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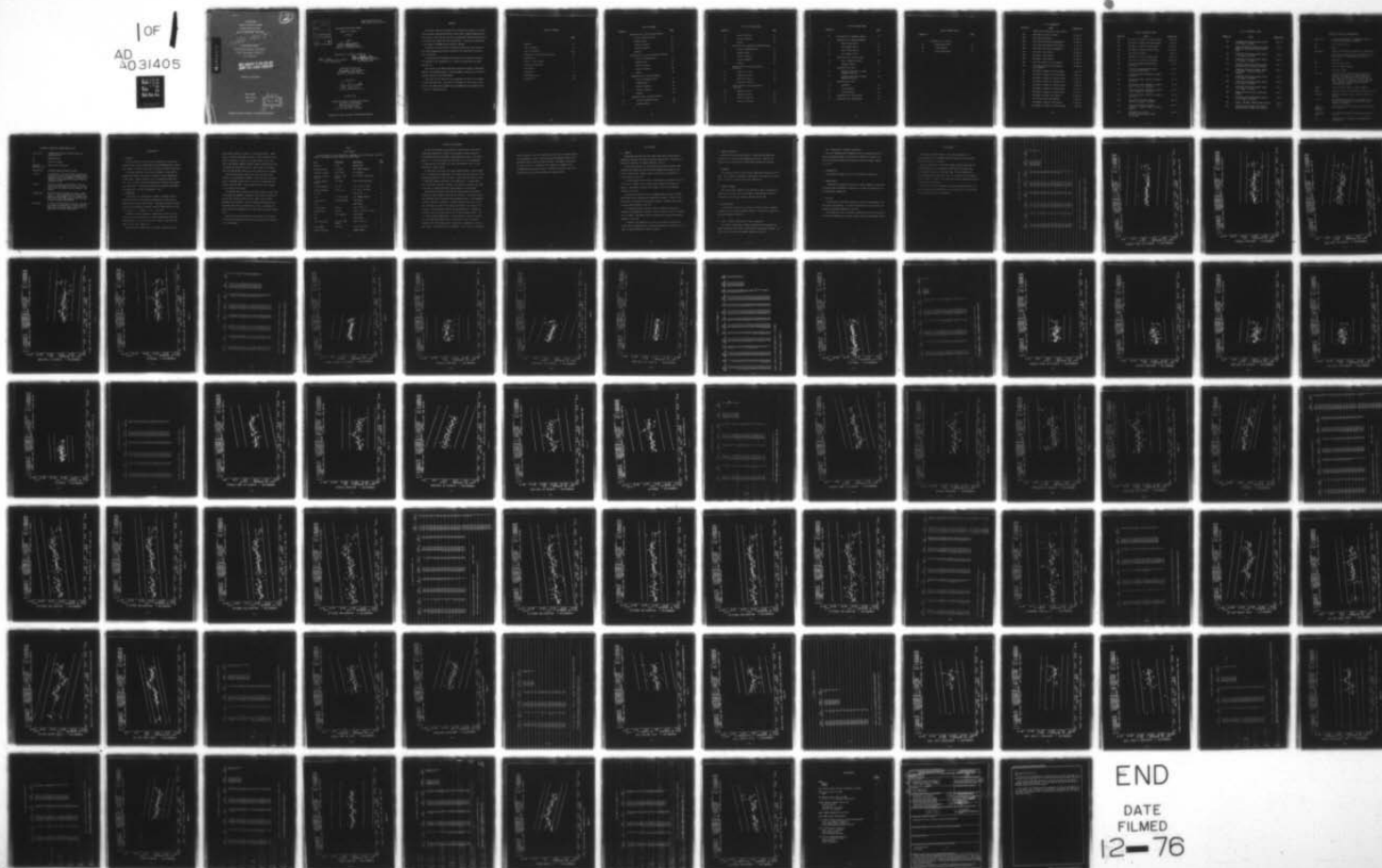
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PROPELLANT SURVEILLANCE REPORT LGM-30 A AND B STAGE I, TP-H1011--ETC(U)
SEP 76 J A THOMPSON

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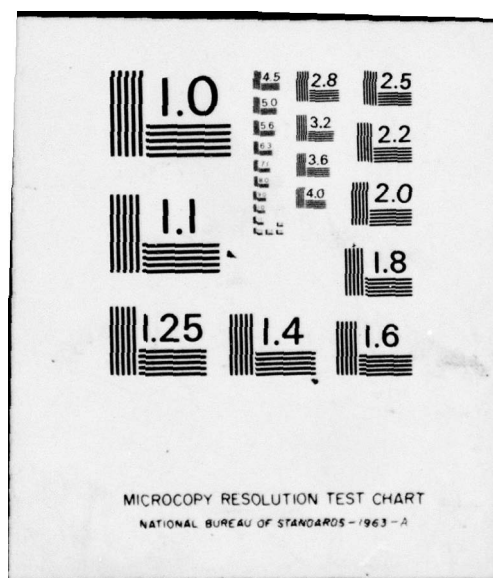
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UNITED STATES AIR FORCE
HILL AIR FORCE BASE, UTAH 84406

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PROPELLANT
SURVEILLANCE REPORT
LGM-30 A&B STAGE 1
TP-H1011

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MANCP REPORT NR 351(76)
MMEMP PROJECT M72632-5MP116P

PROPELLANT SURVEILLANCE REPORT

LGM-30 A & B STAGE I

TP-H1011

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ABSTRACT

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 A and B First Stage Minuteman Motors. This report is the eleventh time that a statistical approach has been used to analyze First Stage bulk carton propellant. Testing was accomplished in accordance with MMEMP Project M72632 - 5MP116P.

The purpose of testing was to determine and provide early warning of any serious degradation trends occurring in the propellant for service life predictions.

An analysis of all parameters indicates that no potential problems are expected in the propellant for at least two years past the oldest data point.

Data stored in the G085 System were plotted utilizing the IBM 360-65 Computer and CAL-COMP Plotter. The data range at any age can be found by suitable inquiry of the G085 System.

Each point on the regression plot represents the mean of all samples at that particular age. The number of specimens at each point is indicated on the sample size summary sheet accompanying each regression plot or group of regression plots.

TABLE OF CONTENTS

	<u>Page</u>
Abstract	ii
List of Figures	iv
List of References	viii
Glossary of Terms and Abbreviations	xi
Introduction	1
Table 1 - Test Program	3
Statistical Discussion	4
Test Results	6
Conclusions	9
Distribution List	78
DD Form 1473	79

LIST OF FIGURES

<u>Figure Nr</u>		<u>Page</u>
	Regression Plot, Very Low Rate Tensile	
1	Strain at Maximum Stress	11
2	Maximum Stress	12
3	Strain at Rupture	13
4	Stress at Rupture	14
5	Modulus	15
	Regression Plot, Low Rate Biaxial, Tensile	
6	Strain at Maximum Stress	17
7	Maximum Stress	18
8	Strain at Rupture	19
9	Stress at Rupture	20
10	Modulus	22
	Regression Plot, Low Rate Tensile	
11	Strain at Maximum Stress	24
12	Maximum Stress	25
13	Strain at Rupture	26
14	Stress at Rupture	27
15	Modulus	28
	Regression Plot, High Rate Tensile	
16	Strain at Maximum Stress	30
17	Maximum Stress	31

LIST OF FIGURES (CONT)

<u>Figure Nr</u>		<u>Page</u>
18	Strain at Rupture	32
19	Stress at Rupture	33
20	Modulus	34
	Regression Plot, High Rate Triaxial Tensile	
21	Strain at Maximum Stress	36
22	Maximum Stress	37
23	Strain at Rupture	38
24	Stress at Rupture	39
25	Modulus	40
	Regression Plot, Stress Relaxation 3% Strain	
26	Modulus at 10 sec	42
27	Modulus at 50 sec	43
28	Modulus at 100 sec	44
29	Modulus at 1000 sec	45
	Regression Plot, Stress Relaxation 5% Strain	
30	Modulus at 10 sec	47
31	Modulus at 50 sec	48
32	Modulus at 100 sec	49
33	Modulus at 1000 sec	50

LIST OF FIGURES (CONT)

<u>Figure Nr</u>		<u>Page</u>
34	Regression Plot, Hardness, Shore A	52
	Regression Plot, Dynamic Response	
35	Shear Storage 200 Hz	54
36	Loss Tangent 200 Hz	55
37	Shear Storage 400 Hz	56
38	Loss Tangent 400 Hz	57
	Regression Plot, Pressure Time	
39	Time to Maximum Pressure	59
40	Maximum Pressure	60
	Regression Plot, TCLE	
41	Thermal Coefficient of Linear Expansion below T_g	62
42	Thermal Coefficient of Linear Expansion above T_g	63
	Regression Plot, DSC	
43	Endotherm	65
44	First Exotherm	66
45	Second Exotherm	67
46	Regression Plot, Ignitability	69
47	Regression Plot, Burning Rate	71

LIST OF FIGURES (CONT)

<u>Figure Nr</u>		<u>Page</u>
	Regression Plot, Sol Gel	
48	Weight Swell Ratio	73
49	% Extractables	75
50	Cross Link Density	77

LIST OF REFERENCES

<u>Report Nr</u>	<u>Title</u>	<u>Report Date</u>
	LGM-30 First Stage, Wing I Test Reports	
29A	Test Report (Missile in silo)	13 Jan 64
29B	Zero Time Test Results	29 Jan 64
29C	Zero Time Test Results (Supplement 1)	30 Mar 64
29D	Zero Time Test Results (Aft Closure)	9 Jun 64
29E	Zero Time (Aft Closure Supplement 1)	24 Jun 64
29F	ATP Phase I Test Results	30 Mar 65
29G	ATP Phase I Test Results	19 Aug 65
29H	ATP Phase I Test Results	10 Sep 65
32A	Zero Time, Wings II-V Test Results	17 Mar 65
32B	Zero Time, Wings II-V Test Results (Aft Closure)	18 Mar 65
32C	ATP Phase I, Wings II-V Test Results	3 Nov 65
49	ATP Phase I, Wings II-V (First Group)	18 Mar 66
53	ATP Phase I, Wings II-V (Second Group)	22 Apr 66
55	ATP Phase I, Wings II-V (Third Group)	29 Apr 66
58	ATP Phase I, Wings II-V (Fourth Group)	6 May 66
61	ATP Phase I, Wings II-V (Fifth Group)	10 Jun 66
66	ATP Phase I, Wings II-V (Sixth Group)	22 Jul 66
76	ATP Phase II, Wing I Test Results	24 Jan 67
78	Zero Time, Wing VI Test Results	3 Feb 67
104	ATP Phase I, Wing VI (First Group)	12 Oct 67
118	ATP Phase II, Wings II-V (First Group)	5 Mar 68

LIST OF REFERENCES (CONT)

<u>Report Nr</u>	<u>Title</u>	<u>Report Date</u>
126	ATP Phase II, Wings II-V (Second Group)	11 Apr 68
130	ATP Phase II, Wings II-V (Third Group)	3 May 68
162	ATP Phase I, Wing VI (Second Group)	30 Sep 69
176	ATP Phase II, Wing VI (First Group)	15 Apr 70
181	ATP Phase III, Wing I	7 May 70
185	ATP Phase I, Wing VI (Third Group)	22 Jun 70
195	ATP Phase III, Wings II-V (Retest)	29 Oct 70
223	Surveillance Report LGM-30 Stage I (TP-H1011)	Sep 71
239	Surveillance Report LGM-30 Stage I (TP-H1011 and TP-H1043)	Apr 72
258	Surveillance Report LGM-30A & B Stage I, (TP-H1011)	Nov 72
268	Surveillance Report LGM-30A & B Stage I, (TP-H1011)	May 73
271	Surveillance Report LGM-30F & C Stage I, Phase A Series II, (TP-H1011)	Jul 73
277	Surveillance Report LGM-30F & G Stage I, Phase A Series III, (TP-H1011)	Oct 73
280	Surveillance Report LGM-30A & B Stage I, (TP-H1011)	Nov 73
288	Propellant Surveillance Report LGM-30A & B, Stage 1, TP-H1043	Mar 74
290	Propellant Surveillance Report LGM-30F & G, Stage 1, Phase B, Series I, TP-H1011	Mar 74
300	Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	May 74

LIST OF REFERENCES (CONT)

<u>Report Nr</u>	<u>Title</u>	<u>Report Date</u>
302	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Nov 74
313	Stage 1 Propellant Surveillance Report, Propellant Containing Glacial Acrylic Acid	Oct 74
315	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Jan 75
316	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Feb 75
319	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VI, TP-H1011	Apr 75
321	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase B, Series II, TP-H1011	Apr 75
325	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jun 75
328	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Sep 75
330	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Oct 75
335	Stage 1 Motor Reliability Improvement Program	Dec 75
337	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1043	Feb 76
339	Stage 1, New MAPO & ERL-510 Qualification	Mar 76
341	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VII, TP-H1011	Mar 76

GLOSSARY OF TERMS AND ABBREVIATIONS

Aging Trend	A change in properties or performance resulting from aging of material or component
CSA	Cross Sectional Area
DB	Dogbone
Degradation	Gradual deterioration of properties or performance
E	Modulus (psi), defined as stress divided by strain along the initial linear portion of the curve.
EB	End Bonded
EGL	Effective Gage Length
em	Strain at maximum stress
er	Strain at rupture
"F" ratio	The ratio of the variance accounted for by the regression function to the random unexplained variance. The regression function having the most significant "F" ratio is used for plotting data. The ratio is also used in detecting significant changes in random variation between succeeding time points
JANNAF	Joint Army, Navy, NASA, Air Force Committee
MANCP	Propellant Lab Section at Ogden Air Logistics Center
Ogden ALC	Ogden Air Logistics Center, Air Force Logistics Command
r or R	The Correlation Coefficient is a measure of the degree of closeness of the linear relationship between two variables
Linear Regression Equation	The general form of the linear regression equation is $Y = a + bx$
Regression Line	Line representing mean test values with respect to time
S_b	Standard error of estimate of the regression coefficient

GLOSSARY OF TERMS AND ABBREVIATIONS (cont)

S_e or $S_{Y.X}$	Standard deviation of the data about the regression line
S_m	Maximum Stress
S_r	Stress at rupture
Standard Deviation (S_y)	Square root of variance
Strain Rate	Crosshead speed divided by the EGL
"t" test	A statistical test used to detect significant differences between a measured parameter and an expected value of the parameter (determines if regression slope differs from zero at the 95% confidence level)
Variance	The sum of squares of deviations of the test results from the mean of the series after division by one less than the total number of test results
3 Sigma Band	The area between the upper and lower 3 sigma limit. It can be expected that 99.73% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.
90-90 Band	It can be stated with 90% confidence that 90% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed

INTRODUCTION

A. PURPOSE:

Quality assurance tests have been conducted for thirteen and one-half years on First Stage LGM-30A and B Minuteman Motor Propellant blocks to evaluate the effects of aging on TP-H1011 propellant.

Statistical analysis of the tests performed, as directed by Engineering, should provide early warning if serious degradation trends occur. Annual evaluation of the propellant provide data that can be directly input into engineering reliability and service life predictions. Testing was performed in accordance with MMEMP Directive GTD-1C and GTD-1C Amendments 1 and 2.

B. BACKGROUND:

Testing was first accomplished at MANCP on LGM-30A TP-H1011 propellant blocks in 1963 and was designated Zero-Time Testing (MAGCP Report Nrs 29B, 29C and 29F). Subsequent testing was accomplished at approximately 24 month intervals (MAGCP Report Nrs 29G, 29H - Phase I; 76 - Phase II; 181 - Phase III).

LGM-30B Zero-Time testing was accomplished in 1964 with subsequent testing at intervals of 24 months (MAGCP Report Nrs 32A-Zero-Time; 32C, 49, 53, 55, 58, 61, 66 - Phase I; 118, 126, 130 - Phase II; 195, 268 - Phase III).

Reports prior to MAGCP Report Nr 223(72) contained raw data

using sigma relation to compare to Zero-Time variance. MANCP Report Nr 239(72) published in April of 1972 contained all the data on LGM-30A, B, F and G in the G085 System at that time. Report Nrs 258(72), 268(73), 280(73) reported LGM-30A and B data in statistical analysis by itself. This report is the sixth time that LGM-30A and B data have been reported in this manner.

Zero-Time testing was started as soon as possible after receipt of the propellant by MANCP. Data from these tests were used to establish a base line for each test to which each subsequent test data (ATP - Accelerated Test Plan) were compared in the reports listed above.

The LGM-30A and B propellant test matrix (Table 1) were used to determine the number of specimens to be taken from each propellant loaf and the specific test or tests to which these specimens were subjected. Low rate tensile and hardness specimens were taken from all LGM-30A and B blocks. Specimens for other physical and combustion tests were taken from every seventh block.

Some tests were not conducted at the earlier test periods (0-6 years) and, therefore, data are not available for inclusion in the regressions.

Table 1

Test Program

The test matrix is taken from GTD-1C, Amendment 2, and the tests, conditions, number of specimens and test methods are listed below.

<u>Test</u>	<u>Conditions</u>	<u>Description</u>	<u>Per Cond</u>
Hardness	10 Sec	Dogbone Ends	3
Low Rate Tensile	2.0 in/min	1/2" JANNAF Dogbone	3
High Rate Tensile	1750 in/min	3/4" Dogbone	3
High Rate Triaxial Tensile	600 psi, 1750 in/min	3/4" GL Rail End Bonded	1
Low Rate Biaxial Tensile	0.2 in/min	3/4" GL Rail End Bond	1
Stress Relaxation	3% & 5%	1/2" x 1/2" x 4" EB	3
Dynamic Response	70 gm ct wt	3.3" dia x .33" disc	1
Sol Gel		1/2" x 1/2"	8
VLR	2×10^{-3} in/min	1/2" JANNAF Dogbone	3
Ignitability	168 cal/cm ² sec	.050" wafer	3
TCLE		.200" wafer	3
Pressure Time	500 psi	1/2" x 3/8" x 1"	3
Burning Rate	1000 psi	.156" x .156" x 5" Strand	3
DTA	12°C Rise/min	.040" wafer	3
DSC		.040" wafer	3
Poisson's Ratio	77°F $\pm$ 2° 15% Strain	.50" x .50" x 4"	6
Tear Energy	70°F $\pm$ 2°	0.1" x 1.18" x 3"	6
Failure Envelope		JANNAF Dogbone	3

STATISTICAL DISCUSSION

In order to determine aging trends for shelf/service predictions, regression analysis was selected as the method of data evaluation. In selecting the best fit model, eight models were tried. The linear model, $Y = a + bX$, was found to be the best fit for the regressions. By using the best fit model, the trend line becomes a more accurate predictor of future trend.

In some cases, the early test results show evidence of data biasing due to considerable changes which are probably post-cure effects of the propellant during the first few years. These post-cure effects tended to skew and produced unrealistic data trend lines. In these cases, data trends were analyzed starting at six years of age where the trend lines were no longer affected by post-curing of the propellant.

Individual data points from different time periods were pooled to establish a least squares trend line for the data. The variance about the regression line, obtained using individual values of the dependent variable, was used to compute a tolerance interval such that at the 90% confidence level 90% of the sample distribution falls within this interval. This tolerance interval was extrapolated to a maximum of 24 months into the future from age of the oldest sample tested. The 't' values and the significance of this statistic, which are reported for each regression model, give an indication of the "statistical significance" of the slope of the trend line as compared to a line of zero slope. Data were plotted by computer. The "y" axis is computed so

that the values at one inch intervals are peculiar to the data spread of the parameter tested. Plotted data points represent means at the particular ages at which testing occurred. The number of specimens at each age point is indicated on the sample size summary sheet accompanying each regression plot. Variance at each test age can be determined by consulting the G085 data storage system.

TEST RESULTS

A. TENSILE

Regressions for very low rate tensile data show a statistically significant decrease for strains and both stresses with a statistically significant increase for modulus (Figures 1 thru 5).

The low rate tensile for both strains and stress at rupture show a statistically significant decrease while maximum stress show no significant aging trend. Modulus shows a statistically significant increase (Figures 6 thru 10).

Low rate biaxial tensile shows a statistically significant decrease for strain at rupture, and a statistically significant increase for modulus. There were no significant changes in the other parameters (Figures 11 thru 15).

The high rate tensile strain at maximum stress, stress at rupture and modulus show a statistically significant increase. Strain at rupture shows a statistically significant decrease. Maximum stress shows no aging trend (Figures 16 thru 20).

For triaxial tensile testing, strain at maximum stress shows a statistically significant increase. Strain at rupture and both stresses show no change. The modulus shows a statistically significant decrease (Figures 21 thru 25).

In general, the regressions for all of the tensile testing show trends that are gradual and no operational problems are expected for at least two years beyond the oldest data point.

B. STRESS RELAXATION:

Modulus at 3% and 5% strain shows a statistically significant increase at all time periods (Figures 26 thru 33). However, the trend lines are gradual and no operational problems are expected.

C. HARDNESS:

The propellant shows a statistically significant increase in hardness. This increase is gradual as indicated by the slope of the curve which is close to a line of zero slope (Figure 45).

D. DYNAMIC RESPONSE:

The storage shear modulus at 200 and 400 hz shows a statistically significant decrease, while loss tangent at 200 and 400 hz shows a statistically significant increase (Figures 35 thru 38).

E. PRESSURE TIME:

A statistically significant increase is shown in time to maximum pressure with the maximum pressure showing a statistically significant decrease (Figures 39 and 40).

F. TCLE: (Thermal Coefficient of Linear Expansion)

The thermal coefficient of linear expansion below and above the glass transition point shows a statistically significant increase. In both cases the increase is gradual (Figures 41 and 42).

G. DSC: (Differential Scanning Calorimeter)

The first endotherm peak temperature (on this propellant there is only one endotherm) shows a statistically significant increase; the first and second exotherm peak temperature shows no change. (Figures 43 thru 45).

H. IGNITABILITY:

No significant change is seen in this parameter (Figure 46).

I. BURNING RATE:

A statistically significant decrease is shown; however, the decrease is gradual and no problems are foreseen for at least two years past the last data point (Figure 47).

J. SOL GEL:

A statistically significant decrease is shown for weight swell ratio and percent extractables. The cross link density shows a statistically significant increase (Figures 48 thru 50).

The increase in cross link density correlates well with the decreasing strain (elasticity), increasing stress, modulus and hardness trends.

CONCLUSIONS

This report includes LGM-30 A and B bulk propellant test results presently in the G085 System and covers the past thirteen and one-half years of testing.

The test results show that under present storage conditions the physical/mechanical and combustion properties of the propellant are remaining relatively stable with age. This is indicated by the regression plots where the slope of the trend line is relatively flat or close to a line of zero slope and have not changed appreciably from the last test period.

From the statistical analyses, all tests conducted indicate that motor propellant reliability will not be affected for two years past the last data point on the regression.

