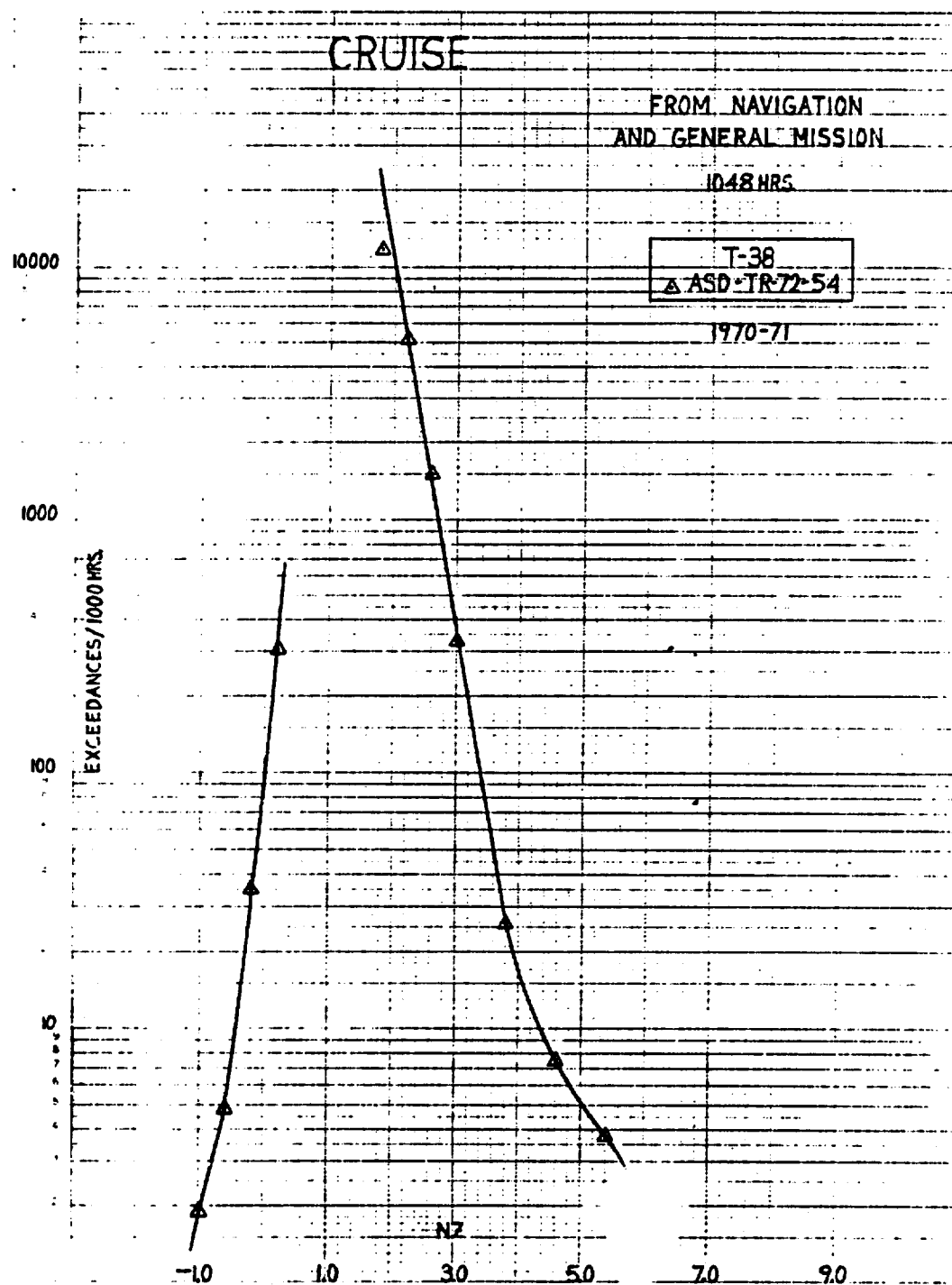


FIGURE 77