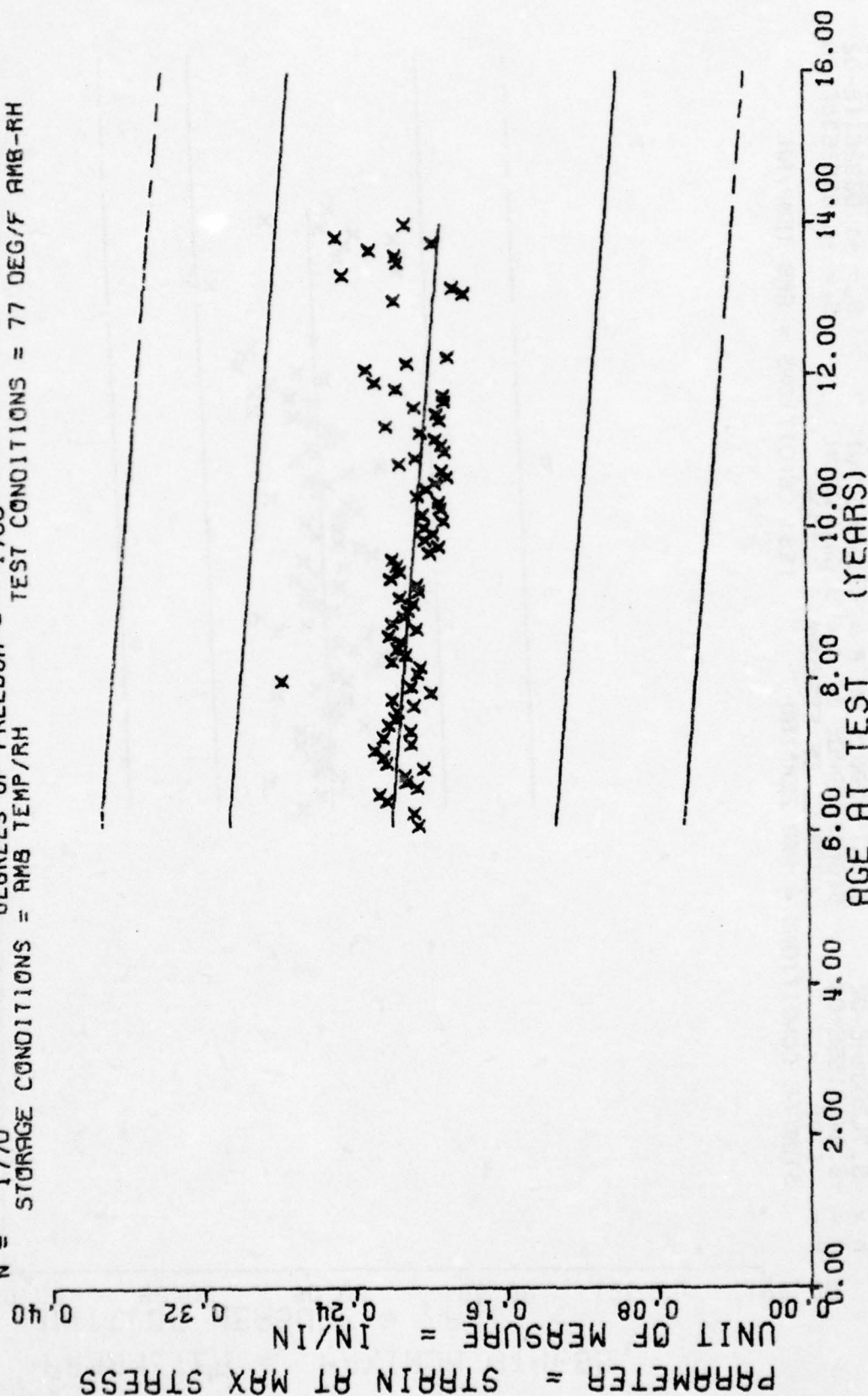
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
73.0	9	130.0	34	125.0	18	160.0	6
75.0	18	131.0	42	126.0	51	162.0	6
77.0	18	132.0	34	127.0	26	163.0	6
78.0	3	133.0	49	128.0	42	164.0	3
79.0	9	134.0	20	129.0	28	165.0	3
80.0	30	135.0	39	130.0	18	166.0	3
81.0	18	136.0	28	131.0	25	168.0	6
82.0	9	137.0	28	132.0	24		
83.0	18	138.0	44	133.0	20		
84.0	18	139.0	19	134.0	39		
85.0	6	140.0	26	135.0	45		
86.0	40	141.0	24	136.0	18		
87.0	27	142.0	29	137.0	39		
88.0	23	143.0	41	138.0	21		
89.0	13	144.0	15	139.0	12		
90.0	7	145.0	16	140.0	24		
91.0	36	146.0	27	141.0	33		
92.0	7	147.0	12	142.0	21		
93.0	15	148.0	33	143.0	6		
94.0	22	149.0	27	144.0	3		
95.0	22	150.0	36	145.0	3		
96.0	29	151.0	24	146.0	3		
97.0	34	152.0	21	147.0	2		
98.0	41	153.0	19	148.0	1		
99.0	33	154.0	20	149.0	3		

STAGE 1, WING 162 VERY LOW RATE CHS=0.002 IN/MIN

This sample size summary is applicable to figures 1 thru 5.

$Y = ((+2.4100229E-01) + (-2.8689209E-04) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT $G = +5.1603909E-02$
 SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +6.1806053E-05$
 SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +5.1301895E-02$
 DEGREES OF FREEDOM = 1768
 N = 1770
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG/F AMB-RH



STAGE 1. NING 1A2 VERY LOW RATE CHS=0.002 IN/MIN STRAIN AT MAX STRESS (EM)

Figure 1

$Y = ((+8.5947302E+01 \mid + (-5.0381081E-02) \times X)$
 $F = +8.0730737E+00$ SIGNIFICANCE OF F = SIGNIFICANT $\alpha = +8.8930894E+00$
 $R = -6.7420046E-02$ SIGNIFICANCE OF R = SIGNIFICANT $S_e = +1.0692611E-02$
 $t = +2.8413155E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_c = +8.8753638E+00$
 $N = 1770$ DEGREES OF FREEDOM = 1768
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

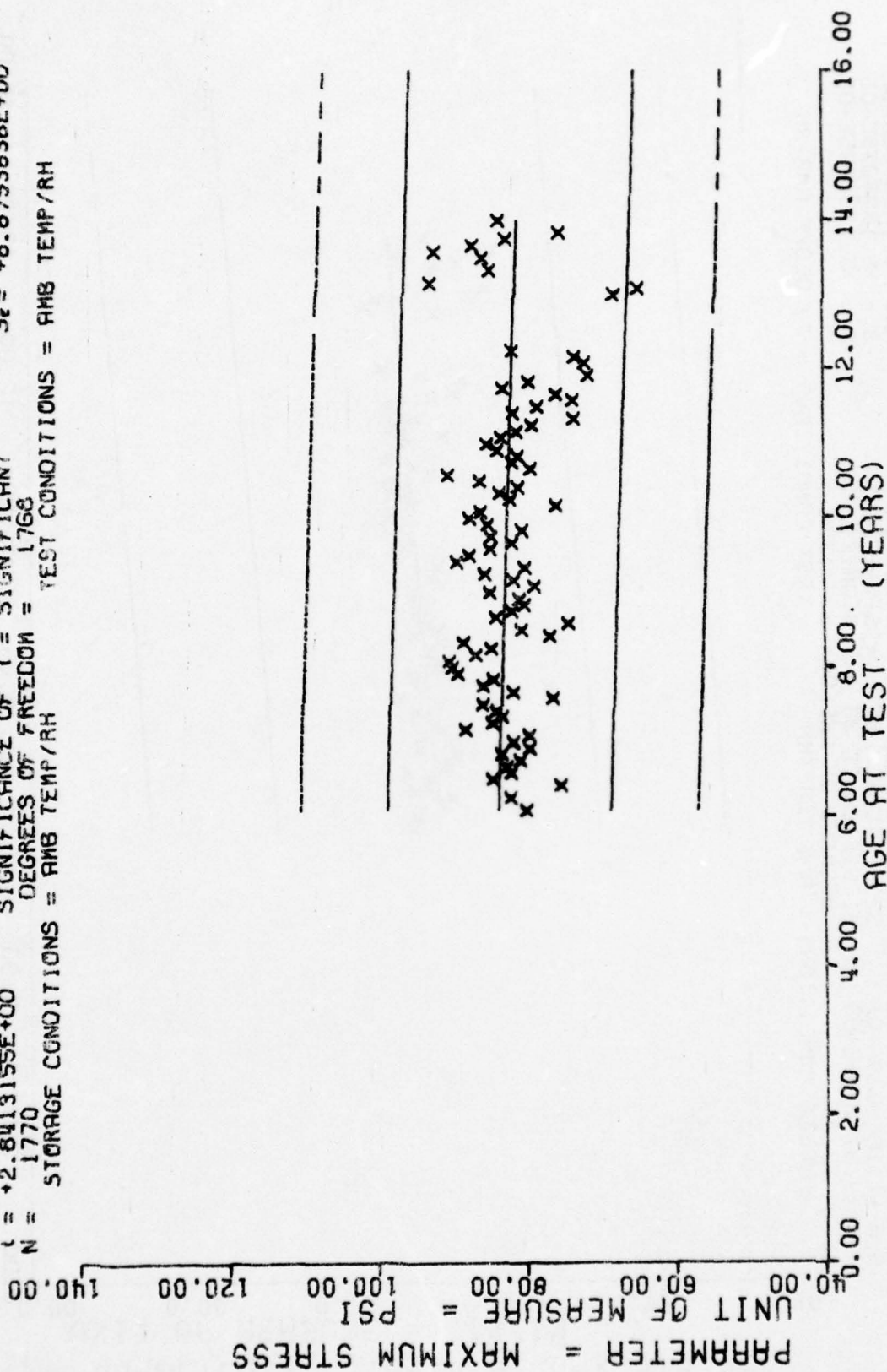
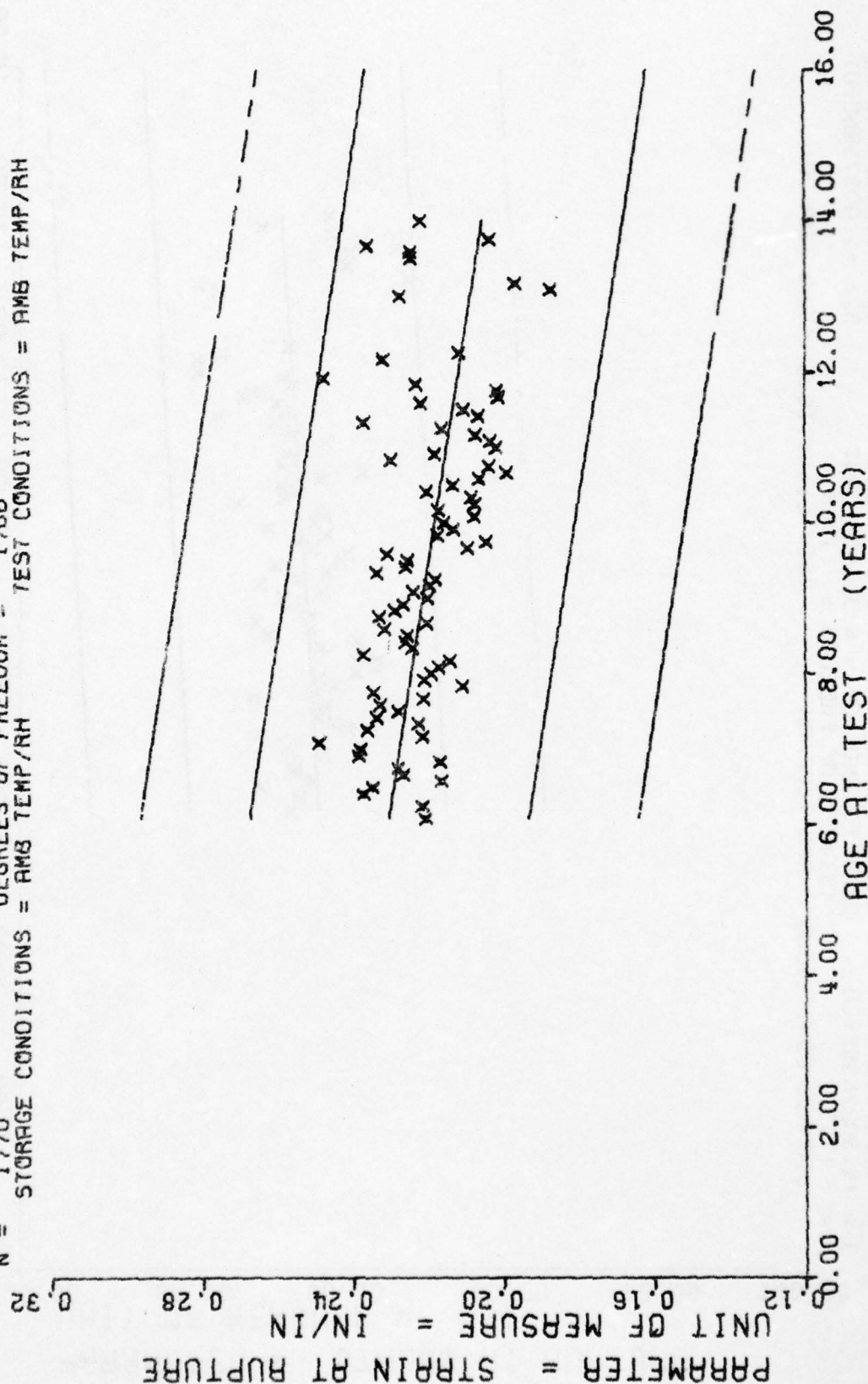


Figure 2

$Y = ((+2.5009354E-01) + (-2.6615408E-04)) * X1$
 $F = +1.0053417E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -2.3195639E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +1.0026673E+01$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 1770$ DEGREES OF FREEDOM = 1768
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 142 VERY LOW RATE CHS=0.002 IN/MIN STRAIN AT RUPTURE (ER)

Figure 3

$F = +1.8509471E+01$ SIGNIFICANCE OF F = (-5.2025440E-02) * X
 $R = -1.0178747E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +4.9022635E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 1770$ DEGREES OF FREEDOM = 1768
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

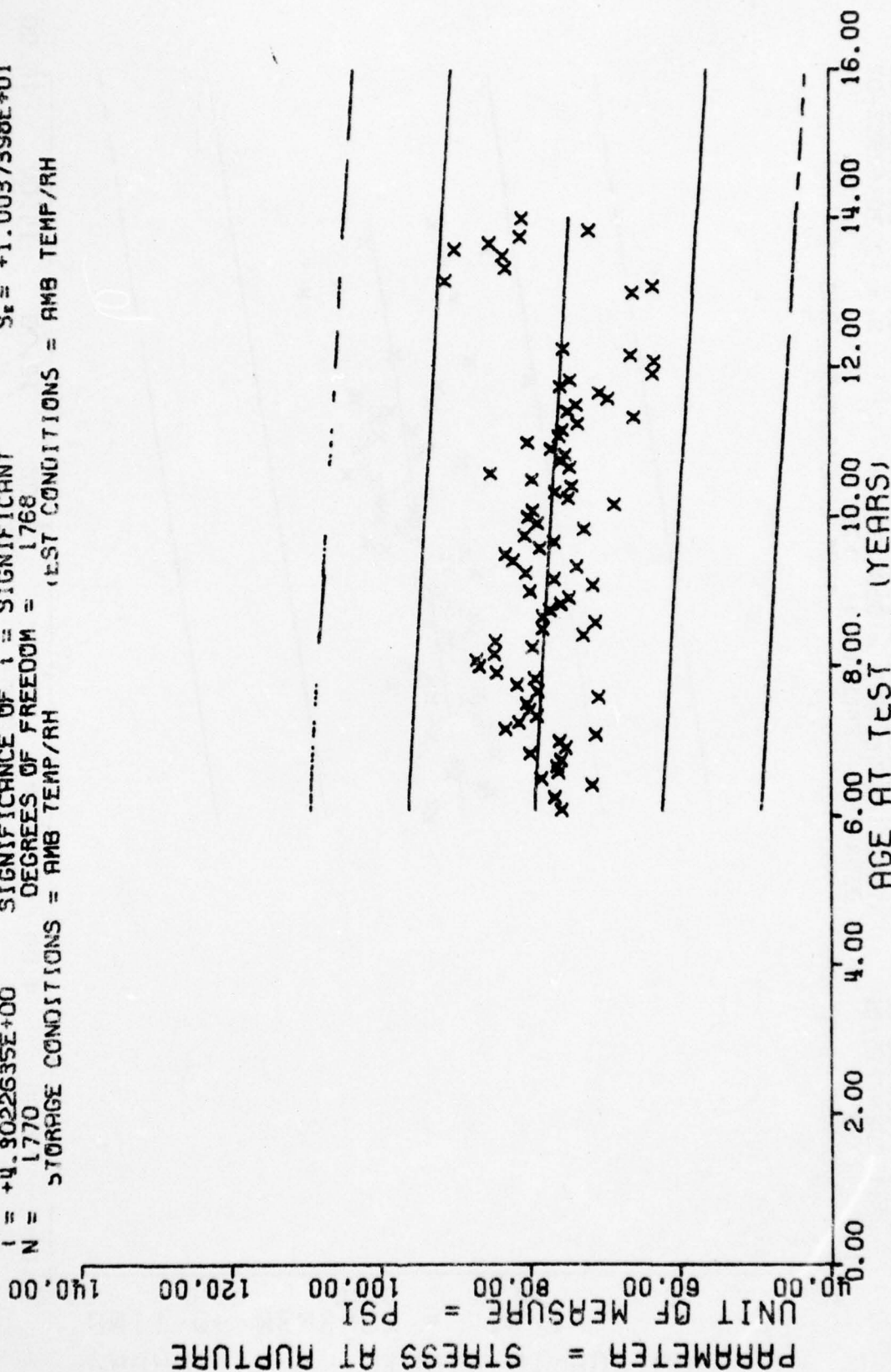


Figure 4

$Y = ((+5.5046616E+02) + (+3.2165531E-01) * X)$
 F = +4.6940500E+00 SIGNIFICANCE OF F = SIGNIFICANT
 R = +5.1479001E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +2.1665756E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1769 DEGREES OF FREEDOM = 1767
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG/F AMB-RH

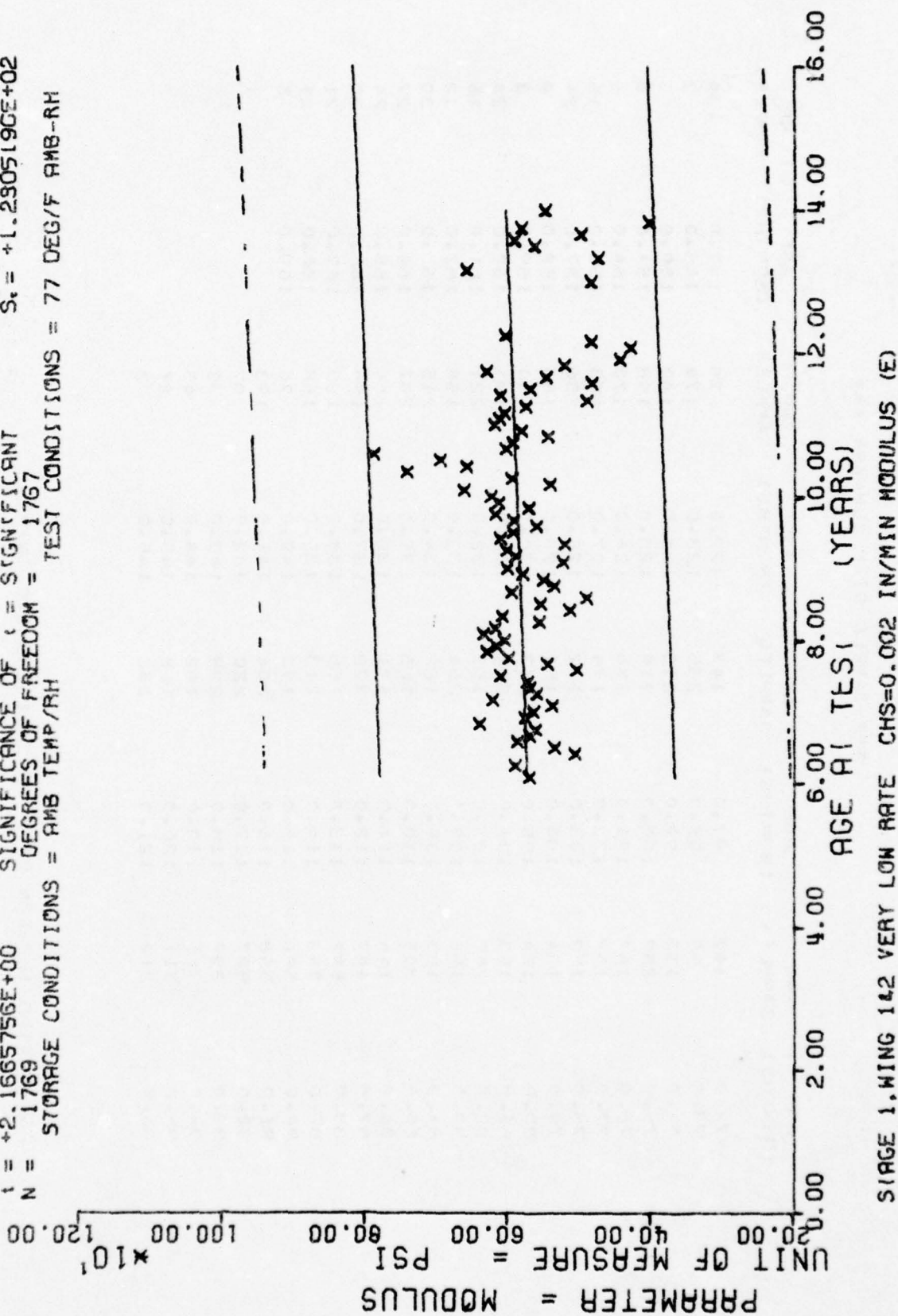


Figure 5

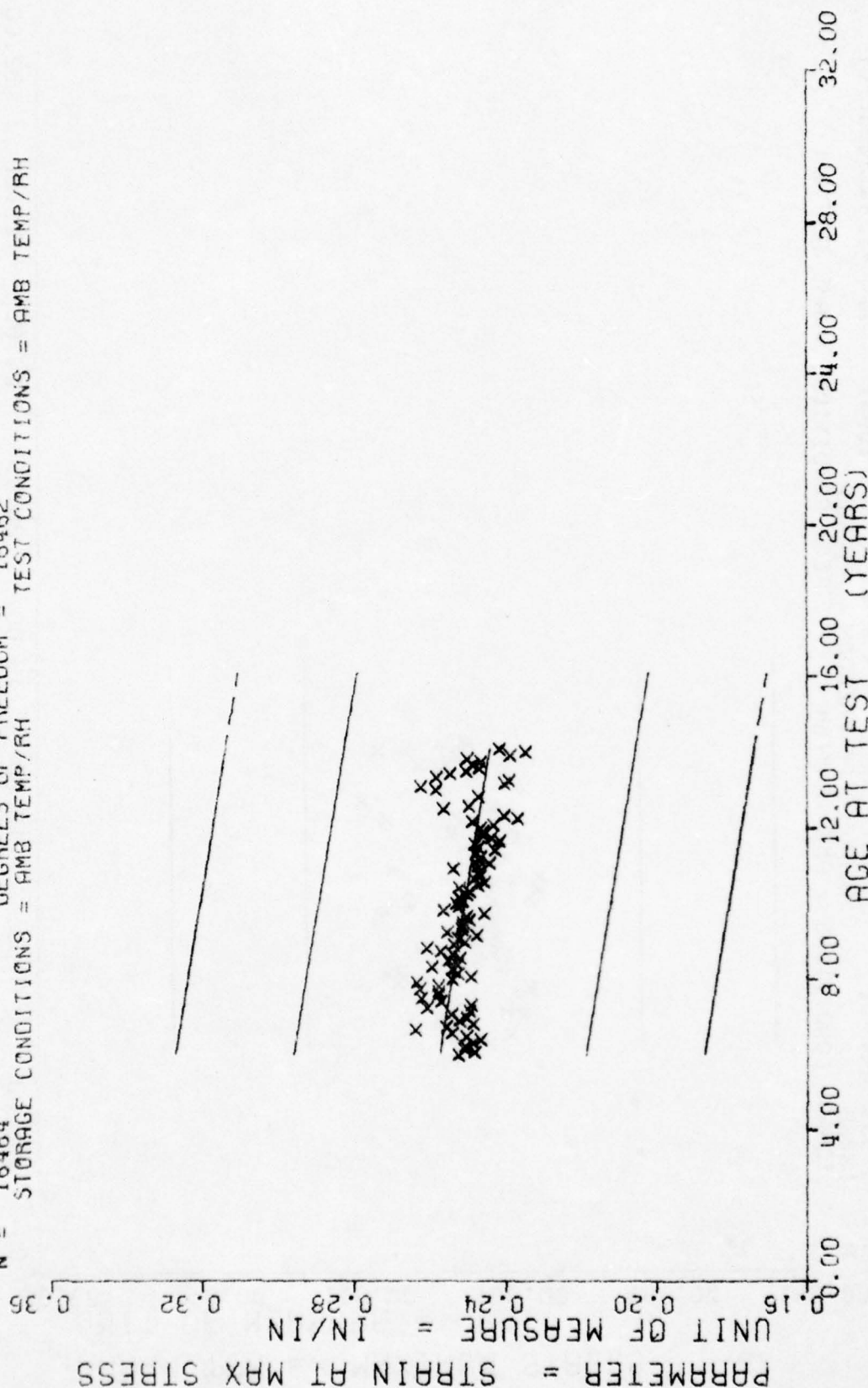
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES
72.0	142	97.0	143	122.0	75	147.0	39
73.0	99	98.0	235	123.0	174	148.0	3
74.0	133	99.0	215	124.0	160	150.0	3
75.0	252	100.0	219	125.0	198	151.0	6
76.0	147	101.0	186	126.0	170	154.0	9
77.0	157	102.0	174	127.0	183	156.0	15
78.0	153	103.0	177	128.0	156	157.0	24
79.0	134	104.0	151	129.0	183	158.0	9
80.0	194	105.0	217	130.0	160	159.0	3
81.0	153	106.0	274	131.0	191	160.0	24
82.0	260	107.0	153	132.0	221	161.0	15
83.0	166	108.0	254	133.0	158	162.0	12
84.0	183	109.0	182	134.0	215	163.0	39
85.0	307	110.0	165	135.0	281	164.0	27
86.0	144	111.0	171	136.0	264	165.0	24
87.0	467	112.0	322	137.0	198	166.0	30
88.0	682	113.0	155	138.0	135	167.0	21
89.0	783	114.0	213	139.0	168	168.0	21
90.0	506	115.0	193	140.0	76	169.0	5
91.0	558	116.0	204	141.0	193		
92.0	527	117.0	220	142.0	97		
93.0	297	118.0	228	143.0	33		
94.0	305	119.0	162	144.0	45		
95.0	311	120.0	188	145.0	27		
96.0	212	121.0	238	146.0	3		

STAGE 1, WING 162 LOW RATE TENSILE CHS=2.0 IN/MIN

This sample size summary is applicable to figures 6 thru 9.

$Y = ((+2.6748230E-01) + (-1.3749450E-04) * X)$
 $F = +2.4461855E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -1.2100419E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +1.5640286E+01$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 16464$ DEGREES OF FREEDOM = 16462
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 1&2 LOW RATE TENSILE CHS=2.0 IN/MIN STRAIN AT MAX STRESS (EM)

Figure 6

$Y = ((+1.3827009E+02) + (-4.4630373E-03) * X)$
 $F = +7.9268021E-01$ SIGNIFICANCE OF F = NOT SIGNIFICANT $G = +1.3313746E+01$
 $R = -6.9387951E-03$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_1 = +5.0129131E-03$
 $t = +8.9032590E-01$ SIGNIFICANCE OF t = NOT SIGNIFICANT $S_2 = +1.3313829E+01$
 $N = 16465$ DEGREES OF FREEDOM = 16463
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

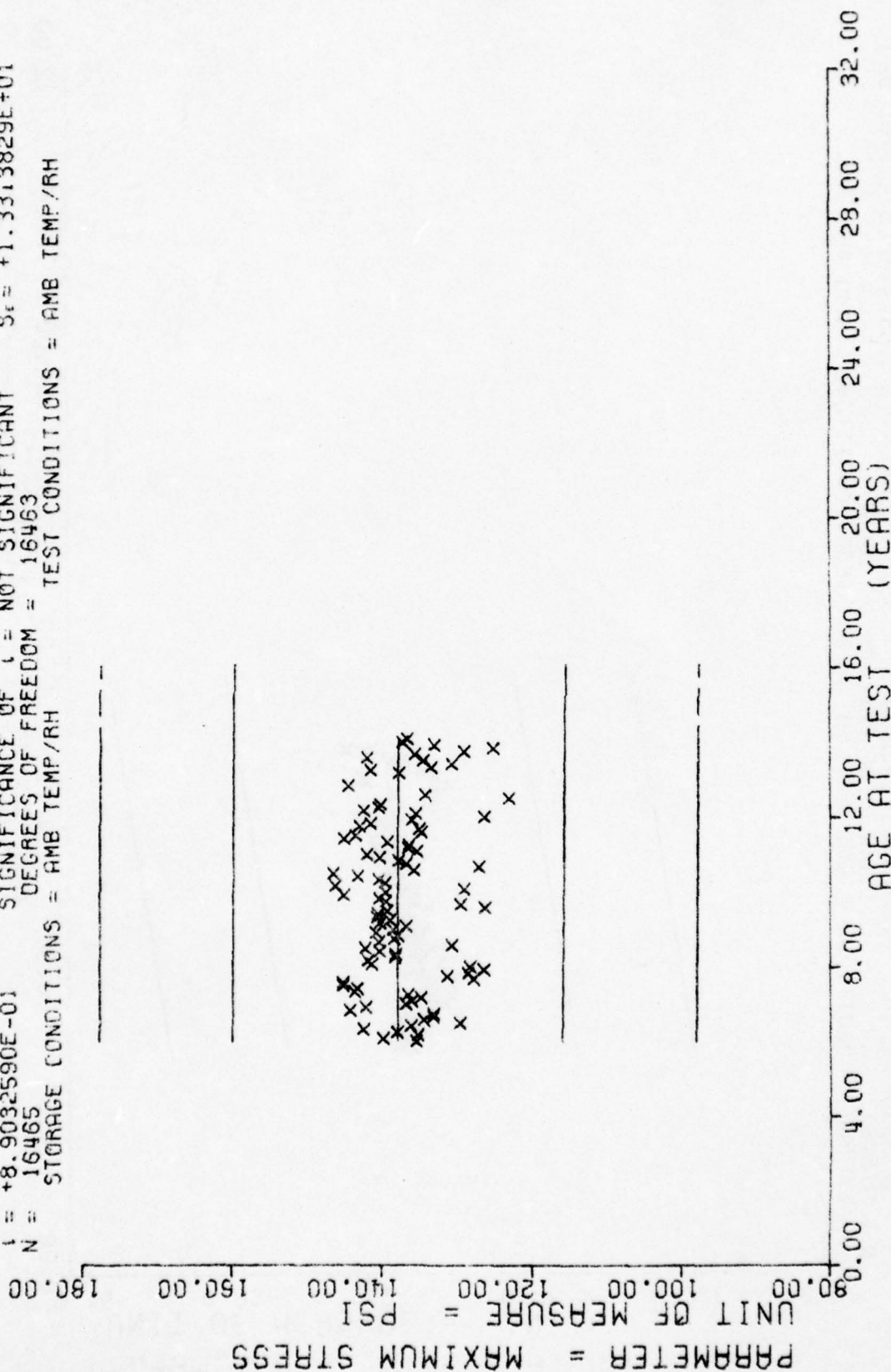
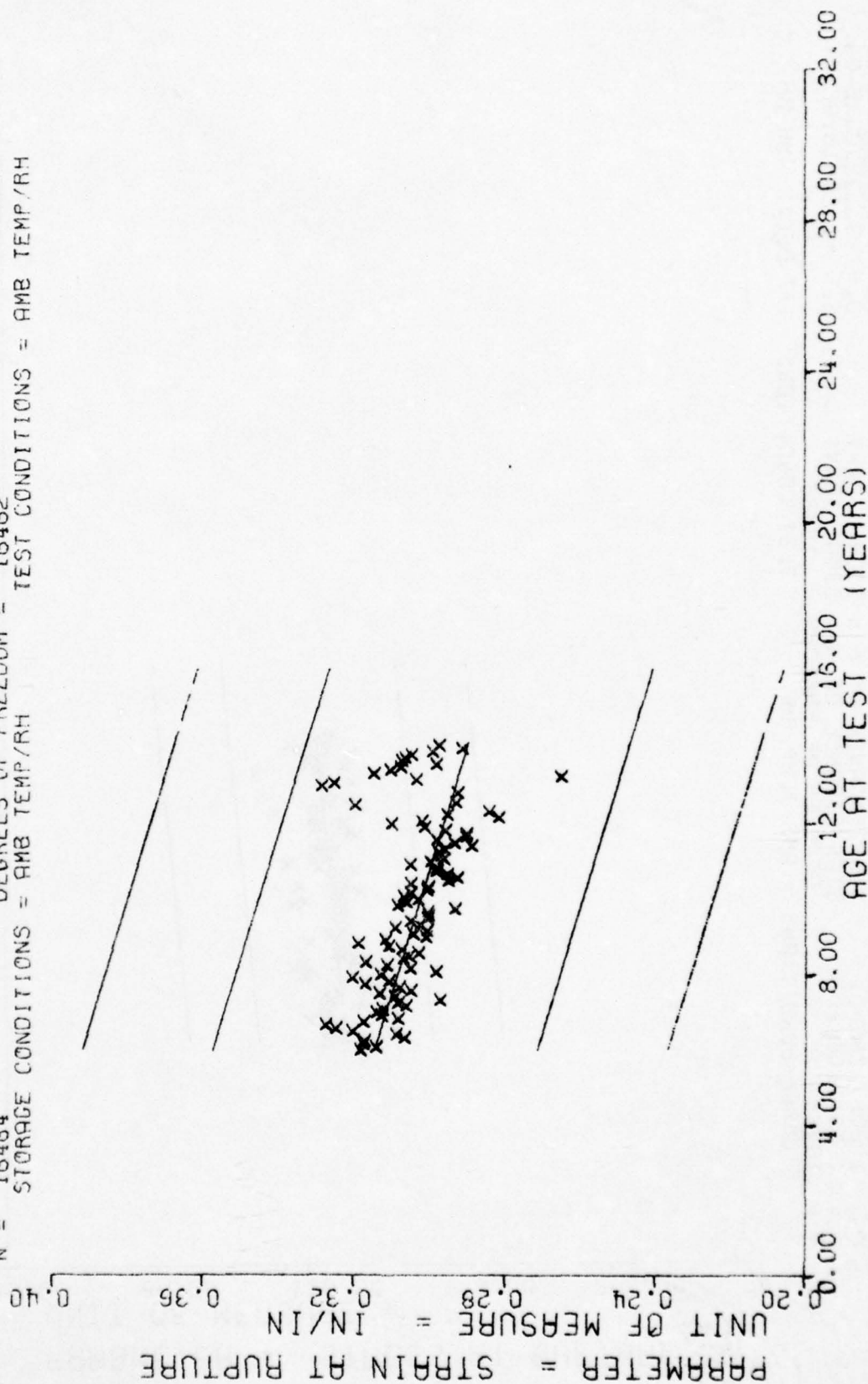


Figure 7

$F = +6.8489825E+02$ SIGNIFICANCE OF F = $-2.5576257E-04$) * X)
 $R = -1.9985740E-01$ SIGNIFICANCE OF R =
 $t = +2.6170560E+01$ SIGNIFICANCE OF t =
 $N = 16464$ DEGREES OF FREEDOM = 16462
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 142 LOW RATE TENSILE CHS=2.0 IN/MIN STRAIN AT RUPTURE (ER)

Figure 8

$Y = ((+1.3631825E+02) + (-8.0991176E-02) \times X)$
 $F = +2.4326972E+02$ SIGNIFICANCE OF F = SIGNIFICANT $U = +1.3892718E+01$
 $R = -1.2067138E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_A = +5.1927053E-03$
 $t = +1.5597106E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_E = +1.3791616E+01$
 $N = 16465$ DEGREES OF FREEDOM = 16463
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG/F AMB-RH

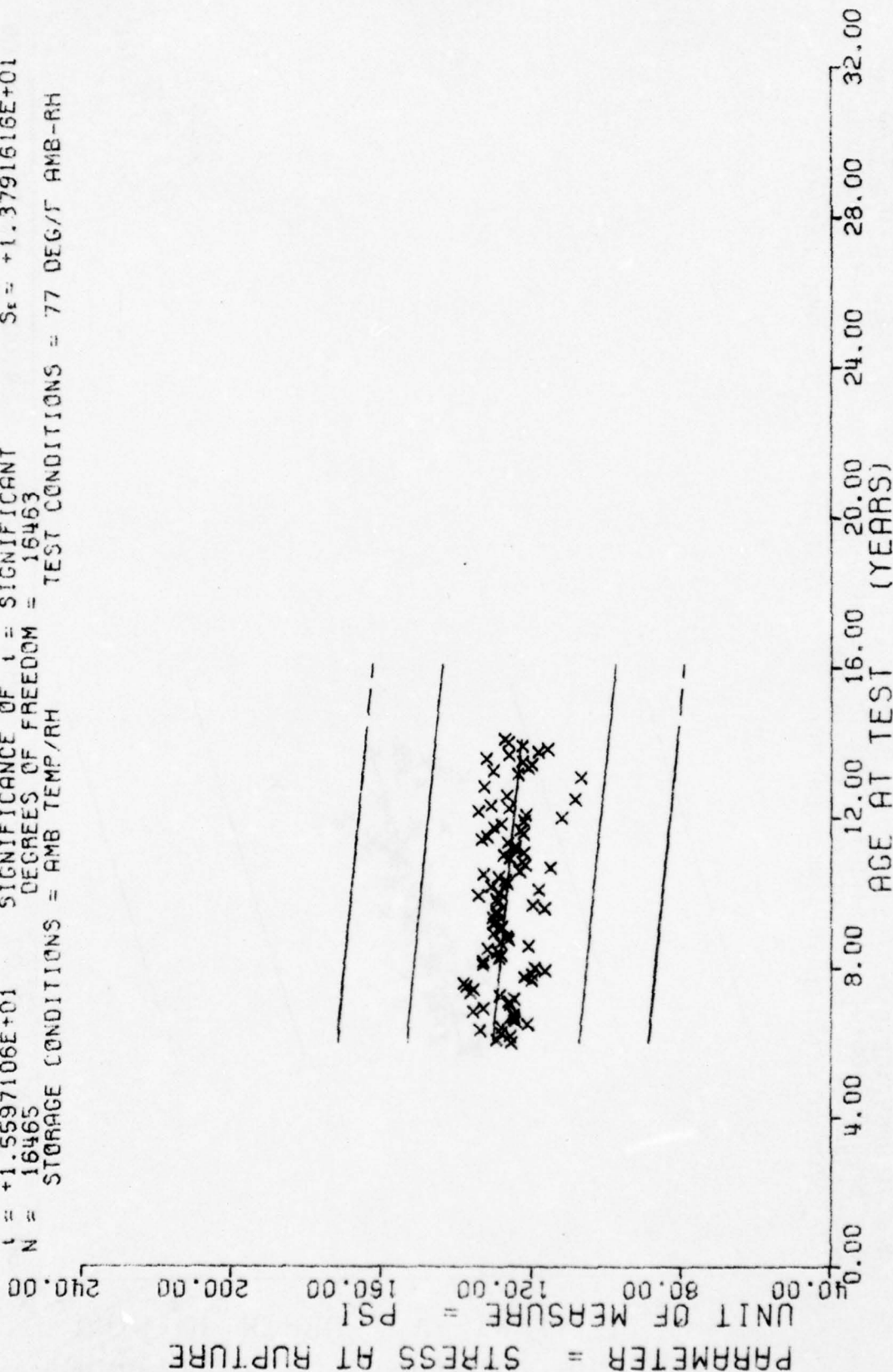
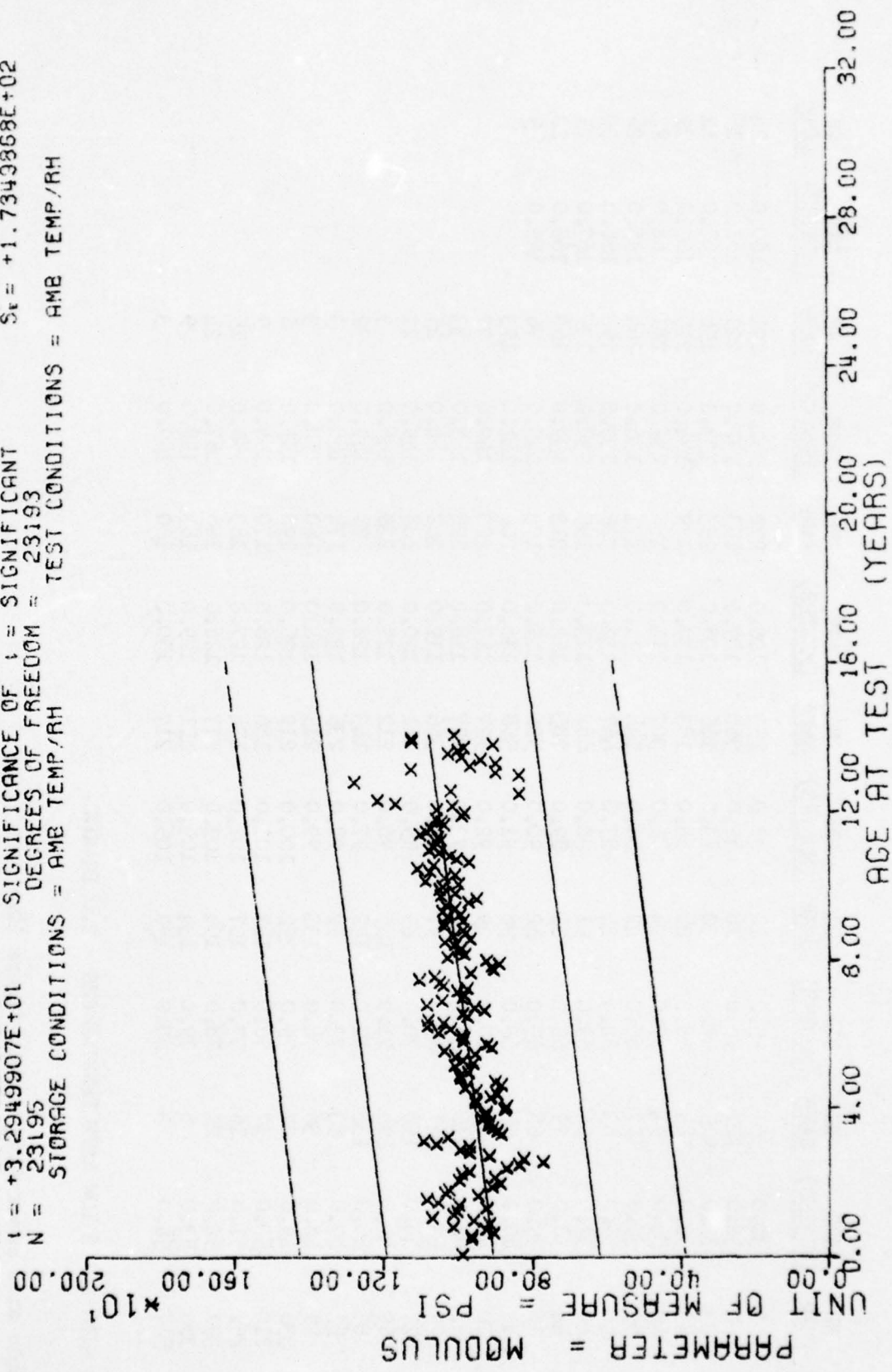


Figure 9

AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP	AGE (MONTHS)	NR SAMP
1.0	1	30.0	391	55.0	24	81.0	153	106.0	272	131.0	191	160.0	24				
6.0	4	31.0	307	56.0	18	82.0	260	107.0	153	132.0	221	161.0	15				
7.0	33	32.0	215	57.0	30	83.0	166	108.0	253	133.0	158	162.0	12				
8.0	53	33.0	114	58.0	24	84.0	183	109.0	179	134.0	215	163.0	39				
9.0	49	34.0	91	59.0	24	85.0	307	110.0	165	135.0	281	164.0	27				
10.0	89	35.0	57	60.0	42	86.0	144	111.0	171	136.0	264	165.0	24				
11.0	40	36.0	63	62.0	24	87.0	467	112.0	322	137.0	198	166.0	30				
12.0	46	37.0	56	63.0	51	88.0	682	113.0	155	138.0	135	167.0	21				
13.0	44	38.0	75	64.0	81	89.0	783	114.0	213	139.0	168	168.0	20				
14.0	65	39.0	68	65.0	42	90.0	506	115.0	193	140.0	76	169.0	5				
15.0	43	40.0	54	66.0	96	91.0	558	116.0	204	141.0	193						
16.0	70	41.0	84	67.0	39	92.0	527	117.0	220	142.0	97						
17.0	42	42.0	216	68.0	69	93.0	297	118.0	228	143.0	33						
18.0	75	43.0	241	69.0	97	94.0	366	119.0	162	144.0	45						
19.0	127	44.0	158	70.0	89	95.0	311	120.0	188	145.0	27						
20.0	65	45.0	194	71.0	165	96.0	212	121.0	238	146.0	3						
21.0	85	46.0	136	72.0	142	97.0	143	122.0	75	147.0	39						
22.0	51	47.0	53	73.0	99	98.0	235	123.0	174	148.0	3						
23.0	79	48.0	36	74.0	133	99.0	215	124.0	160	150.0	3						
24.0	338	49.0	27	75.0	252	100.0	219	125.0	198	151.0	6						
25.0	210	50.0	17	76.0	147	101.0	186	126.0	170	154.0	9						
26.0	251	51.0	16	77.0	157	102.0	174	127.0	183	156.0	15						
27.0	391	52.0	21	78.0	154	103.0	177	128.0	156	157.0	24						
28.0	354	53.0	6	79.0	134	104.0	151	129.0	183	158.0	9						
29.0	517	54.0	3	80.0	194	105.0	217	130.0	160	159.0	3						

This sample size summary applies to figure 10.

F = +1.0856964E+03
 R = +2.1146647E-01
 I = +3.2949907E+01
 N = 23195
 STORAGE CONDITIONS = AMB TEMP/RH
 DEGREES OF FREEDOM = 23193
 Y = ((+9.0796169E+02) + (+1.0032234E+00) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF I = SIGNIFICANT
 S_e = +1.7343868E+02
 S_e = +3.0446927E-02
 S_e = +1.7750926E+02
 TEST CONDITIONS = AMB TEMP/RH



STAGE I, NING 1&2 LOW RATE TENSILE CHS=2.0 IN/MIN MODULUS (E)

Figure 10

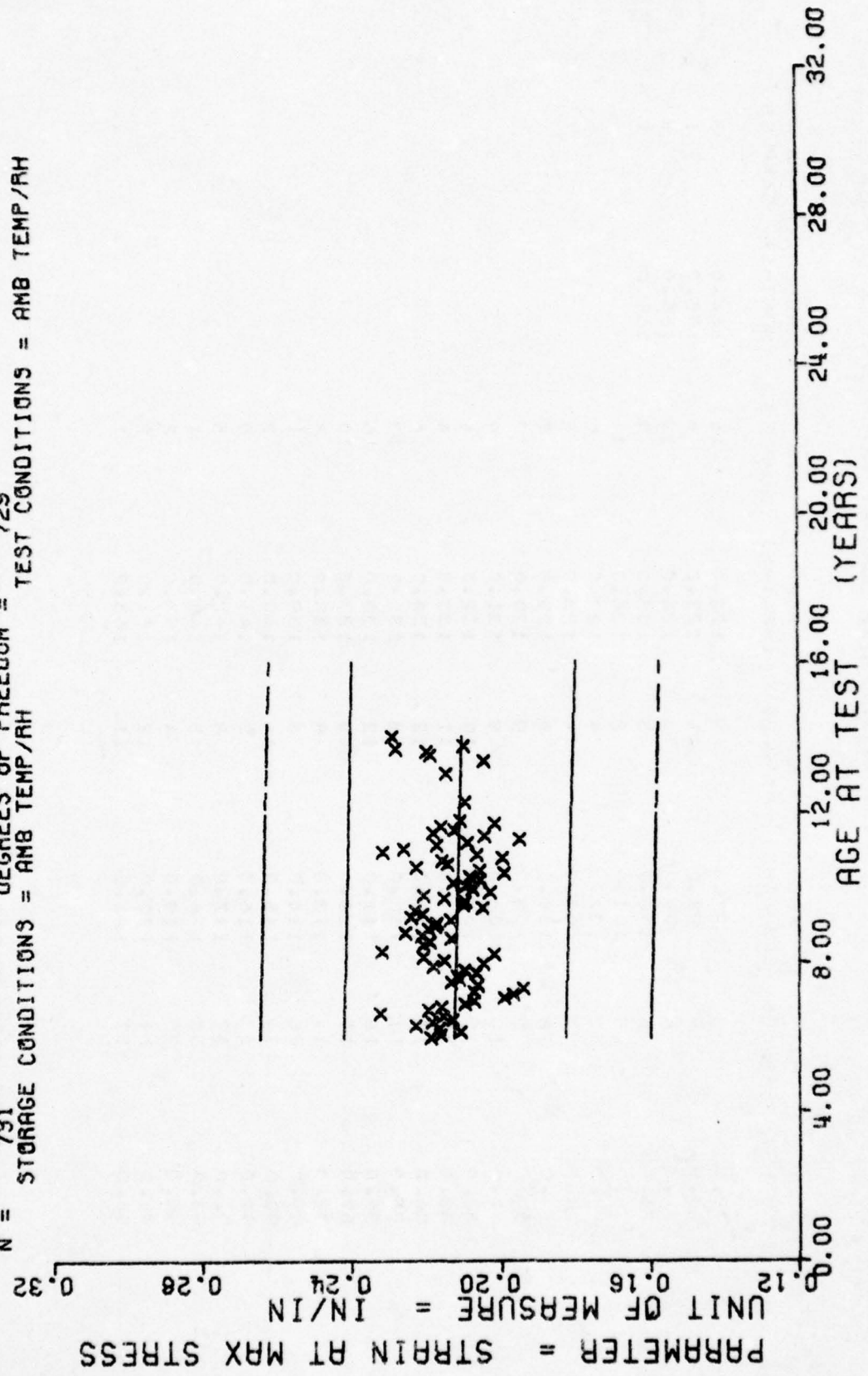
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
72.0	3	97.0	9	122.0	16	164.0	3
73.0	9	98.0	1	123.0	6	165.0	1
74.0	4	99.0	3	124.0	13	166.0	3
75.0	5	100.0	5	125.0	9	169.0	1
76.0	0	101.0	2	126.0	11		
77.0	12	102.0	4	127.0	6		
78.0	7	103.0	4	128.0	8		
79.0	16	104.0	9	129.0	7		
80.0	5	105.0	9	130.0	7		
81.0	10	106.0	9	131.0	4		
82.0	15	107.0	10	132.0	4		
83.0	13	108.0	11	133.0	4		
84.0	11	109.0	12	134.0	6		
85.0	11	110.0	8	135.0	13		
86.0	18	111.0	12	136.0	16		
87.0	11	112.0	10	137.0	10		
88.0	14	113.0	8	138.0	8		
89.0	26	114.0	6	139.0	1		
90.0	34	115.0	11	140.0	2		
91.0	23	116.0	5	141.0	9		
92.0	37	117.0	8	142.0	5		
93.0	30	118.0	5	148.0	1		
94.0	20	119.0	4	157.0	2		
95.0	11	120.0	12	161.0	2		
96.0	10	121.0	11	163.0	1		

STAGE 1, WING 1&2 LOW RATE BIAXIAL CHS=C.2 IN/MIN

This sample size summary is applicable to figures 11 thru 15.