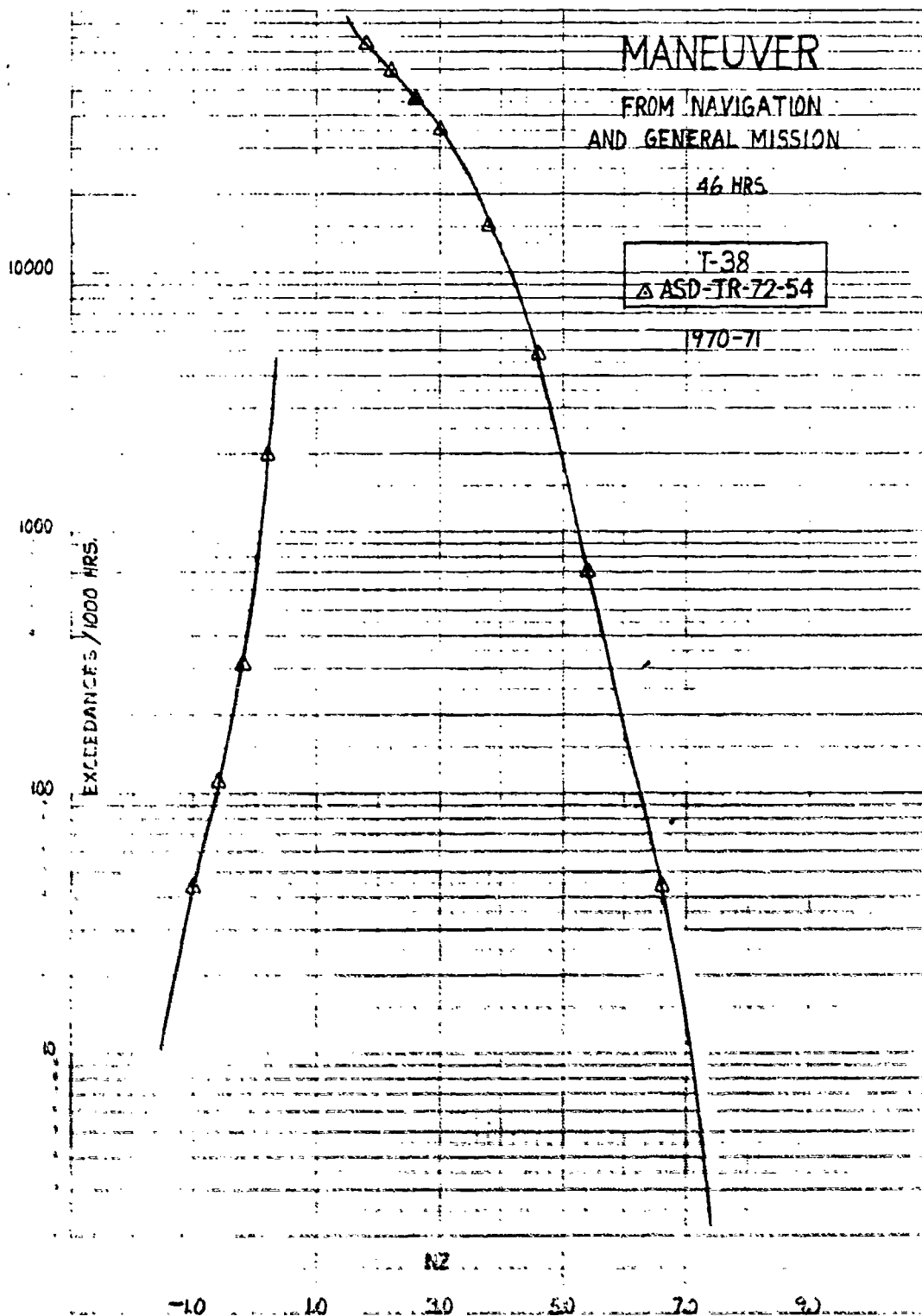


FIGURE 78

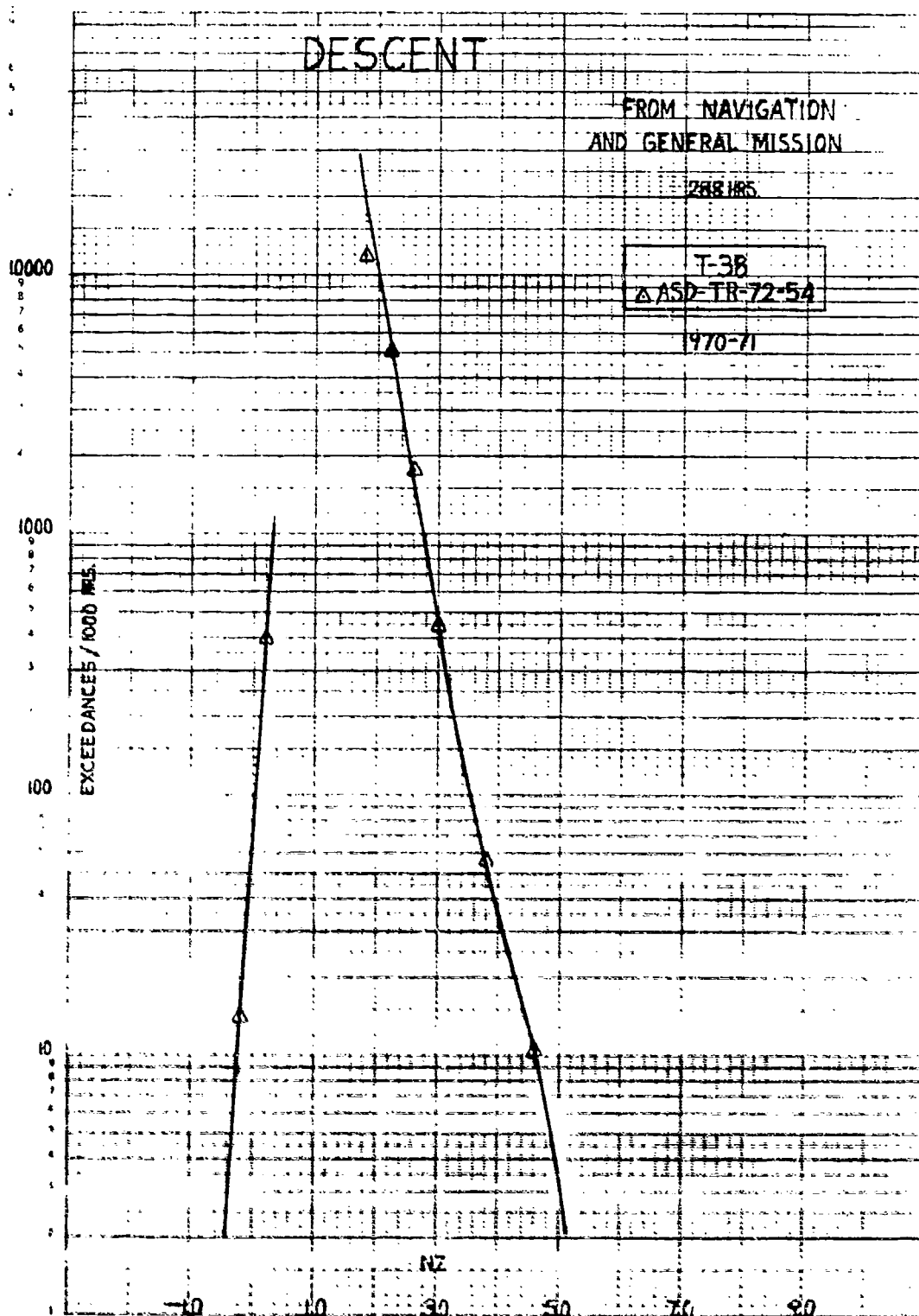