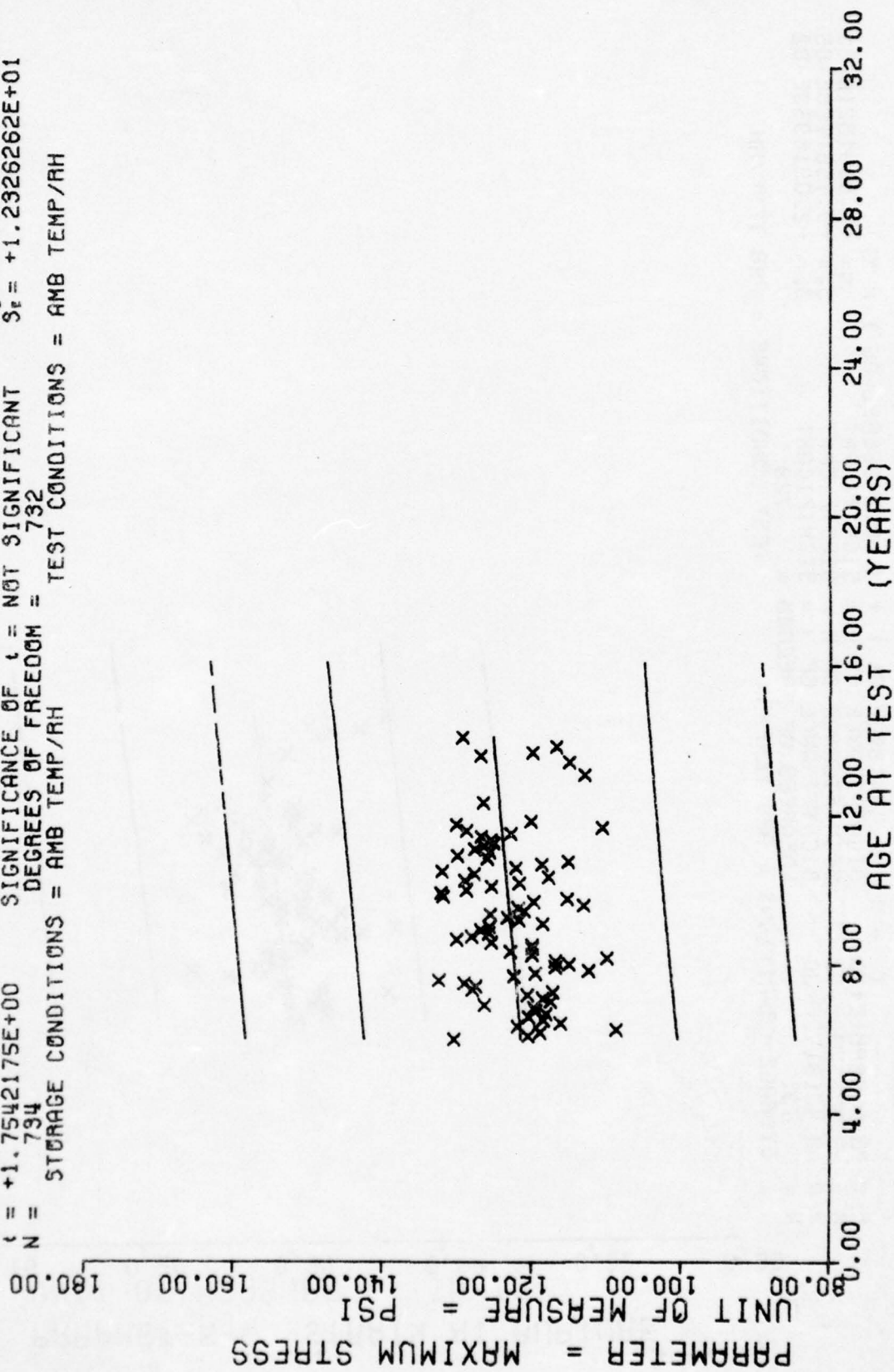
$\gamma = ((+2.1429264E-01) + (-2.3332271E-05) * X)$
 $F = +5.5555813E-01$ SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_r = +1.7433164E-02$
 $R = -2.7595328E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_e = +3.1303454E-05$
 $t = +7.4535772E-01$ SIGNIFICANCE OF t = NOT SIGNIFICANT $S_e = +1.7438474E-02$
 $N = 791$ DEGREES OF FREEDOM = 729
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



STAGE 1, WING 142 LOW RATE BIAXIAL CHS=0.2 IN/MIN STRAIN AT MAX STRESS (EM)

Figure 11

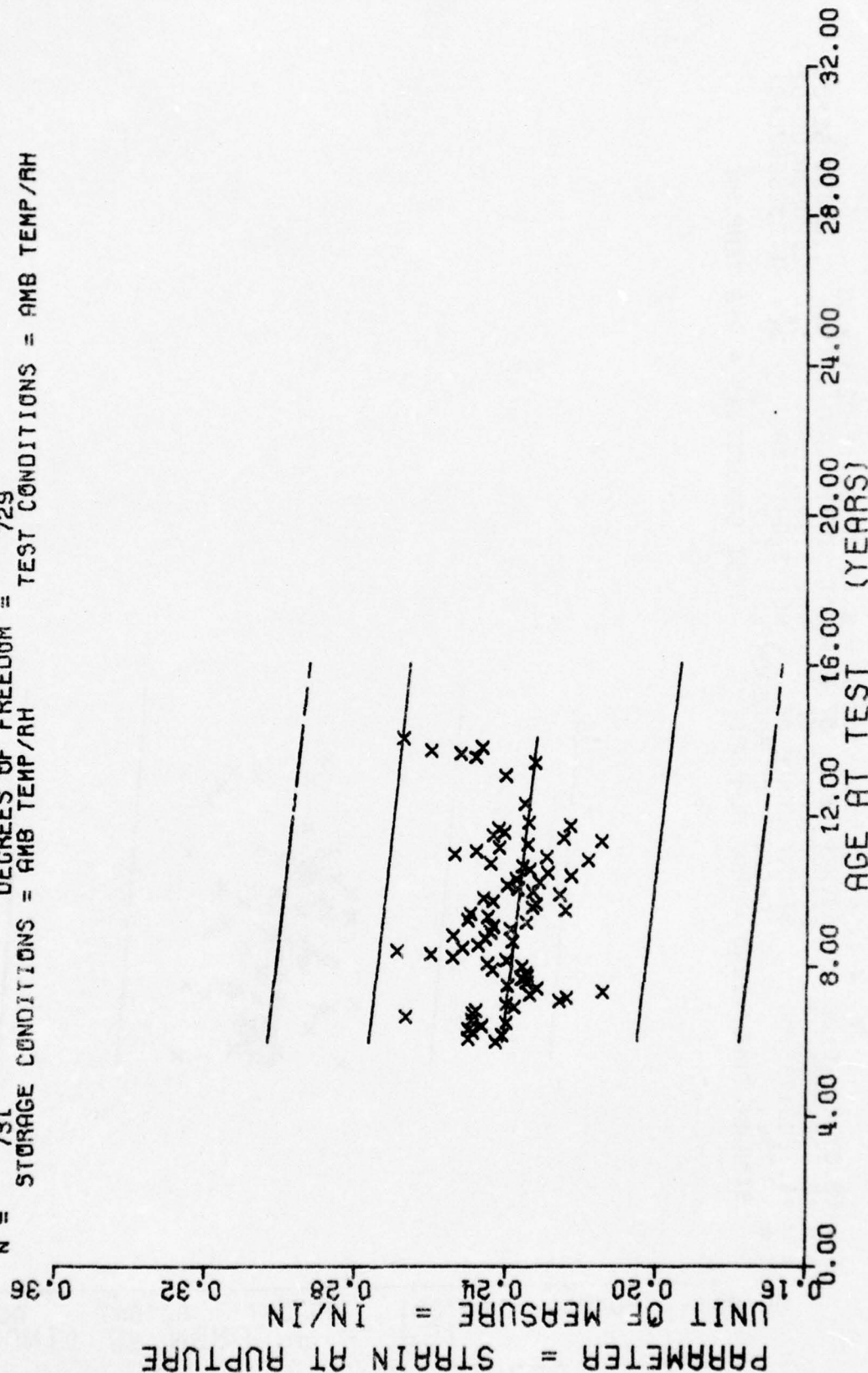
$F = +9.0772791E+00$
 $R = +8.4701886E-02$
 $t = +1.7542175E+00$
 $N = 734$
 $Y = ((+1.1872071E+02) + (+3.8768471E-02) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 732
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 142 LOW RATE BIAxIAL CHS=0.2 IN/MIN MAXIMUM STRESS (SM)

Figure 12

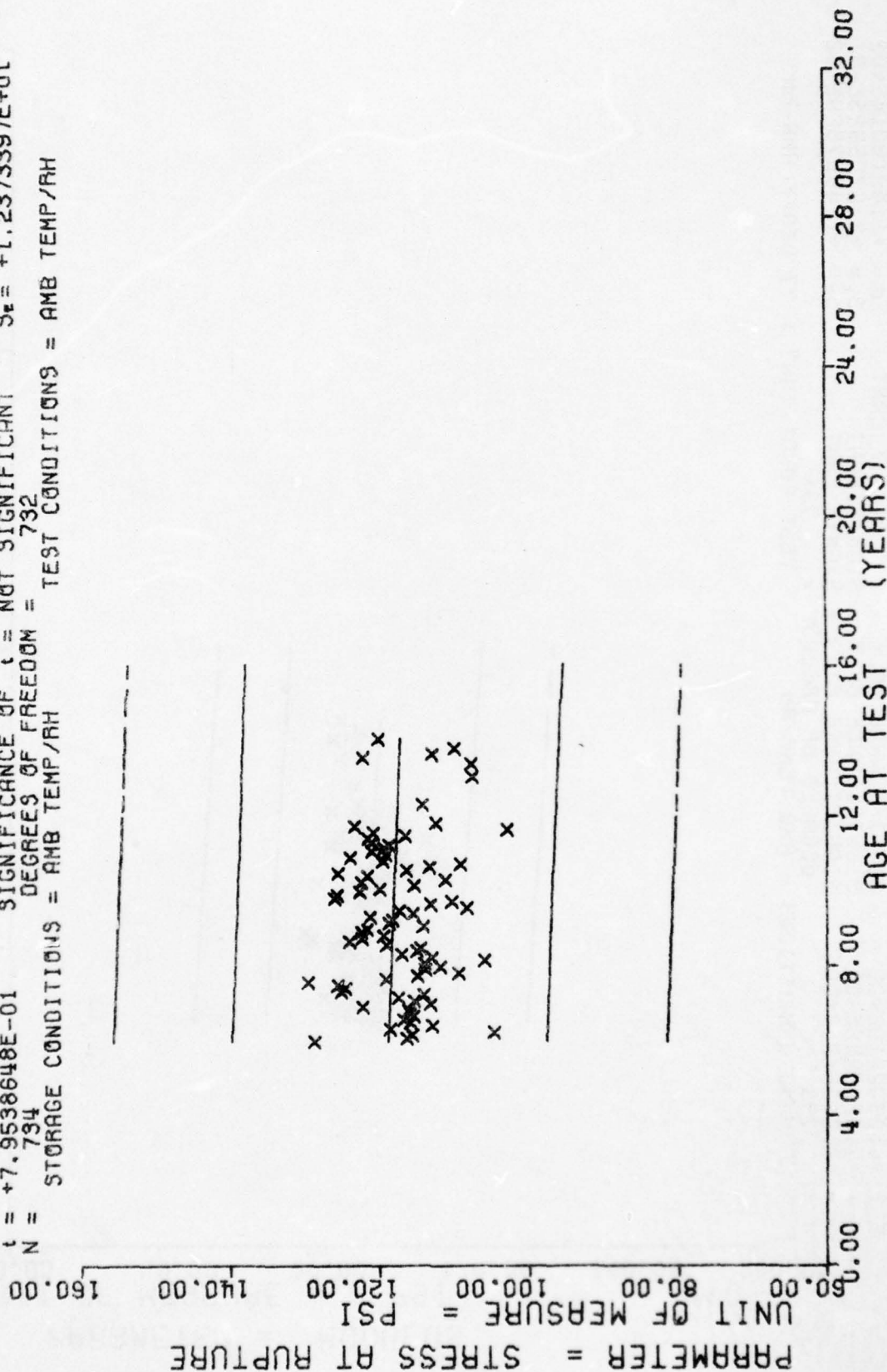
$F = +6.0595601E+00$
 $R = -9.0794446E-02$
 $t = +2.4616173E+00$
 $N = 731$
 $Y = 1(+2.4741392E-01) + (-9.2436669E-05) * X$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 729
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 142 LOW RATE BIAXIAL CHS=0.2 IN/MIN STRAIN AT RUPTURE (ER)

Figure 13

$Y = ((+1.2006082E+02) + (-1.7644469E-02) * X)$
 $F = +6.3263965E-01$ SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_r = +1.2370296E+01$
 $R = -2.9385634E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_e = +2.2183517E-02$
 $t = +7.9538648E-01$ SIGNIFICANCE OF t = NOT SIGNIFICANT $S_e = +1.2373397E+01$
 $N = 734$ DEGREES OF FREEDOM = 732
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 142 LOW RATE BIAXIAL CHS=0.2 IN/MIN STRESS AT RUPTURE (SR)

Figure 14

$F = +4.0502219E+00$
 $R = +7.4290246E-02$
 $t = +2.0125163E+00$
 $N = 739$
 $Y = ((+9.0025750E+02) + (+5.3746106E-01) \times X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 731
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = 77 DEG/F AMB-RH

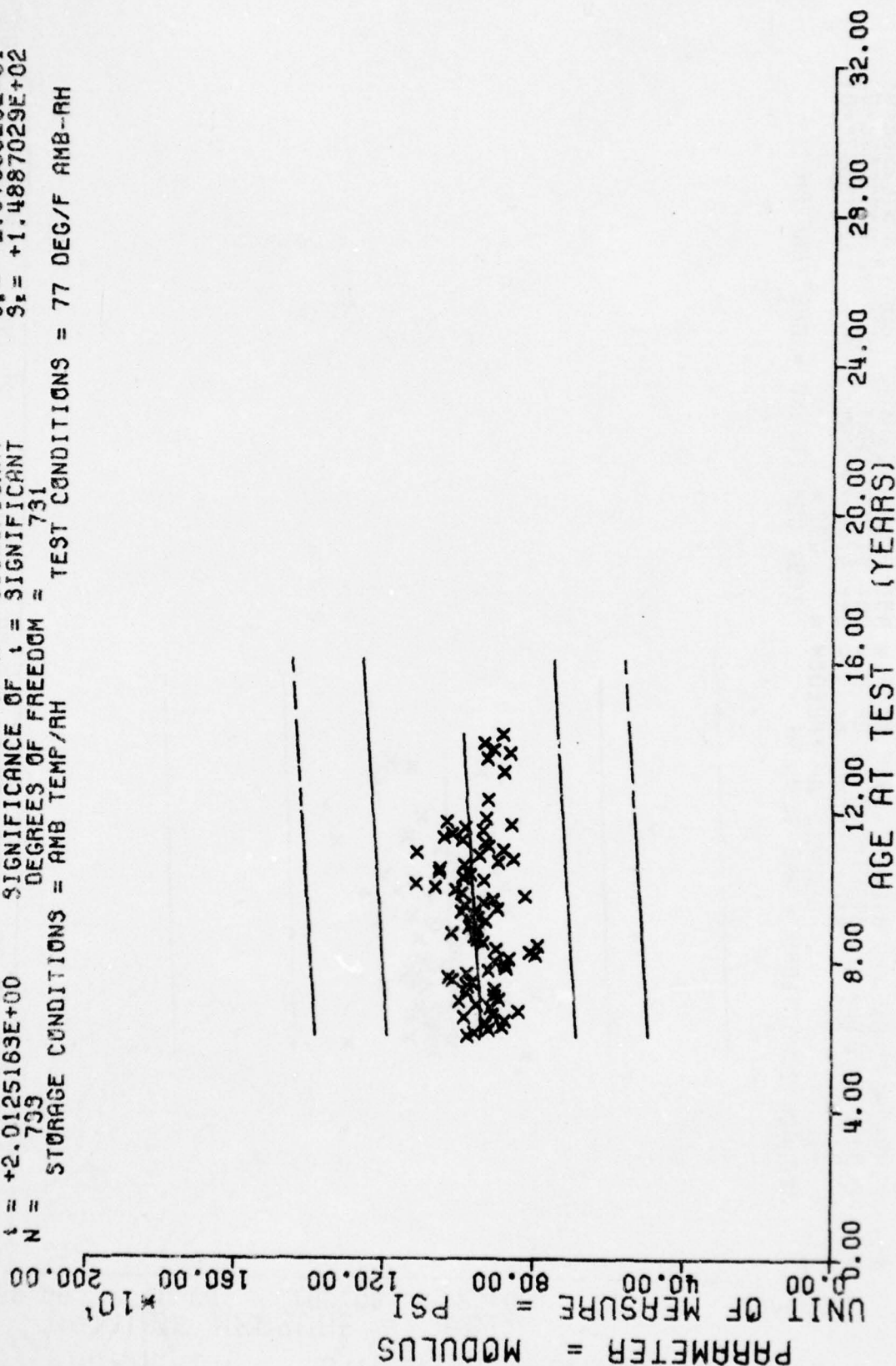


Figure 15

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
72.0	21	97.0	26	122.0	36
73.0	24	98.0	24	123.0	30
74.0	12	99.0	20	124.0	9
75.0	18	100.0	15	125.0	30
76.0	9	101.0	18	126.0	21
77.0	45	102.0	18	127.0	38
78.0	18	103.0	20	128.0	12
79.0	36	104.0	42	129.0	18
80.0	27	105.0	27	130.0	15
81.0	21	106.0	33	131.0	18
82.0	63	107.0	18	132.0	36
83.0	24	108.0	18	133.0	27
84.0	39	109.0	23	134.0	14
85.0	22	110.0	30	135.0	36
86.0	20	111.0	52	136.0	37
87.0	69	112.0	20	137.0	24
88.0	101	113.0	48	138.0	29
89.0	75	114.0	26	139.0	21
90.0	85	115.0	18	140.0	27
91.0	66	116.0	35	141.0	11
92.0	96	117.0	25	142.0	9
93.0	49	118.0	16	143.0	13
94.0	61	119.0	43	144.0	17
95.0	42	120.0	42	146.0	6
96.0	30	121.0	21		

STAGE 1, WING 182 HIGH RATE CHS=1750 IN/MIN

This sample size summary is applicable to figures 16 thru 20.

$Y = 1 (+1.7441884E-01) + 1 (+5.8599167E-04) + X ($
 $F = +1.2414893E+02$ SIGNIFICANCE OF F = SIGNIFICANT $G = +5.0473183E-02$
 $R = +2.2710107E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +5.2592197E-05$
 $t = +1.1142191E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_t = +4.9170990E-02$
 $N = 2285$ DEGREES OF FREEDOM = 2283
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = AMB TEMP/AM

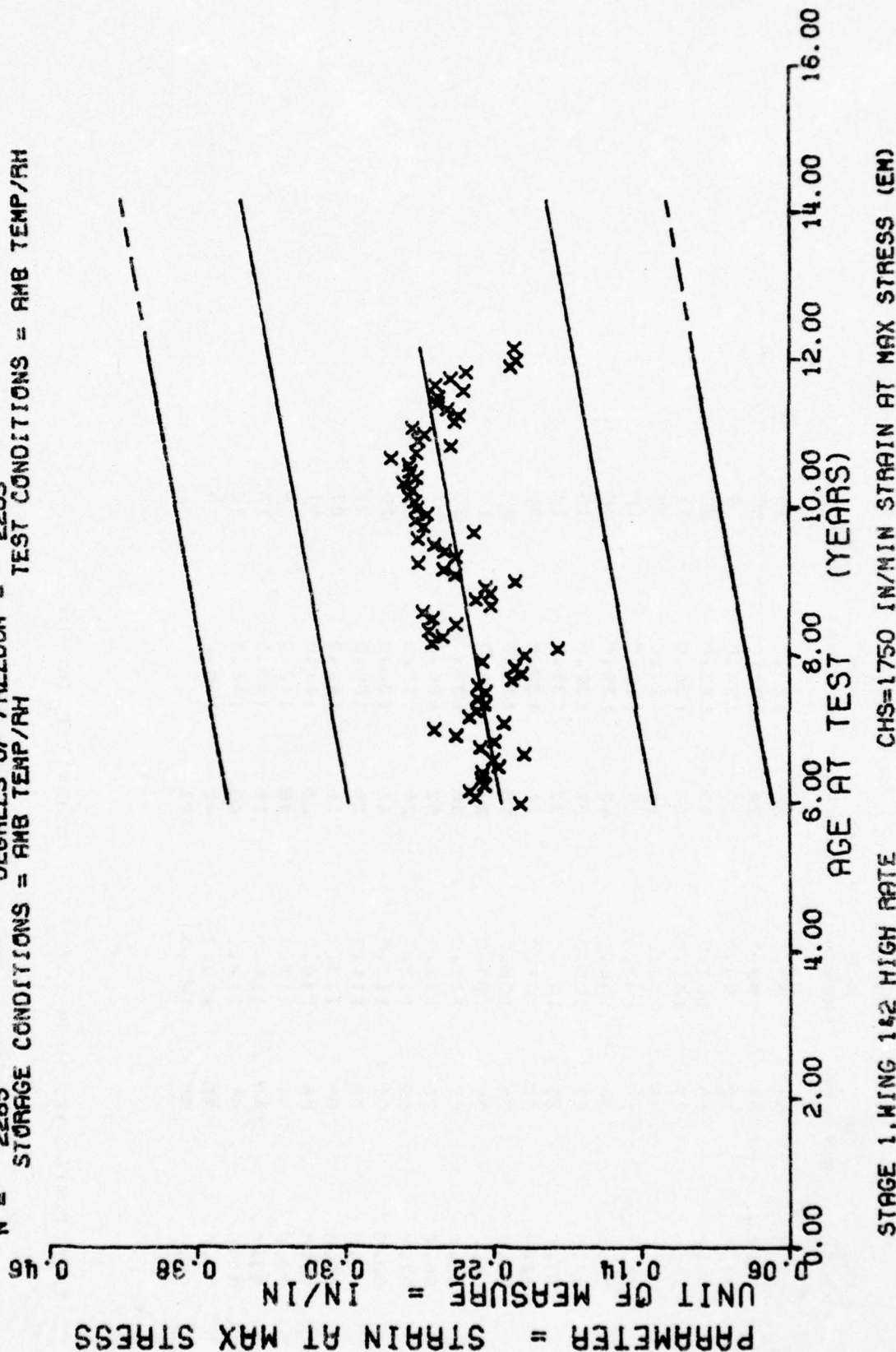


Figure 16

$Y = ((+3.8397734E+02) + (+8.2845498E-03) * X)$
 F = +3.9719590E-02 SIGNIFICANCE OF F = NOT SIGNIFICANT $G_1 = +4.2144461E+01$
 R = +3.8439711E-03 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_1 = +4.5115707E-02$
 t = +1.8362894E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_2 = +4.2153383E+01$
 N = 2284 DEGREES OF FREEDOM = 2282
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

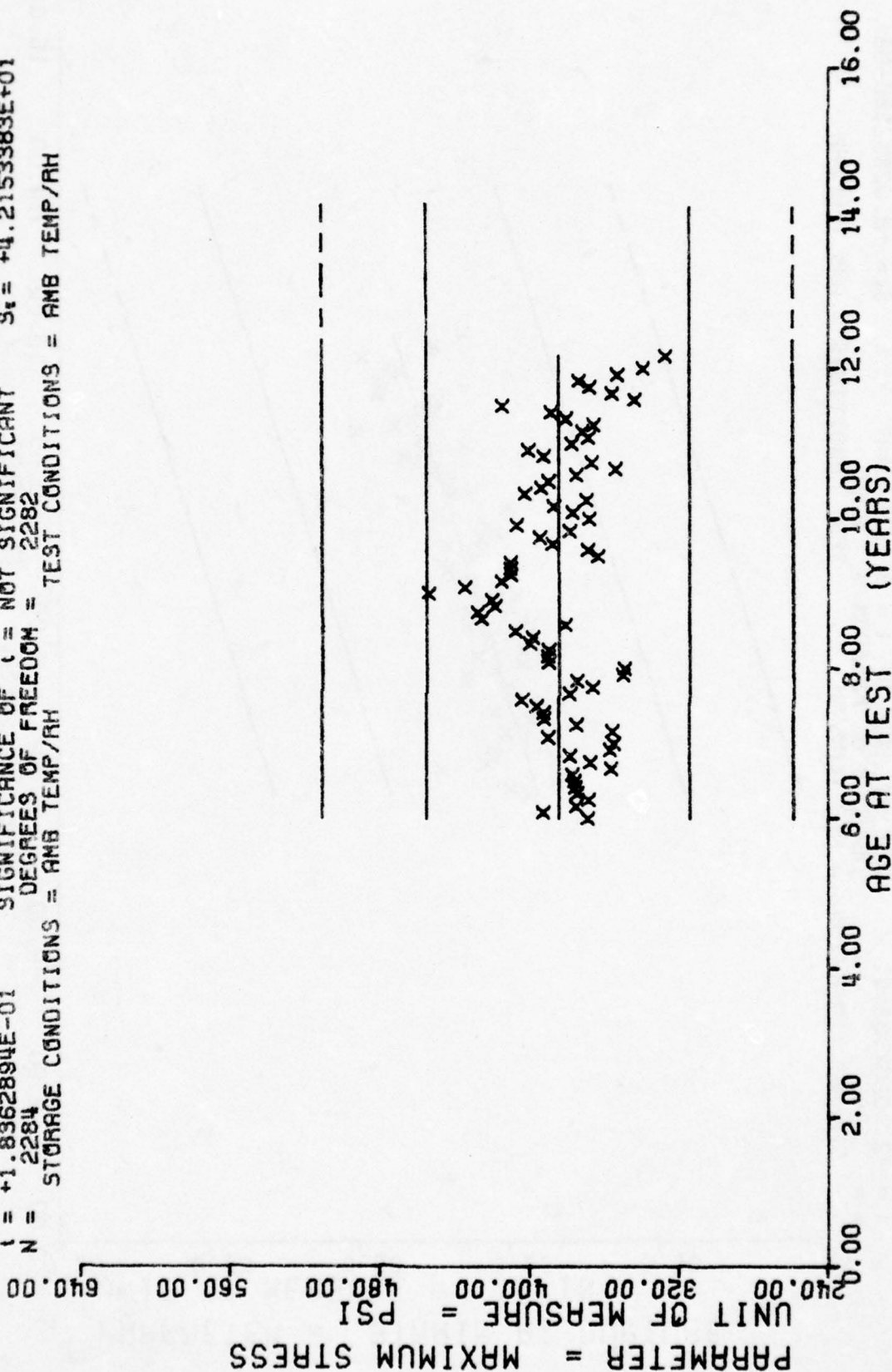
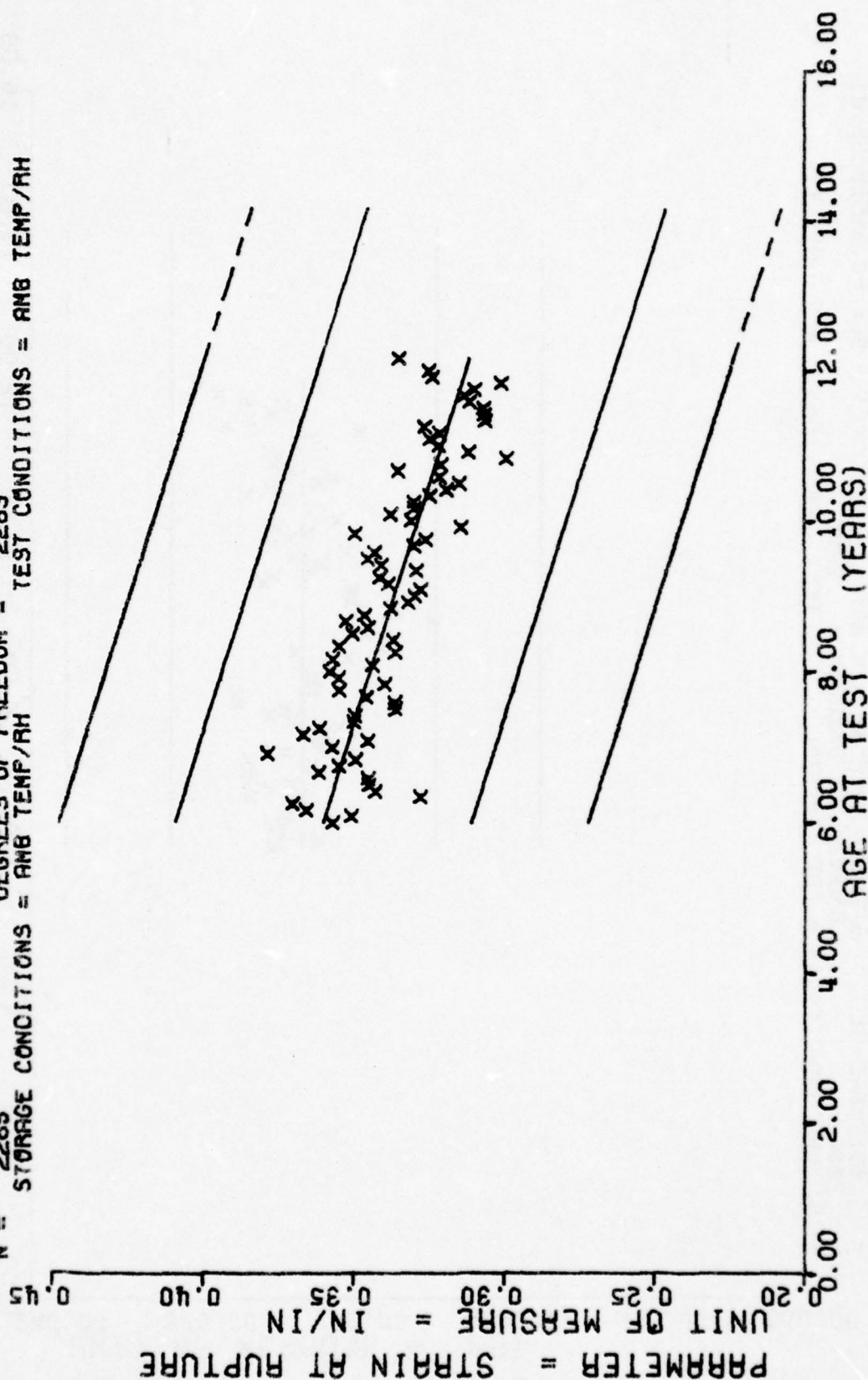


Figure 17

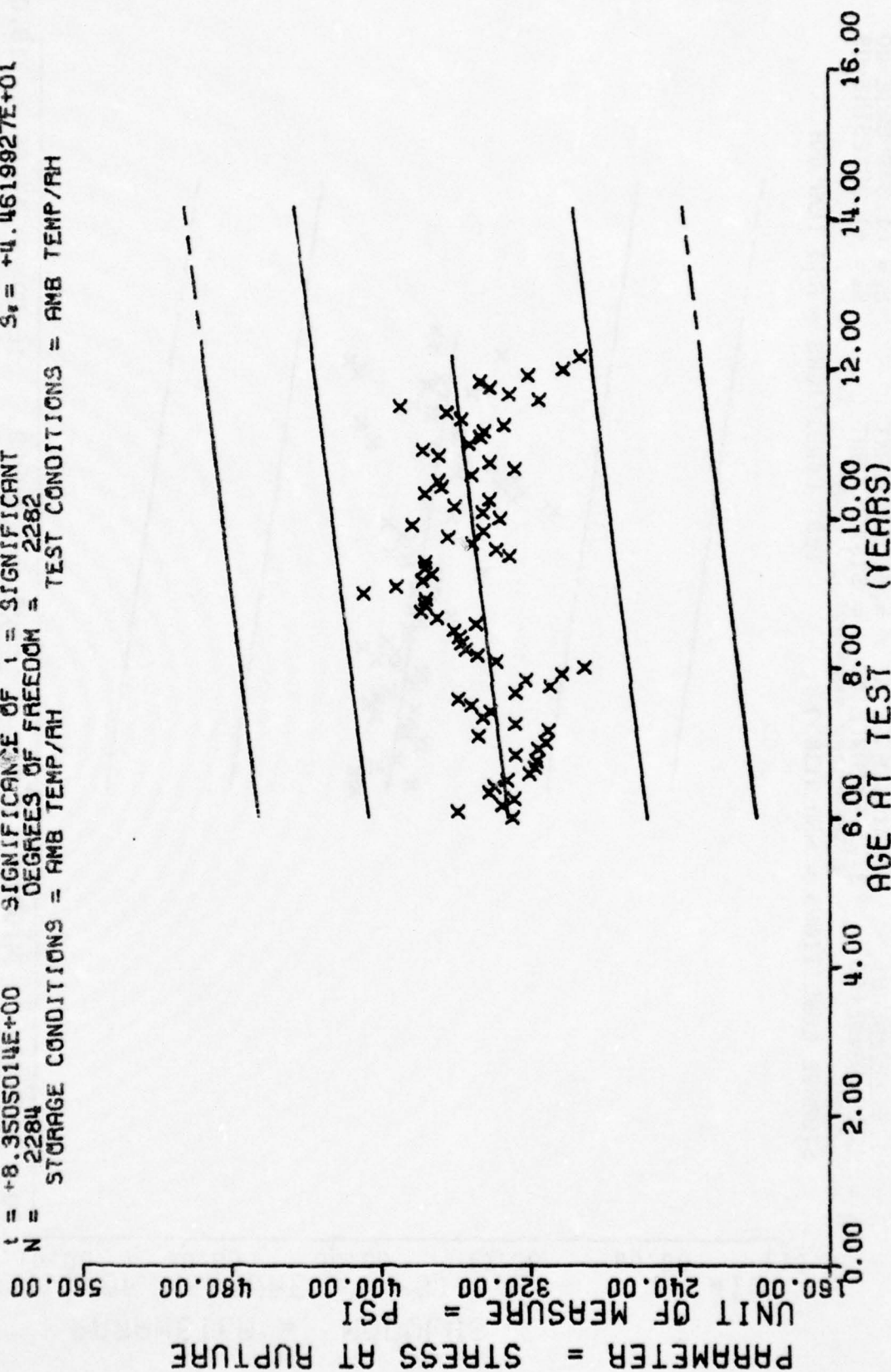
$Y = ((+4.0792430E-01) + (-6.5791881E-04) * X)$
 $F = +4.4185127E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -4.0268611E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +2.1020258E+01$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 2285$ DEGREES OF FREEDOM = 2283
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 142 HIGH RATE CHS=1750 IN/MIN STRAIN AT RUPTURE (EA)

Figure 18

$Y = ((+3.0419216E+02) + (+3.9878310E-01) * X)$
 $F = +6.9730874E+01$ SIGNIFICANCE OF F = SIGNIFICANT $G = +4.5286600E+01$
 $R = +1.7219428E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +4.7755588E-02$
 $t = +8.3505014E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +4.4619827E+01$
 $N = 2284$ DEGREES OF FREEDOM = 2282
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



STAGE 1, WING 142 HIGH RATE CHS=1750 IN/MIN STRESS AT RUPTURE (38A)

Figure 19

$F = +8.0168862E+01$
 $R = +1.8422228E-01$
 $t = +8.9535949E+00$
 $N = 2284$
 STORAGE CONDITIONS = AMB TEMP/RH
 DEGREES OF FREEDOM = 2282
 TEST CONDITIONS = AMB TEMP/RH
 $Y = ((+4.3447443E+03) + ((+1.2086198E+01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 $S_1 = +1.2612314E+03$
 $S_2 = +1.3498649E+00$
 $S_3 = +1.2829127E+03$

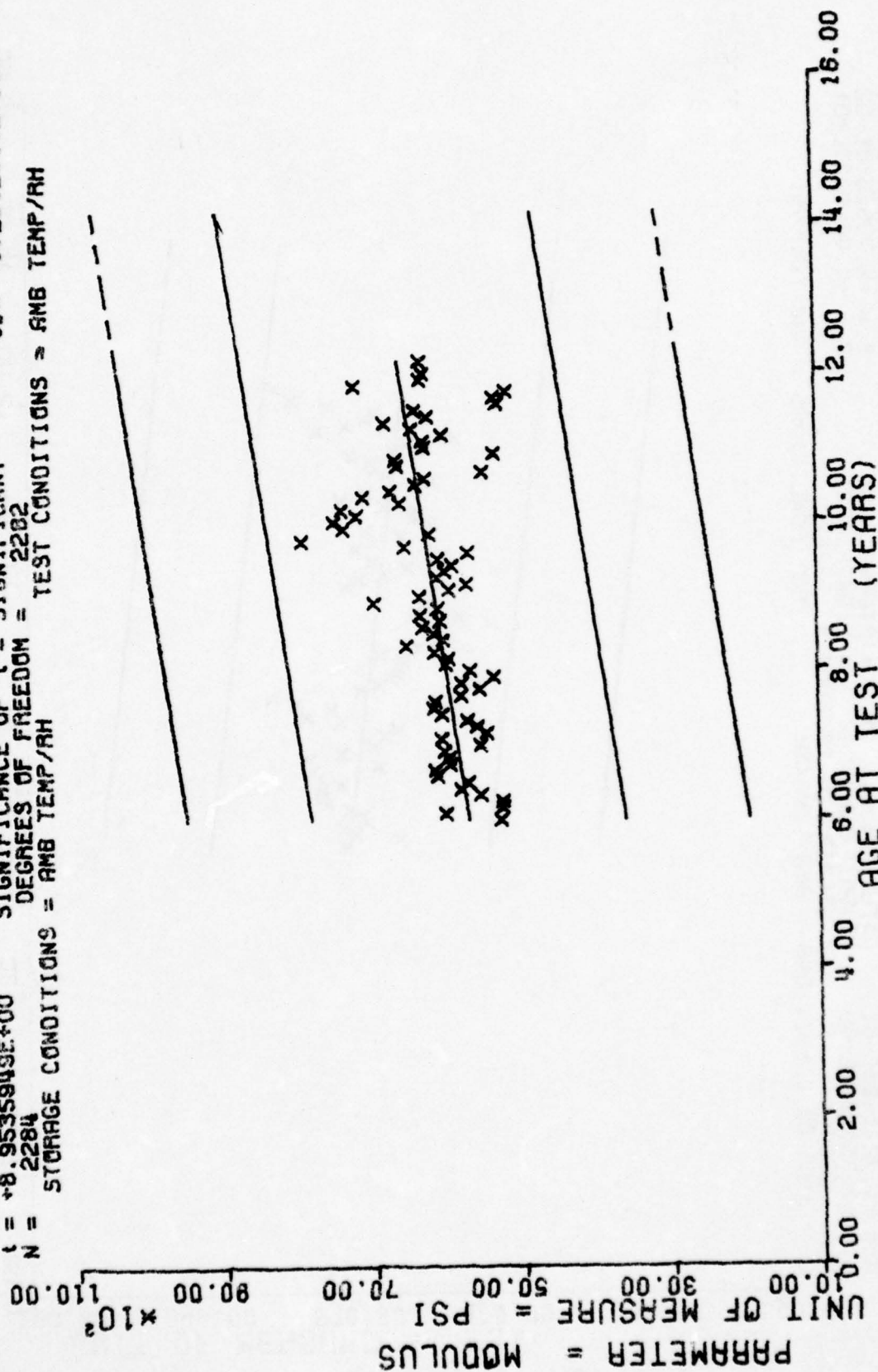


Figure 20

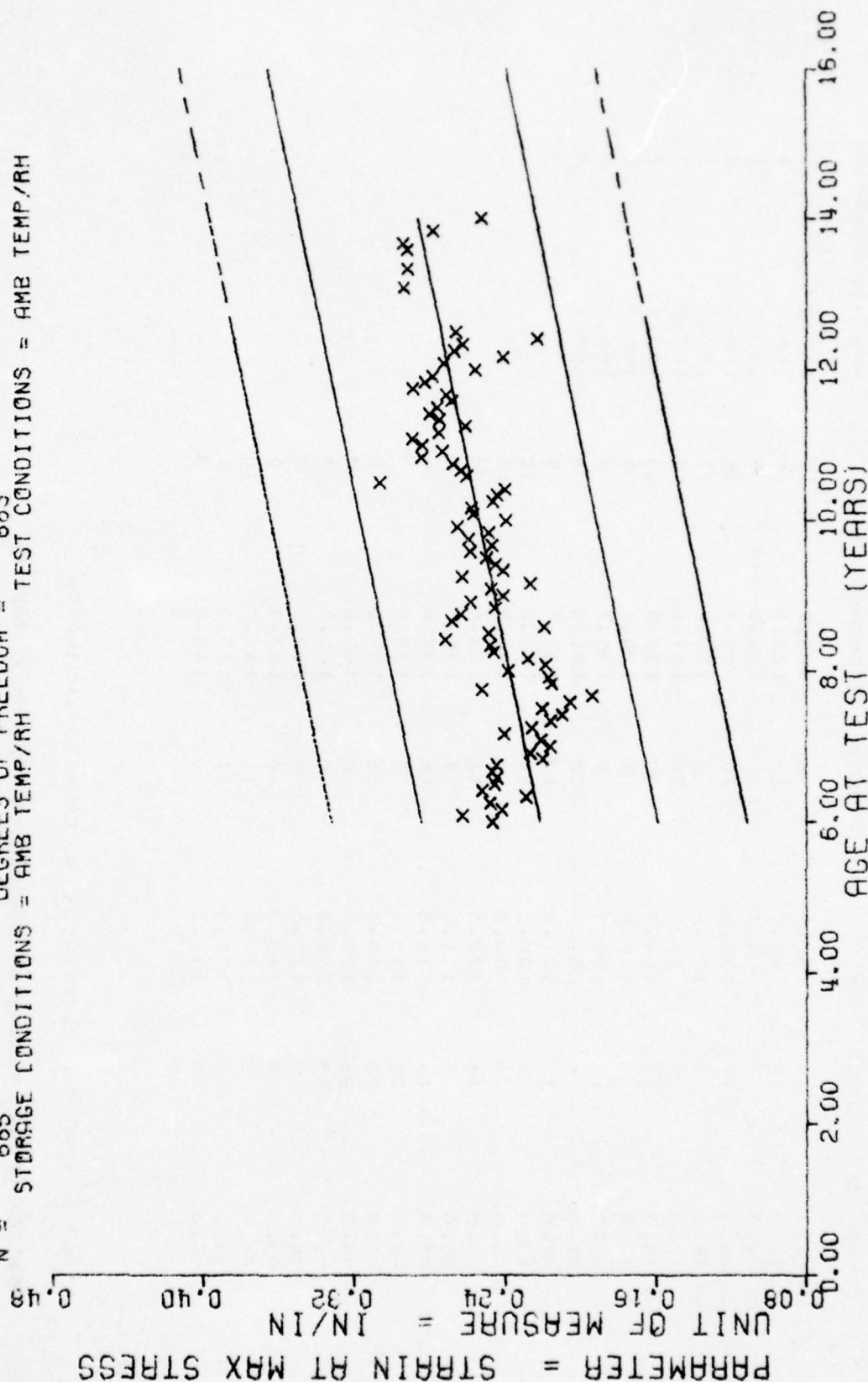
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
72.0	9	97.0	8	122.0	15	147.0	2
73.0	4	98.0	18	123.0	6	148.0	1
74.0	7	99.0	10	124.0	9	149.0	1
75.0	17	100.0	10	125.0	16	150.0	2
76.0	5	101.0	8	126.0	3	157.0	10
77.0	9	102.0	10	127.0	7	160.0	2
78.0	10	103.0	5	128.0	10	163.0	2
79.0	5	104.0	7	129.0	8	164.0	1
80.0	11	105.0	7	130.0	7	166.0	2
81.0	4	106.0	12	131.0	3	168.0	4
82.0	13	107.0	13	132.0	8		
83.0	7	108.0	14	133.0	12		
84.0	4	109.0	8	134.0	12		
85.0	15	110.0	12	135.0	2		
86.0	5	111.0	7	136.0	8		
87.0	14	112.0	14	137.0	6		
88.0	21	113.0	7	138.0	3		
89.0	25	114.0	5	139.0	5		
90.0	26	115.0	6	140.0	3		
91.0	13	116.0	9	141.0	3		
92.0	5	117.0	8	142.0	2		
93.0	6	118.0	9	143.0	5		
94.0	8	119.0	11	144.0	10		
95.0	9	120.0	11	145.0	1		
96.0	8	121.0	9	146.0	3		

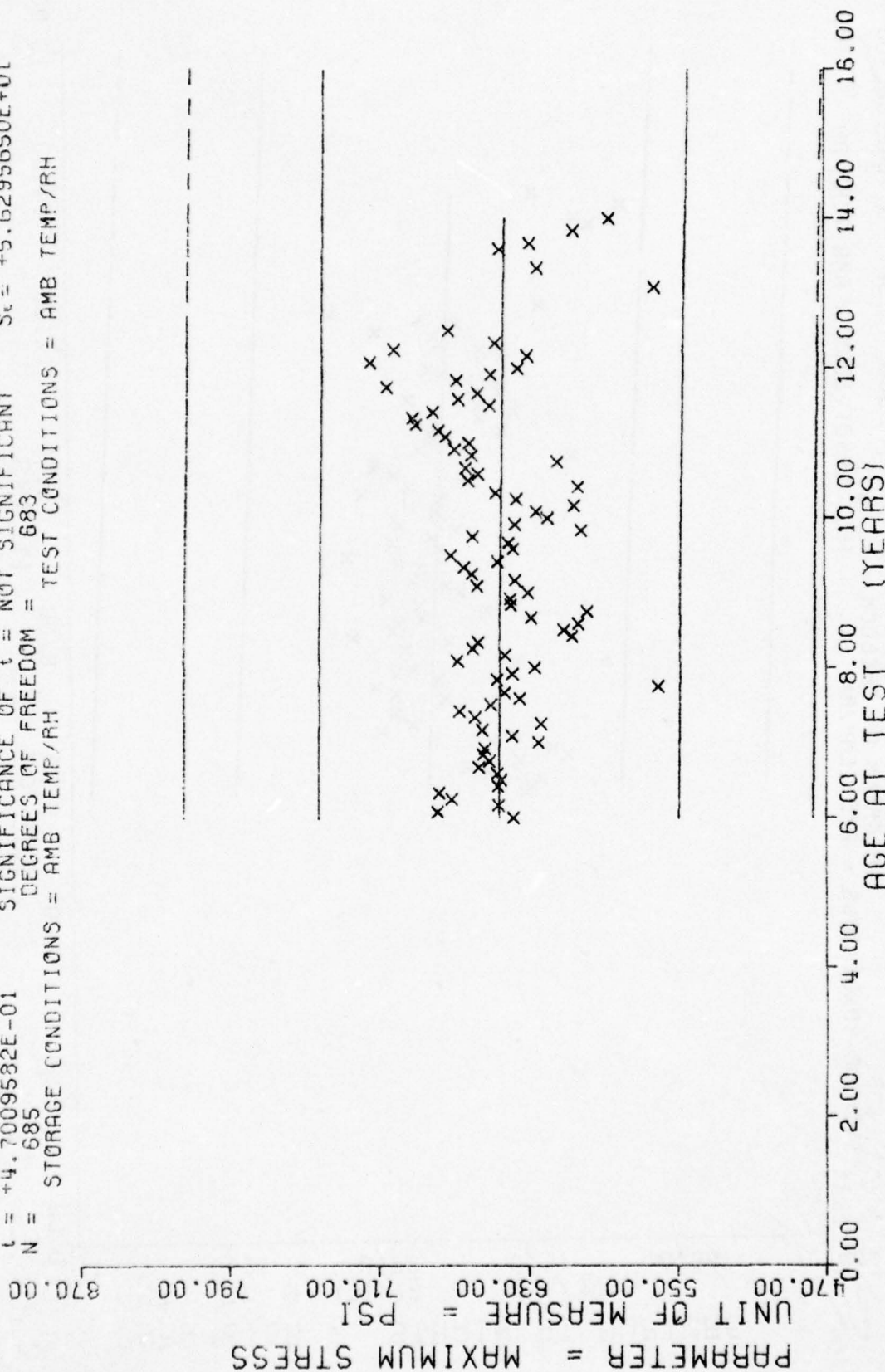
STAGE 1, WING 1&2 H.R. TRIAXIAL CHS=1750, PSI=600.

This sample size summary is applicable to figures 21 thru 25.