FIGURE 79

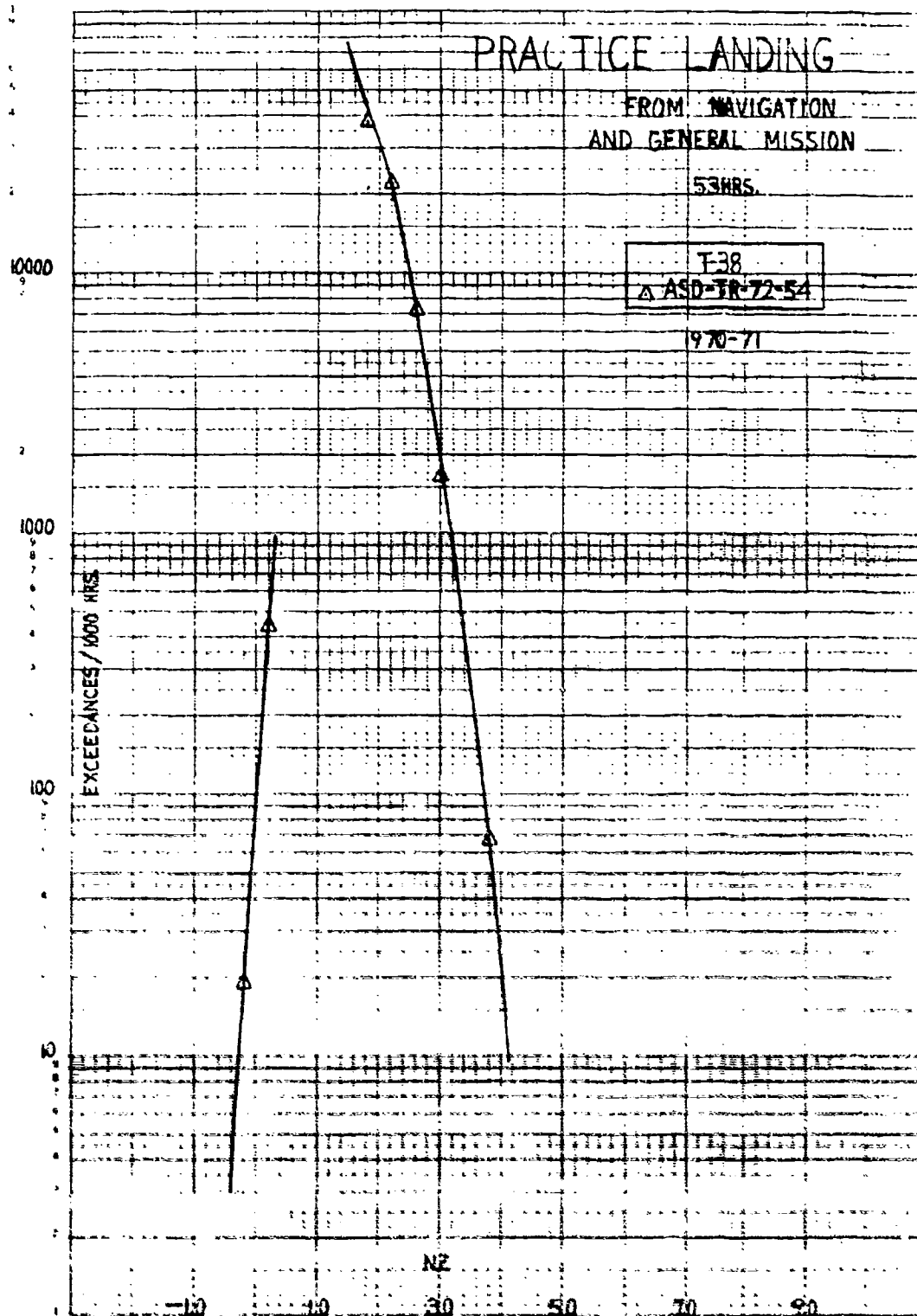


FIGURE 80

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