$Y = ((+1.7349540E-01) + (+6.7031083E-04) \times X)$
 $F = +1.0348452E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +3.6273762E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +1.0172734E+01$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 685$ DEGREES OF FREEDOM = 683
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



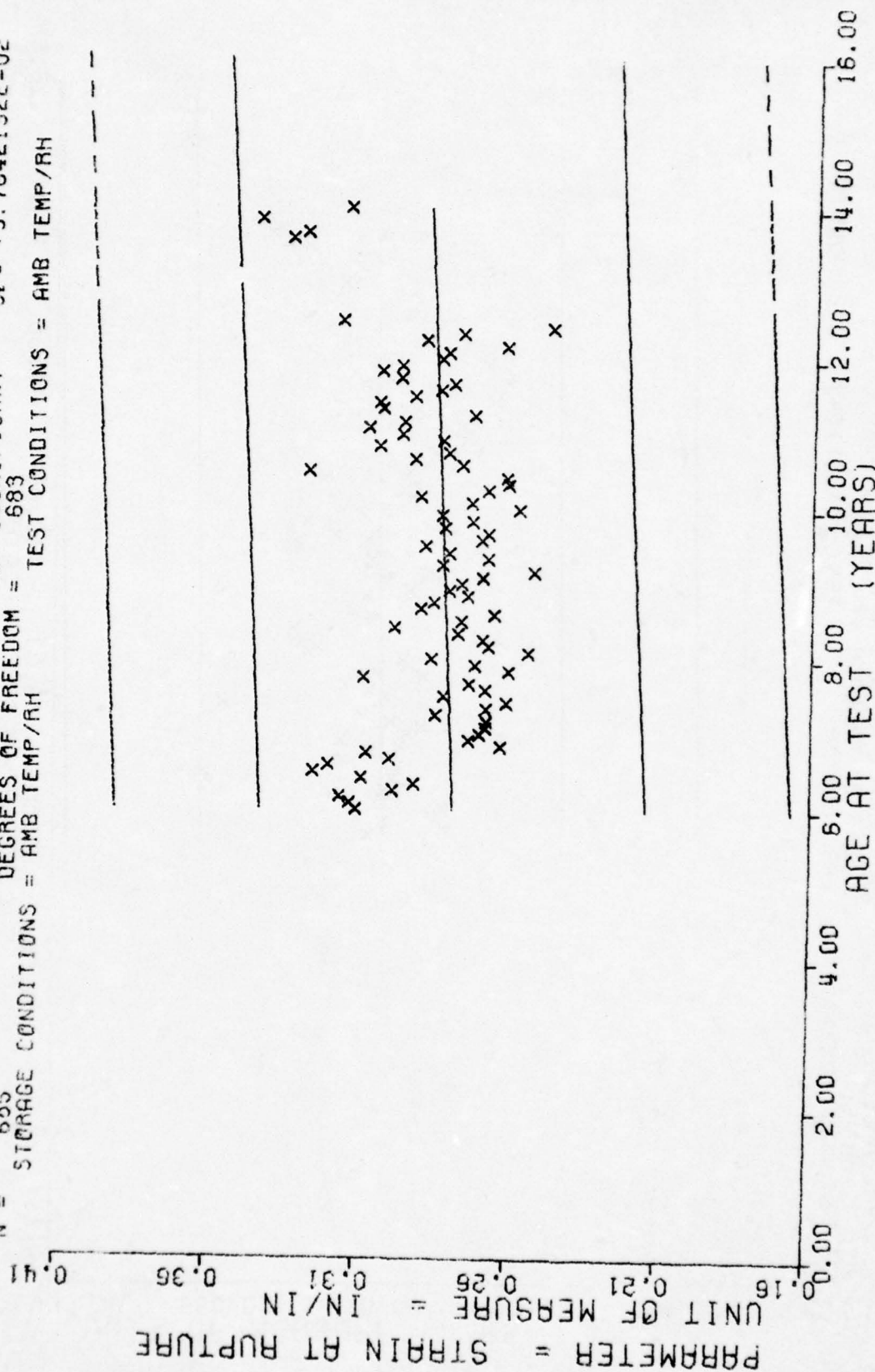
$Y = ((+6.4966200E+02) + (-4.7431786E-02) * X)$
 F = +2.2099008E-01
 R = -1.7934807E-02
 t = +4.7009532E-01
 N = 685
 STORAGE CONDITIONS = AMB TEMP/RH
 DEGREES OF FREEDOM = 683
 TEST CONDITIONS = AMB TEMP/RH
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 S_G = +5.6263583E+01
 S_B = +1.0089812E-01
 S_C = +5.6295650E+01



STAGE 1, WING 1&2 H.R. TRIAXIAL CHS=1750, PSI=600, MAXIMUM STRESS (SM)

Figure 22

$Y = (1 + 2.7148637E-01) + (+1.0705351E-04) \times X$
 F = +2.5178908E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT $G = +3.7683875E-02$
 R = +6.0605083E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT $S = +6.7465611E-05$
 t = +1.5867963E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_1 = +3.7642132E-02$
 N = 685 DEGREES OF FREEDOM = 683
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



$Y = ((+6.2298163E+02) + (+5.4920049E-02) \times X)$
 $F = +3.0961542E-01$ SIGNIFICANCE OF F = NOT SIGNIFICANT $G_1 = +5.5041731E+01$
 $R = +2.1286415E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_0 = +9.8700560E-02$
 $t = +5.5643097E-01$ SIGNIFICANCE OF t = NOT SIGNIFICANT $S_e = +5.5069530E+01$
 $N = 685$ DEGREES OF FREEDOM = 683
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG/F AMB-RH

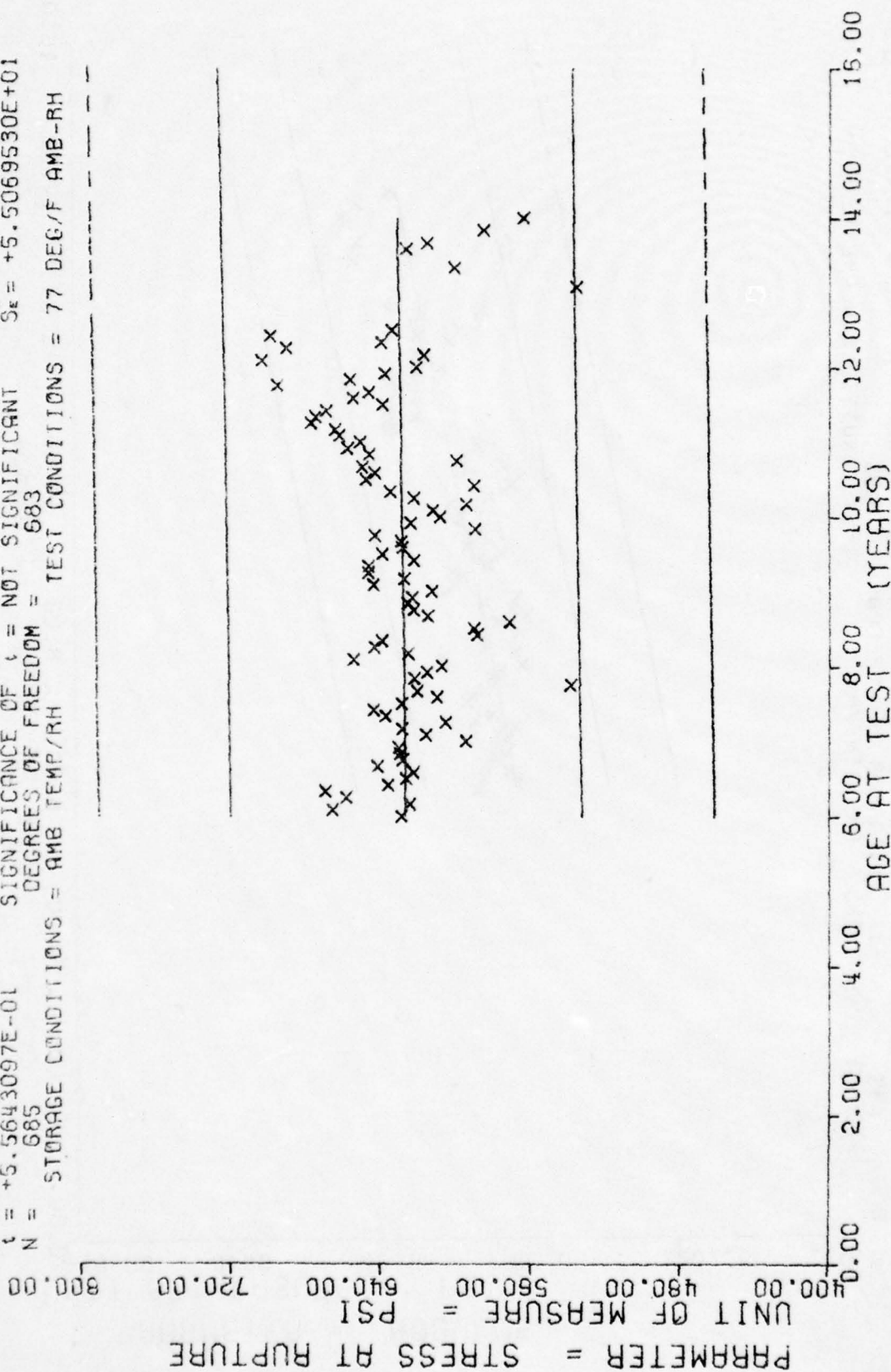
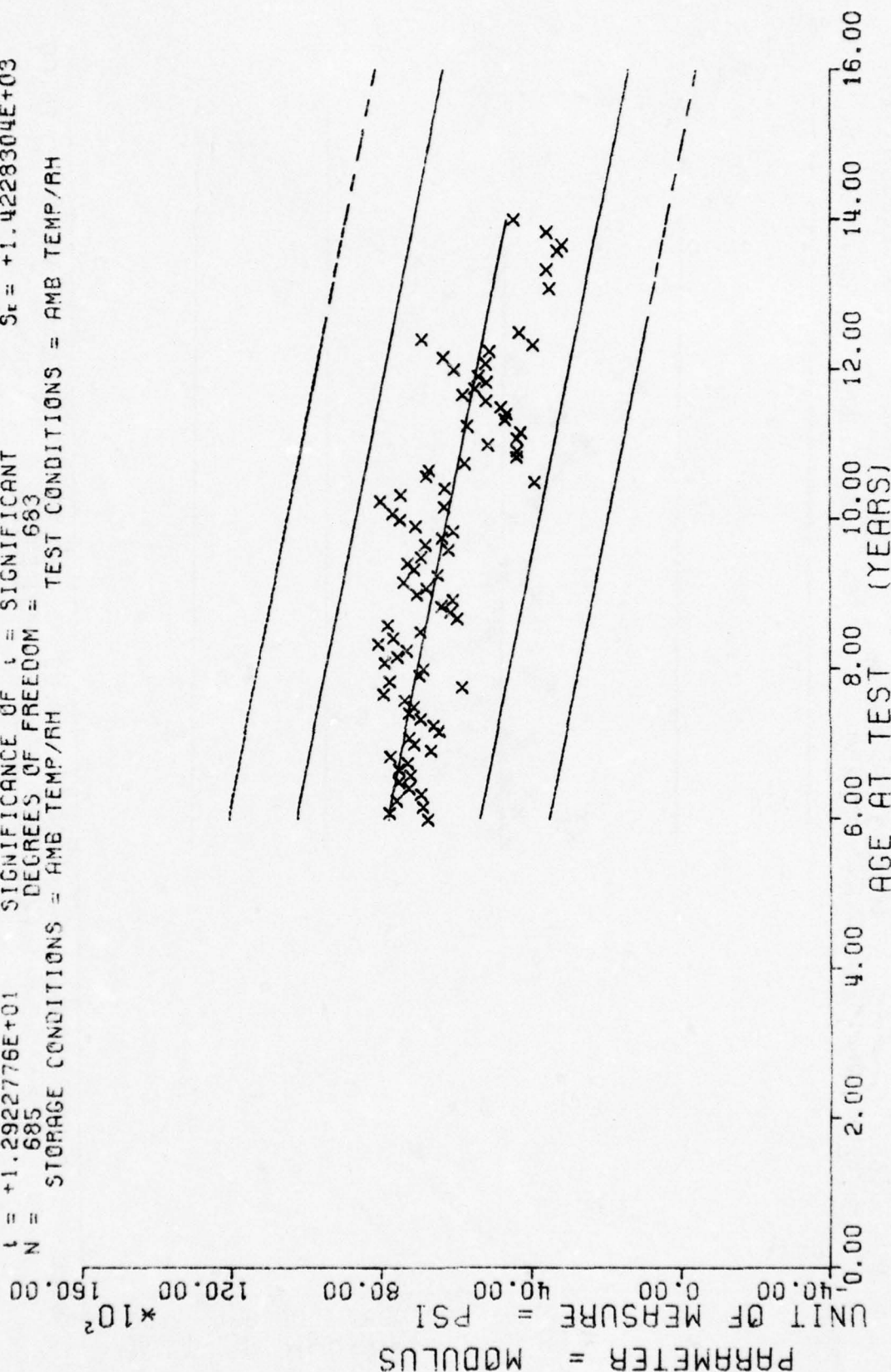


Figure 24

$Y = ((+1.0201220E+04) + (-3.2954698E+01) * X)$
 F = +1.6699314E+02 SIGNIFICANCE OF F = SIGNIFICANT $G = +1.5861128E+03$
 R = -4.4324604E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +2.5501245E+00$
 L = +1.2922776E+01 SIGNIFICANCE OF L = SIGNIFICANT $S_r = +1.4228304E+03$
 N = 685 DEGREES OF FREEDOM = 683
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 1&2 H.R. TRIAXIAL CHS=1750, PSI=600, MODULUS (E)

Figure 25

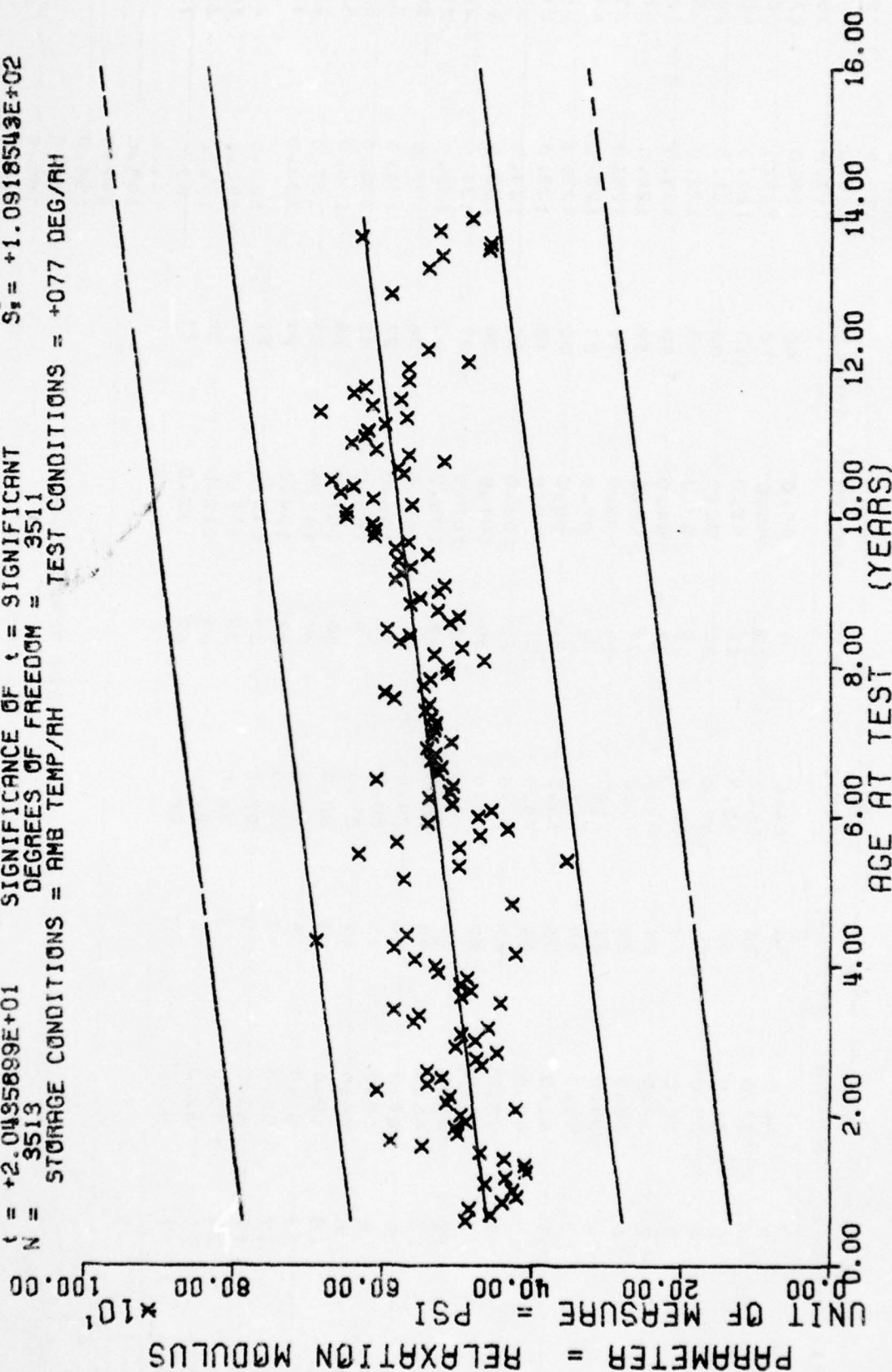
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)		NR SAMPLES		AGE (MONTHS)		NR SAMPLES		AGE (MONTHS)		NR SAMPLES		AGE (MONTHS)		NR SAMPLES	
7.0	4	32.0	39	64.0	9	89.0	66	114.0	33	114.0	33	114.0	33	114.0	33
8.0	3	33.0	38	65.0	12	90.0	72	115.0	36	115.0	36	115.0	36	115.0	36
9.0	5	34.0	30	66.0	12	91.0	113	116.0	20	116.0	20	116.0	20	116.0	20
10.0	4	35.0	29	67.0	24	92.0	63	117.0	35	117.0	35	117.0	35	117.0	35
11.0	5	36.0	29	68.0	6	93.0	93	118.0	21	118.0	21	118.0	21	118.0	21
12.0	7	37.0	23	69.0	17	94.0	60	119.0	36	119.0	36	119.0	36	119.0	36
13.0	6	38.0	20	70.0	27	95.0	39	120.0	42	120.0	42	120.0	42	120.0	42
14.0	10	39.0	22	71.0	24	96.0	30	121.0	15	121.0	15	121.0	15	121.0	15
15.0	12	40.0	28	72.0	24	97.0	23	122.0	9	122.0	9	122.0	9	122.0	9
16.0	9	41.0	38	73.0	21	98.0	30	123.0	12	123.0	12	123.0	12	123.0	12
17.0	6	42.0	84	74.0	21	99.0	15	124.0	27	124.0	27	124.0	27	124.0	27
18.0	8	43.0	63	75.0	21	100.0	48	125.0	21	125.0	21	125.0	21	125.0	21
19.0	7	44.0	50	76.0	30	101.0	36	126.0	44	126.0	44	126.0	44	126.0	44
20.0	11	45.0	39	77.0	15	102.0	27	127.0	51	127.0	51	127.0	51	127.0	51
21.0	12	46.0	48	78.0	27	103.0	43	128.0	21	128.0	21	128.0	21	128.0	21
22.0	9	47.0	36	79.0	27	104.0	34	129.0	33	129.0	33	129.0	33	129.0	33
23.0	8	48.0	15	80.0	30	105.0	27	130.0	18	130.0	18	130.0	18	130.0	18
24.0	8	49.0	17	81.0	18	106.0	33	131.0	27	131.0	27	131.0	27	131.0	27
25.0	18	50.0	5	82.0	36	107.0	24	132.0	33	132.0	33	132.0	33	132.0	33
26.0	13	51.0	4	83.0	27	108.0	33	133.0	18	133.0	18	133.0	18	133.0	18
27.0	17	52.0	3	84.0	27	109.0	27	134.0	33	134.0	33	134.0	33	134.0	33
28.0	17	53.0	5	85.0	33	110.0	21	135.0	36	135.0	36	135.0	36	135.0	36
29.0	29	58.0	3	86.0	33	111.0	18	136.0	39	136.0	39	136.0	39	136.0	39
30.0	29	62.0	3	87.0	69	112.0	36	137.0	33	137.0	33	137.0	33	137.0	33
31.0	51	63.0	3	88.0	69	113.0	21	138.0	15	138.0	15	138.0	15	138.0	15
								139.0	27	139.0	27	139.0	27	139.0	27
								140.0	18	140.0	18	140.0	18	140.0	18
								141.0	33	141.0	33	141.0	33	141.0	33
								142.0	15	142.0	15	142.0	15	142.0	15
								144.0	3	144.0	3	144.0	3	144.0	3
								145.0	3	145.0	3	145.0	3	145.0	3
								147.0	6	147.0	6	147.0	6	147.0	6
								156.0	3	156.0	3	156.0	3	156.0	3
								158.0	3	158.0	3	158.0	3	158.0	3
								160.0	9	160.0	9	160.0	9	160.0	9
								162.0	6	162.0	6	162.0	6	162.0	6
								163.0	3	163.0	3	163.0	3	163.0	3
								164.0	3	164.0	3	164.0	3	164.0	3
								165.0	6	165.0	6	165.0	6	165.0	6
								166.0	6	166.0	6	166.0	6	166.0	6
								168.0	3	168.0	3	168.0	3	168.0	3

STAGE 1, WING 1&2, STRESS RELAXATION 3.0X TEST TEMP. 77 DEG

This sample size summary is applicable to figures 26 thru 29.

$F = +4.1762598E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +3.2604189E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +2.0435889E+01$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 3513$ DEGREES OF FREEDOM = 3511
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = +077 DEG/AM



STAGE I, WING 1&2, STRESS RELAXATION 3.0% 10 SEC TEST TEMP. 77 DEG

Figure 26

$Y = ((+3.7605979E+02) + (+6.6977513E-01) * X)$
 $F = +2.6854496E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +2.6620424E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +1.6387341E+01$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 3523$ DEGREES OF FREEDOM = 3521
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH

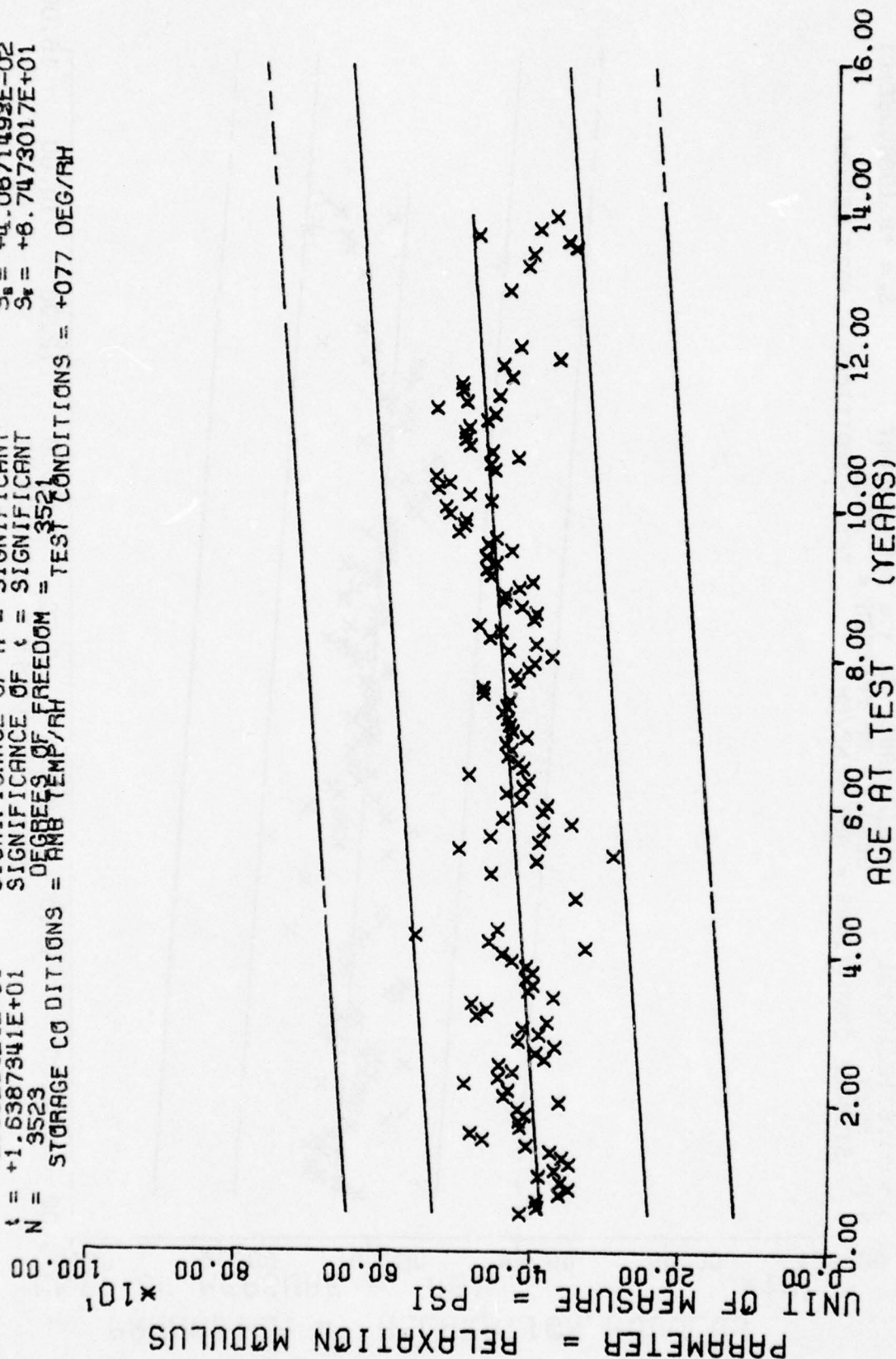


Figure 27

$Y = ((+3.5124957E+02) + (+6.1714530E-01) \times X)$
 F = +2.5954854E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_1 = +8.4940431E+01$
 R = +2.6201845E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +3.8306999E-02$
 t = +1.6110510E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +8.1984495E+01$
 N = 3523 DEGREES OF FREEDOM = 3521
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH

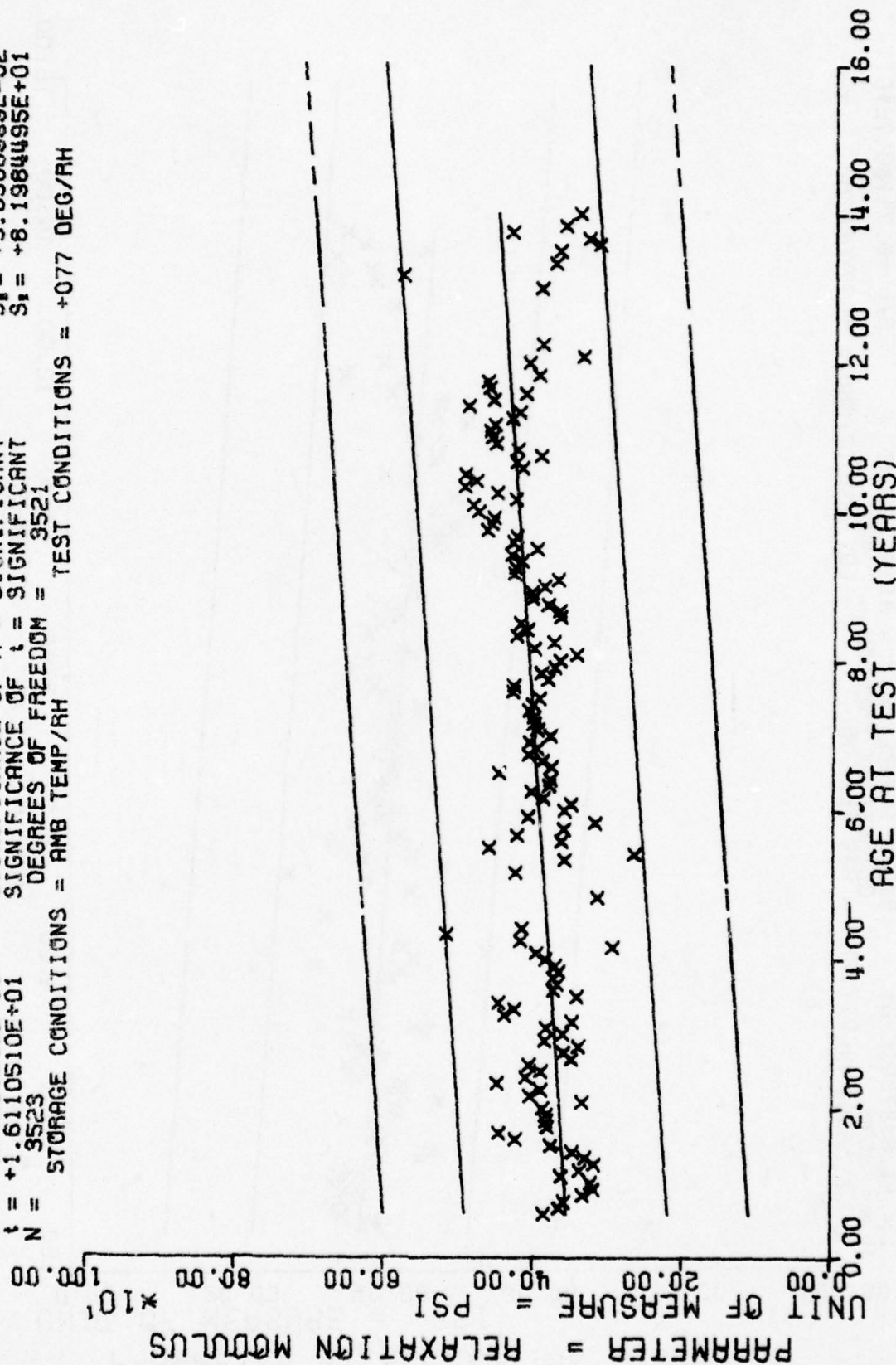
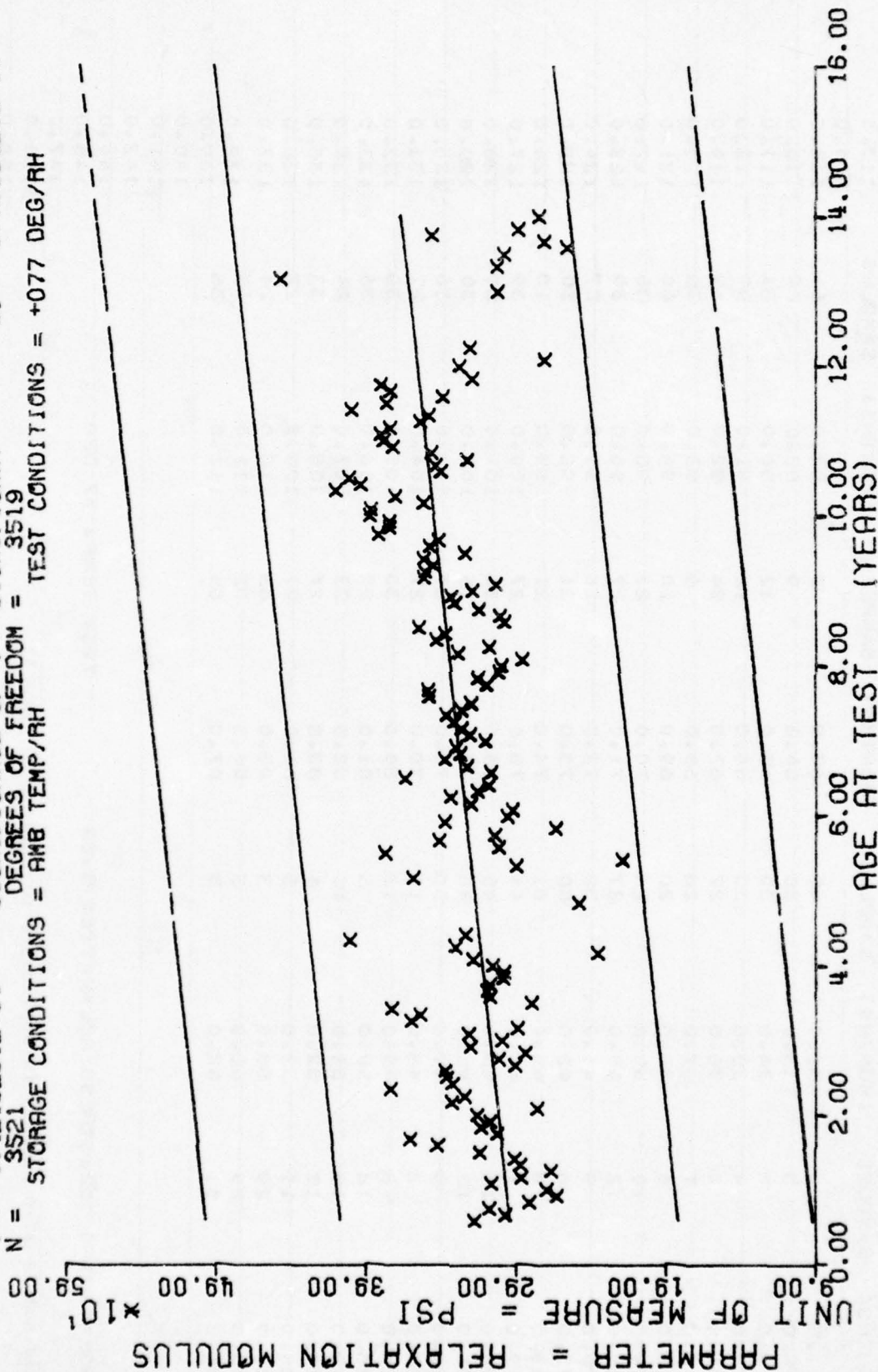


Figure 28

$Y = ((+2.913969E+02) + (+4.4989262E-01) \times X)$
 $F = +2.0210209E+02$ SIGNIFICANCE OF F = SIGNIFICANT $Q = +5.9597186E+01$
 $R = +2.3305027E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +3.1646337E-02$
 $t = +1.4216261E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +6.7690421E+01$
 $N = 3521$ DEGREES OF FREEDOM = 3519
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



STAGE I, WING 142, STRESS RELAXATION 3.0% 1000 SEC TEST TEMP. 77 DEG

Figure 29

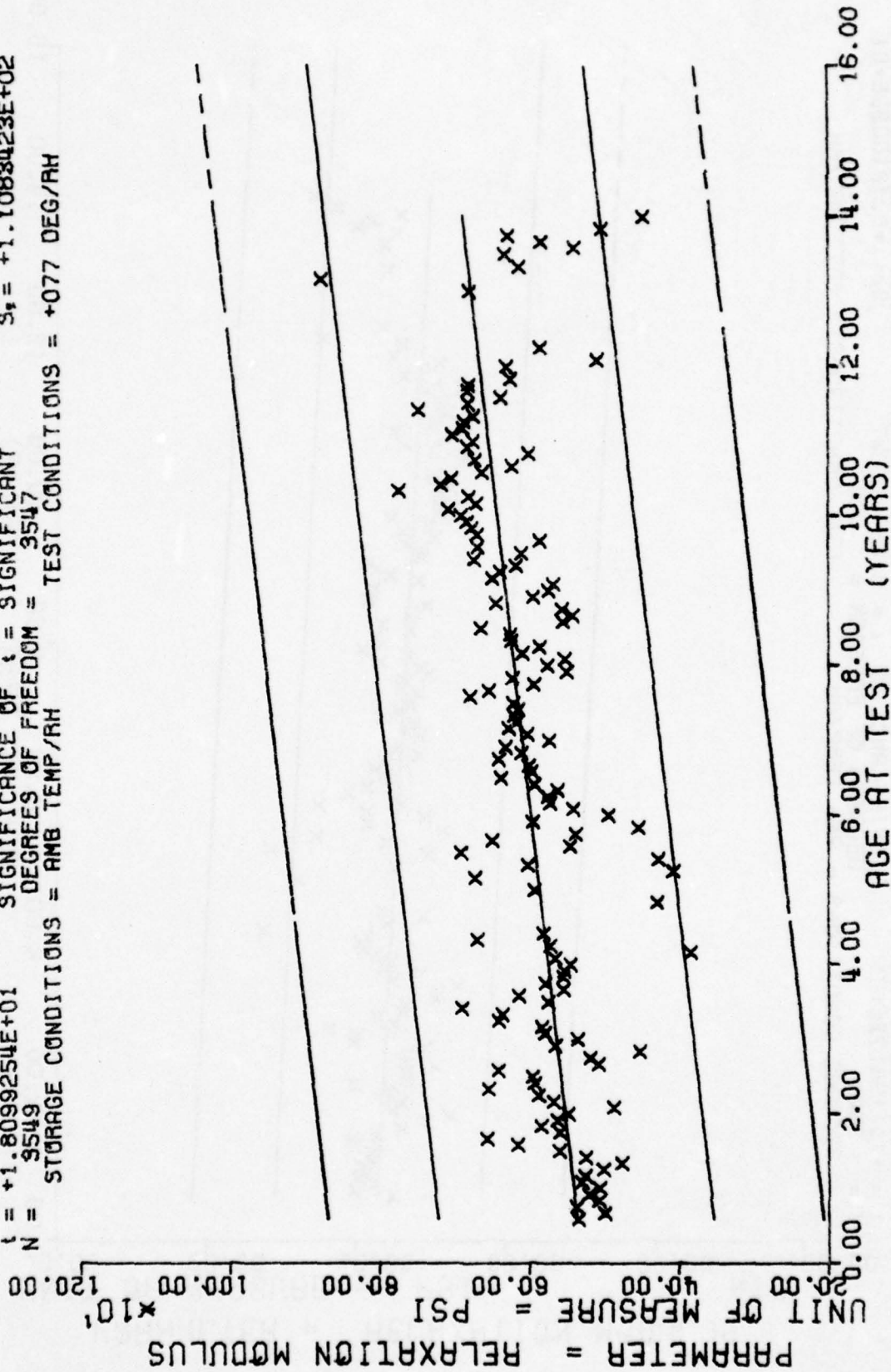
*** SAMPLE SIZE SUMMARY ***

AGE		AGE		AGE		AGE		AGE		AGE		AGE	
(MONTHS)	NR	(MONTHS)	NR	(MONTHS)	NR	(MONTHS)	NR	(MONTHS)	NR	(MONTHS)	NR	(MONTHS)	NR
SAMPLES		SAMPLES		SAMPLES		SAMPLES		SAMPLES		SAMPLES		SAMPLES	
7.0	4	32.0	40	63.0	3	88.0	66	113.0	18	114.0	33	115.0	30
8.0	3	33.0	36	64.0	9	89.0	69	116.0	27	117.0	39	118.0	21
9.0	5	34.0	30	65.0	12	90.0	81	119.0	36	120.0	42	121.0	15
10.0	4	35.0	30	66.0	12	91.0	99	122.0	9	123.0	12	124.0	24
11.0	5	36.0	27	67.0	24	92.0	69	125.0	27	126.0	33	127.0	44
12.0	7	37.0	26	68.0	6	93.0	90	128.0	40	129.0	21	130.0	27
13.0	6	38.0	20	69.0	18	94.0	60	131.0	27	132.0	33	133.0	21
14.0	10	39.0	23	70.0	27	95.0	36	134.0	33	135.0	39	136.0	27
15.0	12	40.0	27	71.0	27	96.0	30	137.0	27	138.0	15	139.0	27
16.0	9	41.0	36	72.0	26	97.0	27	140.0	18	141.0	32	142.0	15
17.0	6	42.0	80	73.0	21	98.0	30	143.0	3	144.0	3	145.0	3
18.0	8	43.0	61	74.0	21	99.0	18	146.0	6	147.0	6	148.0	3
19.0	7	44.0	44	75.0	27	100.0	39	149.0	3	150.0	3	151.0	3
20.0	11	45.0	40	76.0	38	101.0	39	152.0	3	153.0	3	154.0	3
21.0	12	46.0	48	77.0	15	102.0	30	155.0	3	156.0	3	157.0	3
22.0	9	47.0	36	78.0	27	103.0	36	158.0	3	159.0	3	160.0	3
23.0	8	48.0	15	79.0	27	104.0	27	161.0	3	162.0	3	163.0	3
24.0	8	49.0	17	80.0	30	105.0	38	164.0	3	165.0	3	166.0	3
25.0	18	50.0	5	81.0	20	106.0	36	167.0	3	168.0	3	169.0	3
26.0	13	51.0	13	82.0	33	107.0	24	170.0	3	171.0	3	172.0	3
27.0	17	52.0	4	83.0	27	108.0	33	173.0	3	174.0	3	175.0	3
28.0	17	53.0	5	84.0	27	109.0	27	176.0	3	177.0	3	178.0	3
29.0	29	58.0	3	85.0	33	110.0	24	179.0	3	180.0	3	181.0	3
30.0	29	60.0	3	86.0	32	111.0	18	182.0	3	183.0	3	184.0	3
31.0	51	62.0	3	87.0	69	112.0	36	185.0	3	186.0	3	187.0	3

STAGE 1. WING 102. STRESS RELAXATION 5.0% TEST TEMP. 77 DEG

This sample size summary is applicable to figures 30 thru 33.

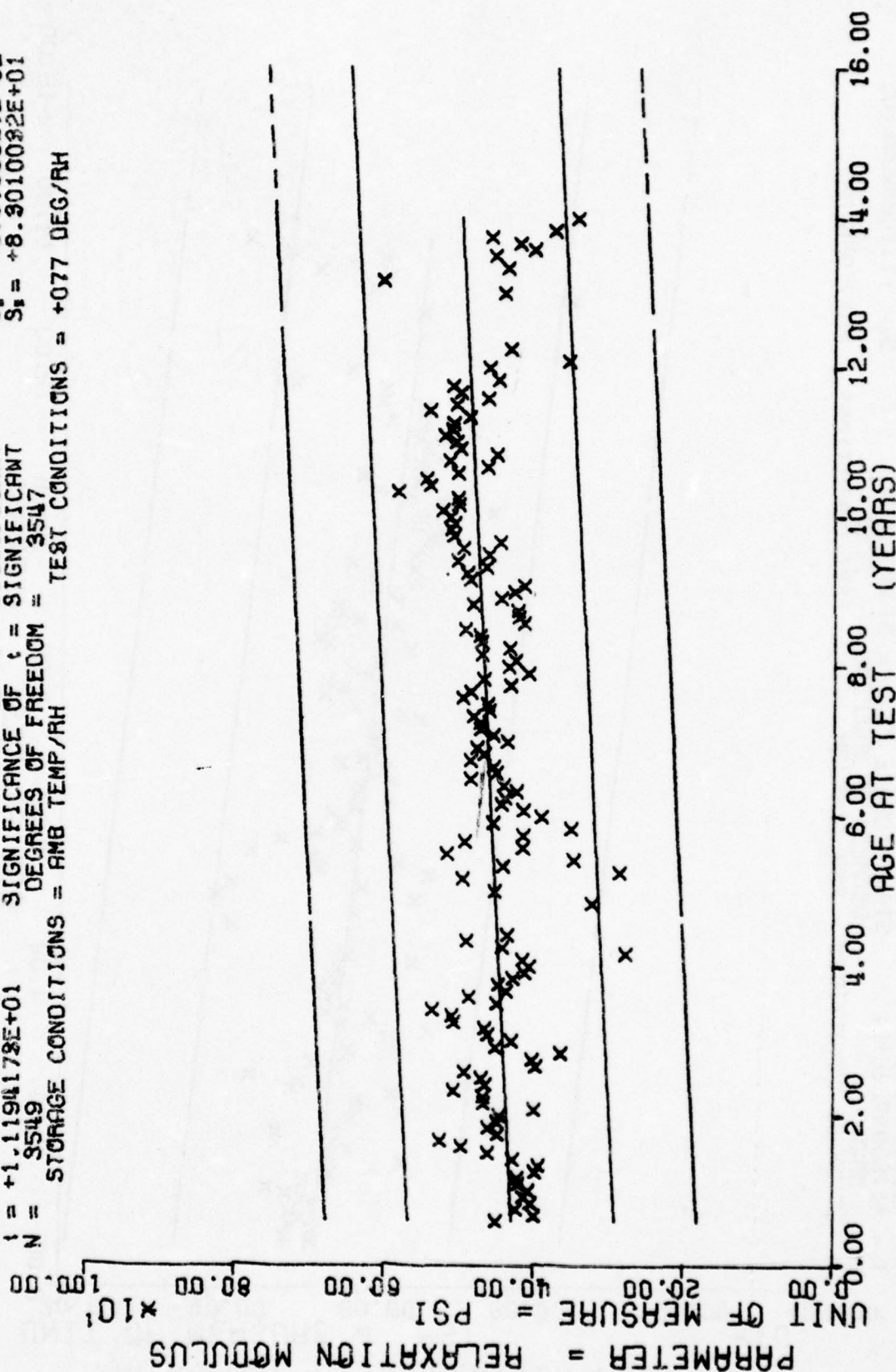
$F = +3.2758299E+02$ SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +1.1582295E+02$
 $R = +2.9076906E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +5.1756442E-02$
 $t = +1.8099254E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +1.1088423E+02$
 $N = 3549$ DEGREES OF FREEDOM = 3547
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



STAGE I, WING 142, STRESS RELAXATION 5.0% 10 SEC TEST TEMP. 77 DEG

Figure 30

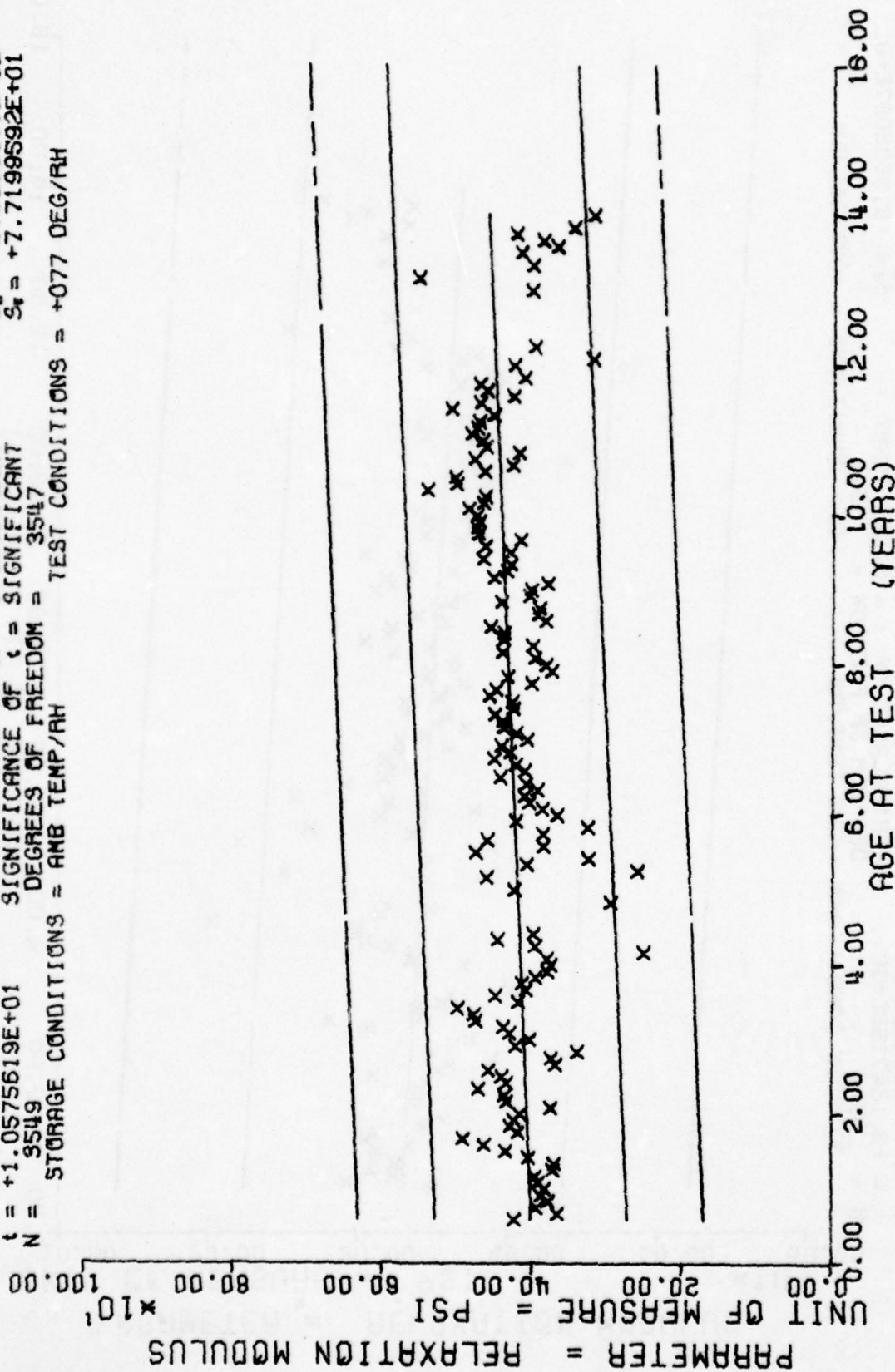
$Y = ((+4.271638E+02) + (+4.3292340E-01) \times X)$
 F = +1.2530351E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_r = +8.4451709E+01$
 R = +1.8472360E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_r = +3.8763327E-02$
 t = +1.1194178E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +8.3010032E+01$
 N = 3549 DEGREES OF FREEDOM = 3547
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



STAGE I, WING 142, STRESS RELAXATION 5.0% 50 SEC TEST TEMP. 77 DEG

Figure 31

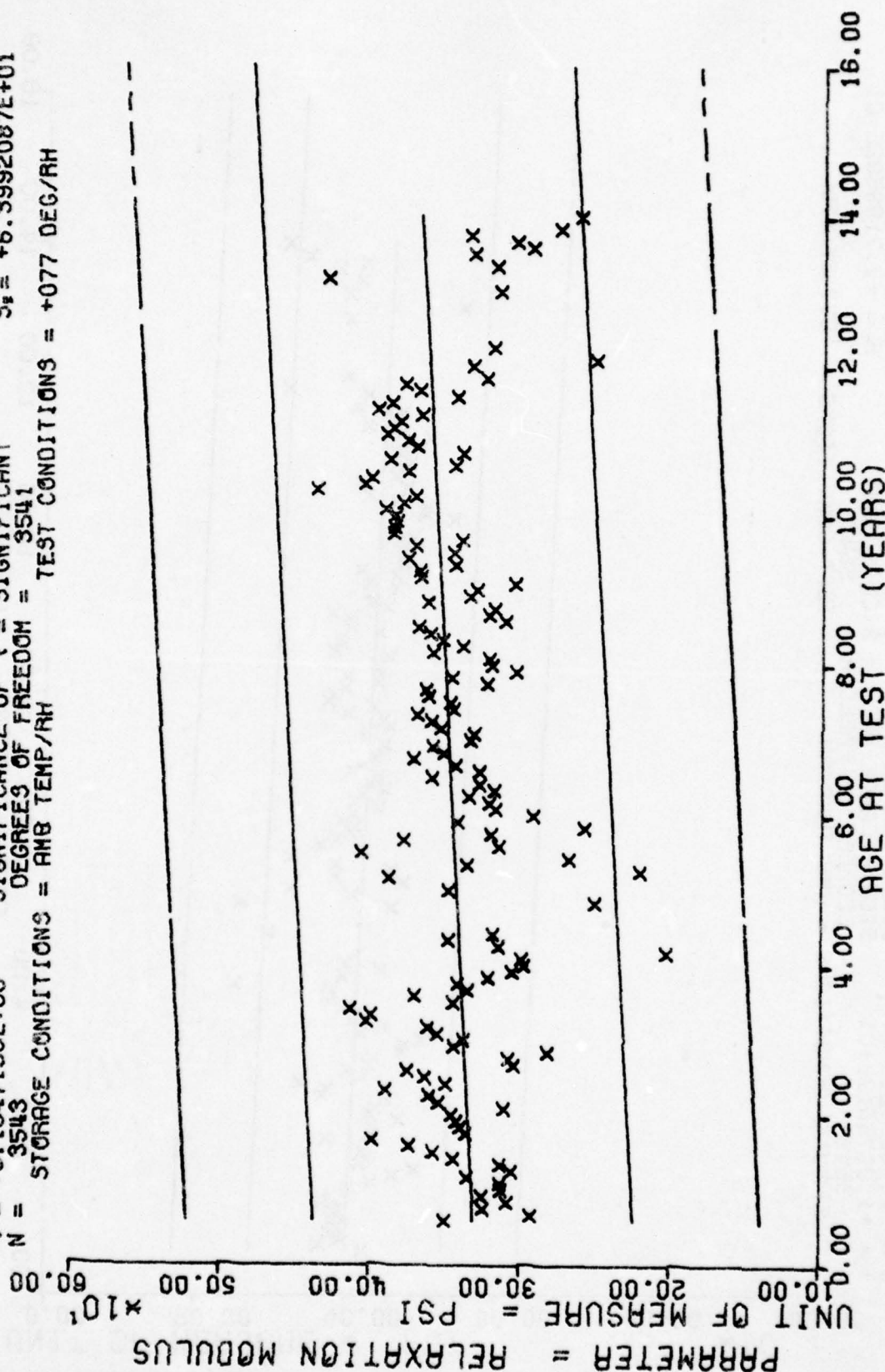
$Y = ((+3.9928427E+02) + (+3.8125125E-01) \times X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 N = 3549 DEGREES OF FREEDOM = 3547
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



STAGE I, WING 142, STRESS RELAXATION 5.0% 100 SEC TEST TEMP. 77 DEG

Figure 32

$F = +6.6662585E+01$
 $R = +1.9593400E-01$
 $t = +8.1647158E+00$
 $N = 3543$
 STORAGE CONDITIONS = AMB TEMP/RH
 DEGREES OF FREEDOM = 3541
 $Y = 11 + 3.2917586E+02$ + (+2.4399306E-01) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 $Q^2 = +6.4582515E+01$
 $S_e = +2.9889840E-02$
 $S_y = +6.3992087E+01$



STAGE I, WING 142, STRESS RELAXATION 5.0% 1000 SEC TEST TEMP. 77 DEG

Figure 33

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
6.0	3	31.0	150	63.0	18	88.0	525	113.0	138		
7.0	24	32.0	63	64.0	24	89.0	585	114.0	153		
8.0	74	33.0	90	65.0	3	90.0	610	115.0	87		
9.0	30	34.0	72	66.0	30	91.0	466	116.0	99		
10.0	28	35.0	74	67.0	6	92.0	528	117.0	78		
11.0	38	36.0	99	68.0	21	93.0	302	118.0	143		
12.0	40	37.0	61	69.0	35	94.0	346	119.0	121		
13.0	75	38.0	77	70.0	22	95.0	191	120.0	120		
14.0	95	39.0	68	71.0	87	96.0	180	121.0	15		
15.0	105	40.0	49	72.0	78	97.0	180	122.0	72		
16.0	25	41.0	99	73.0	63	98.0	183	123.0	42		
17.0	60	42.0	95	74.0	144	99.0	161	124.0	27		
18.0	57	43.0	174	75.0	102	100.0	198	125.0	42		
19.0	72	44.0	223	76.0	105	101.0	159	126.0	33		
20.0	57	45.0	234	77.0	114	102.0	171	127.0	33		
21.0	34	46.0	212	78.0	120	103.0	171	128.0	21		
22.0	73	47.0	234	79.0	117	104.0	195	129.0	27		
23.0	54	48.0	176	80.0	150	105.0	195	130.0	30		
24.0	37	49.0	138	81.0	168	106.0	213	131.0	24		
25.0	141	50.0	87	82.0	207	107.0	117	132.0	15		
26.0	218	51.0	57	83.0	190	108.0	207	133.0	9		
27.0	264	52.0	25	84.0	308	109.0	126	134.0	12		
28.0	257	53.0	26	85.0	180	110.0	156	135.0	24		
29.0	243	57.0	3	86.0	195	111.0	195	136.0	15		
30.0	224	60.0	3	87.0	552	112.0	171	137.0	12		
						138.0		138.0	27		
						139.0		139.0	27		
						140.0		140.0	15		
						141.0		141.0	6		
						142.0		142.0	9		
						143.0		143.0	6		
						144.0		144.0	3		
						146.0		146.0	3		
						153.0		153.0	33		
						156.0		156.0	6		

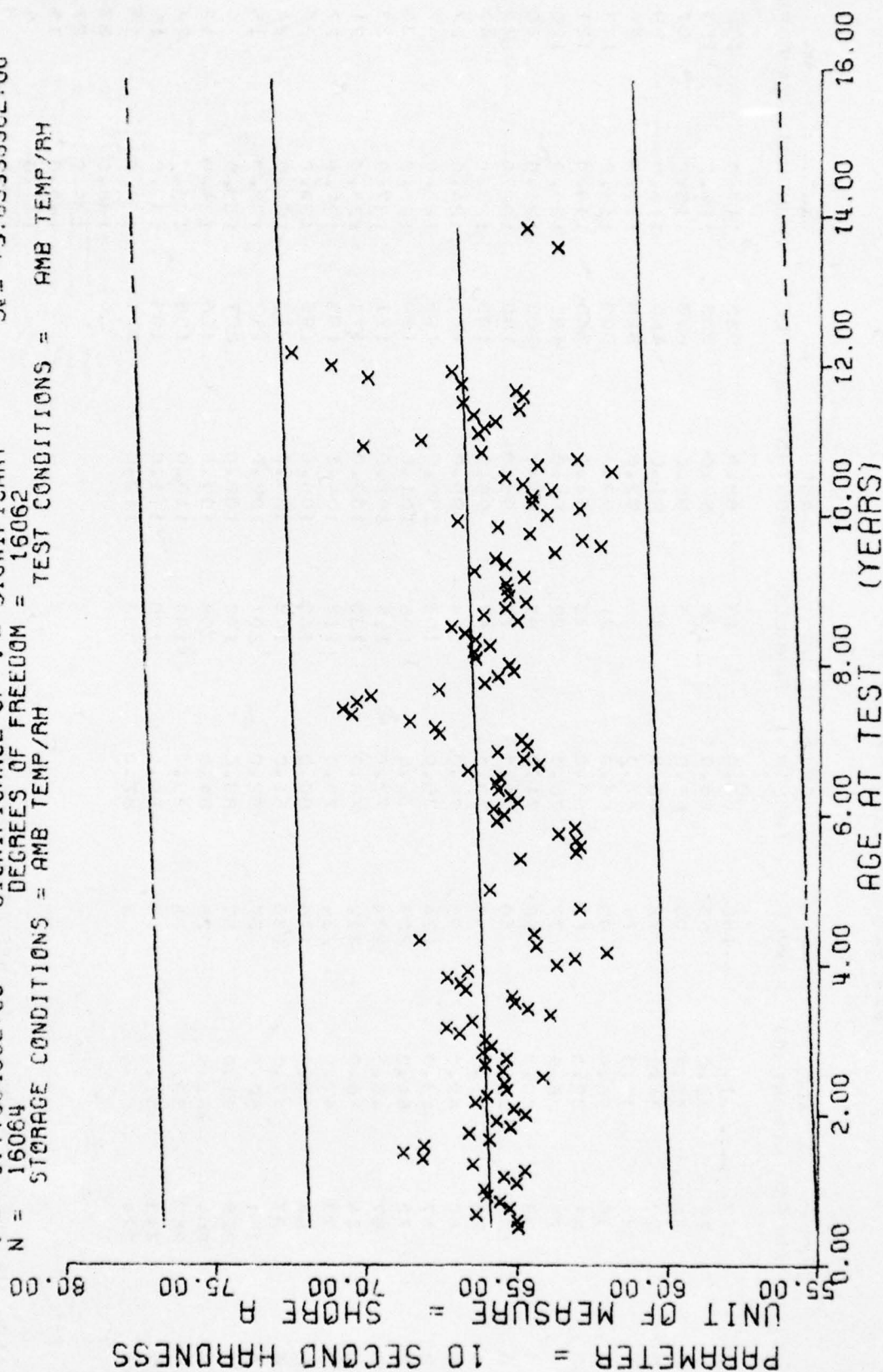
FIGURE 182. HARDNESS SHOT A, 10 SECOND PROPELLANT

This sample size summary is applicable to figure 34.

FWING 182, HARDNESS SHOE A, 10 SECOND PROPELLANT

This sample size summary is applicable to figure 34.

$Y = ((+6.5875652E+01) + (+7.8218136E-03) * X)$
 $F = +7.7068085E+01$ SIGNIFICANCE OF F = SIGNIFICANT $G = +3.6419780E+00$
 $R = +6.9103183E-02$ SIGNIFICANCE OF R = SIGNIFICANT $S_e = +8.9098457E-04$
 $t = +8.7788430E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_e = +3.63333850E+00$
 $N = 16064$ DEGREES OF FREEDOM = 16062
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



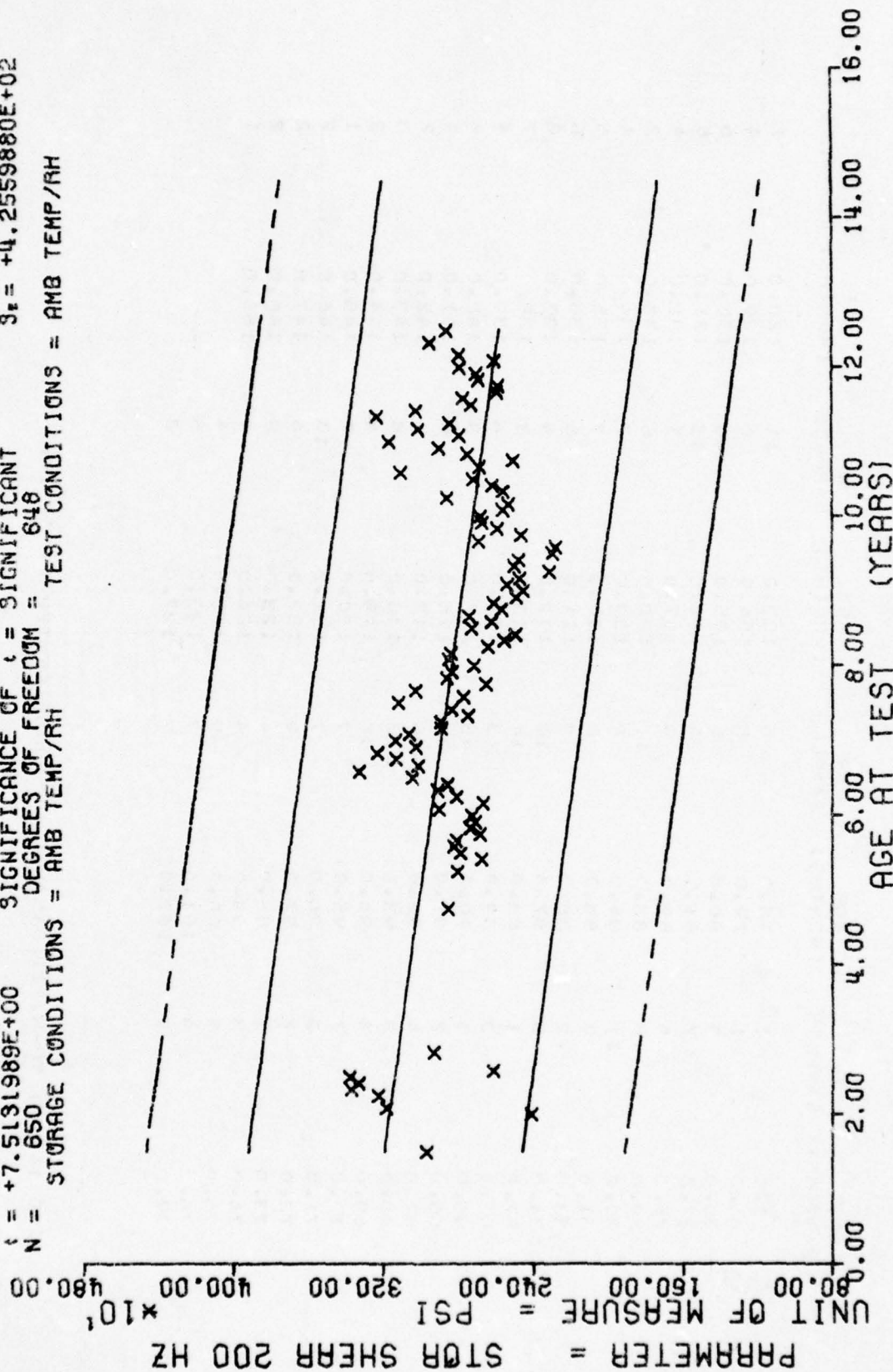
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	1	78.0	5	103.0	11	128.0	1
24.0	1	79.0	5	104.0	6	129.0	4
25.0	3	80.0	5	105.0	6	130.0	6
27.0	7	81.0	9	106.0	13	131.0	5
28.0	8	82.0	9	107.0	3	132.0	4
29.0	8	83.0	11	108.0	6	133.0	2
30.0	11	84.0	8	109.0	7	134.0	4
31.0	3	85.0	6	110.0	7	135.0	5
33.0	2	86.0	9	111.0	6	136.0	6
34.0	3	87.0	14	112.0	4	137.0	8
57.0	1	88.0	14	113.0	3	138.0	7
63.0	3	89.0	13	114.0	6	139.0	4
65.0	3	90.0	45	115.0	3	140.0	4
66.0	2	91.0	33	116.0	6	141.0	4
67.0	4	92.0	28	117.0	8	142.0	2
68.0	3	93.0	23	118.0	8	143.0	3
69.0	4	94.0	10	119.0	4	144.0	2
70.0	7	95.0	7	120.0	7	145.0	1
71.0	3	96.0	7	121.0	10	146.0	2
72.0	7	97.0	9	122.0	6	147.0	2
73.0	7	98.0	4	123.0	5	148.0	2
74.0	3	99.0	4	124.0	4	150.0	1
75.0	7	100.0	9	125.0	4		
76.0	9	101.0	7	126.0	5		
77.0	9	102.0	7	127.0	3		

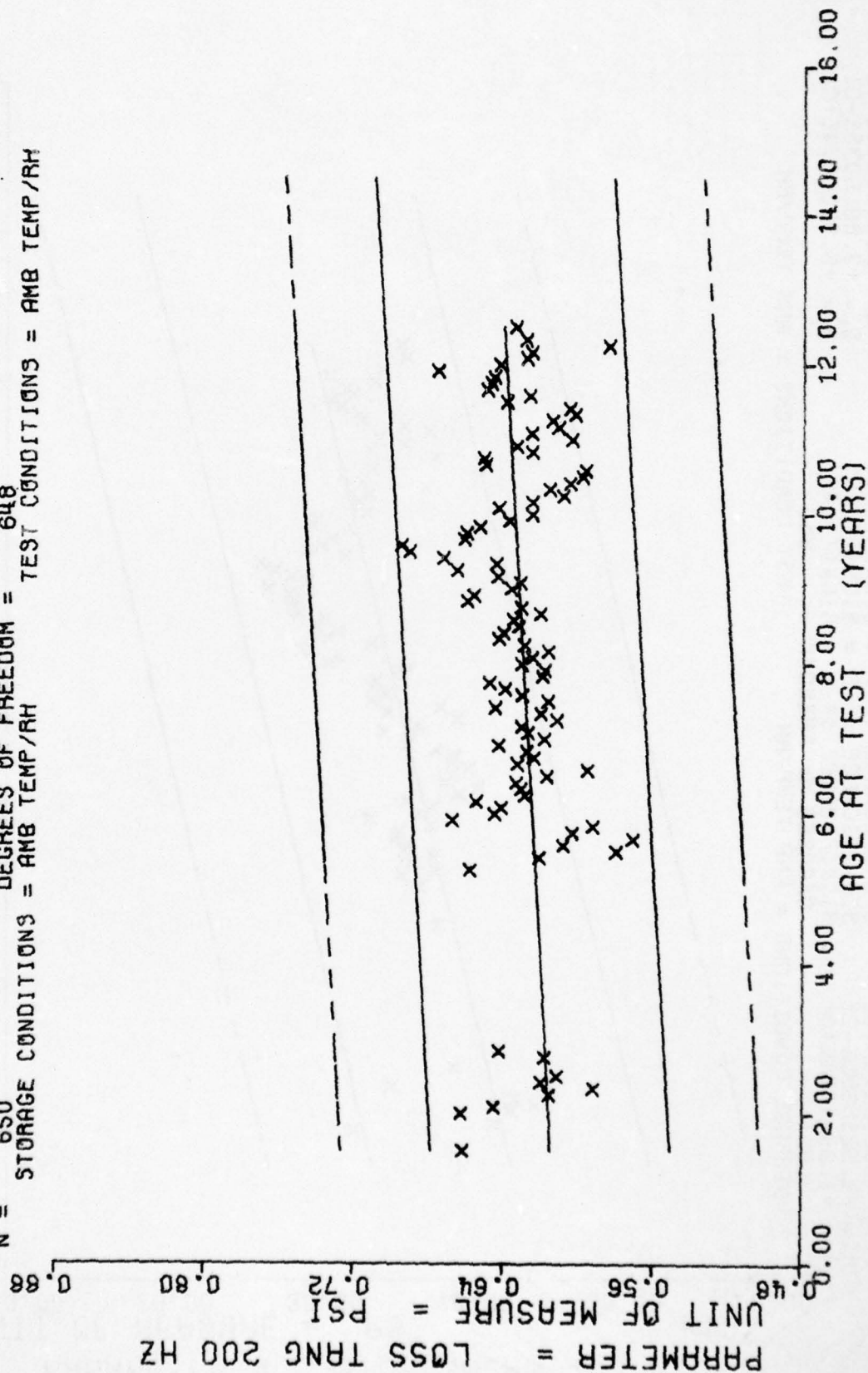
WING 182 S1 TD-H1011 DYNAMIC RESPONSE, CENTER-WT 70 GM,

This sample size summary is applicable for figures 35 thru 38.

$Y = ((+3.2793182E+03) + (-4.6827322E+00) \times X)$
 $F = +5.6446158E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -2.8907425E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +7.5131989E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 650$ DEGREES OF FREEDOM = 648
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



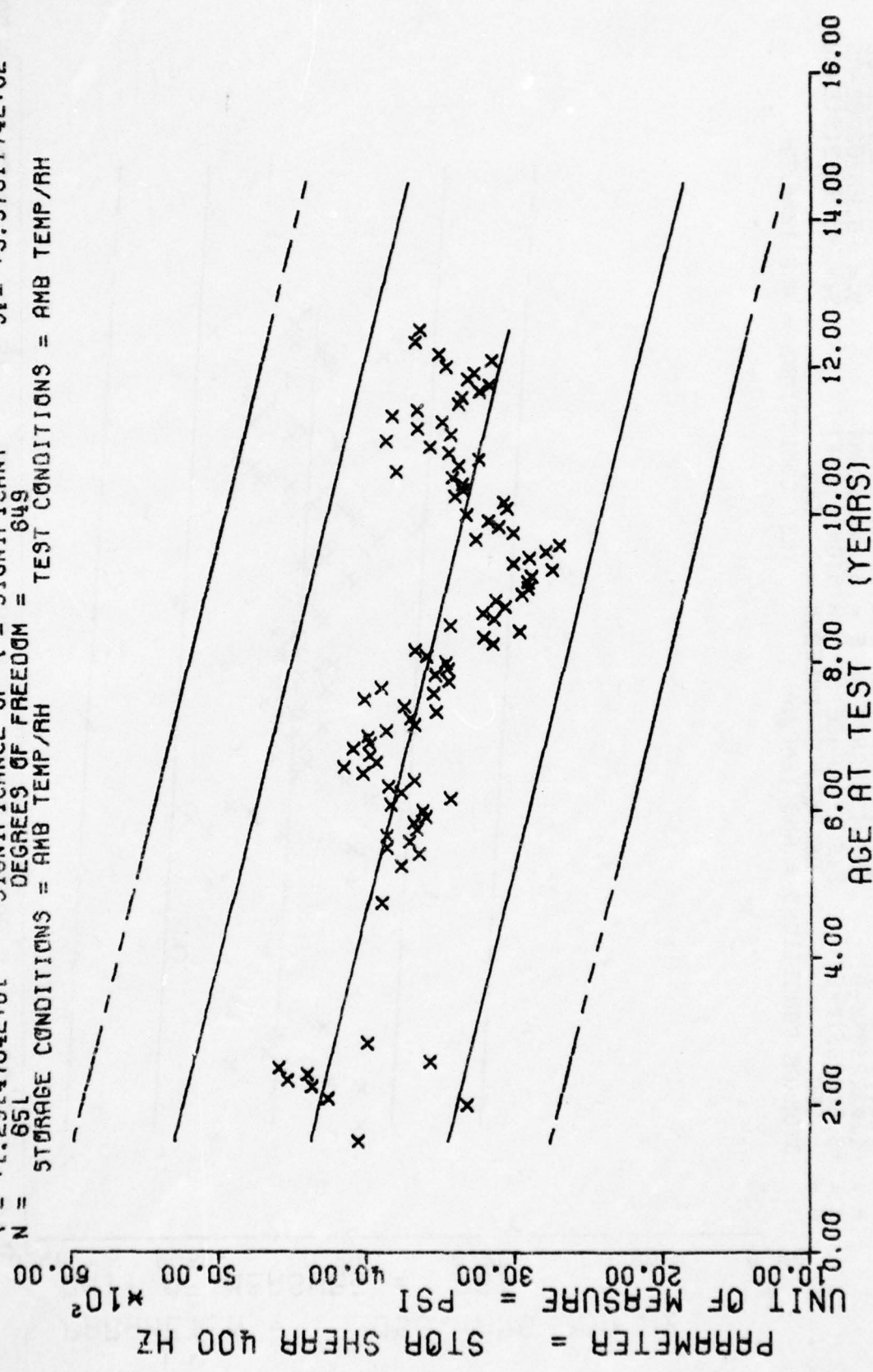
$F = +1.3667772E+01$ SIGNIFICANCE OF F = SIGNIFICANT $G = +3.7832093E-02$
 $R = +1.4972986E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S = +5.4870228E-05$
 $t = +3.6969951E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_e = +3.7468191E-02$
 $N = 650$ DEGREES OF FREEDOM = 648
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



S1 WING 142 TP-H1011 DYNAMIC RESPONSE LOSS TANGENT AT 200 HZ, CENTER-WT 70 GM

Figure 36

$Y = ((+4.5614651E+03) + (-1.0152951E+01) \times X)$
 $F = +1.6679114E+02$ SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +6.0161214E+02$
 $R = -4.5216505E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +7.8615073E-01$
 $t = +1.2914764E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +5.3701174E+02$
 $N = 651$ DEGREES OF FREEDOM = 649
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING L42 SL TP-HLOLL DYNAMIC RESPONSE, CENTER-WT 70 GM, STOR SHEAR AT 400 HZ

$F = +2.9741839E+02$
 $R = +5.6088249E-01$
 $t = +1.7245822E+01$
 $N = 650$

$Y = \{ (+5.1764406E-01) + (+1.5898774E-03) * X \}$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 648

STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = AMB TEMP/RH

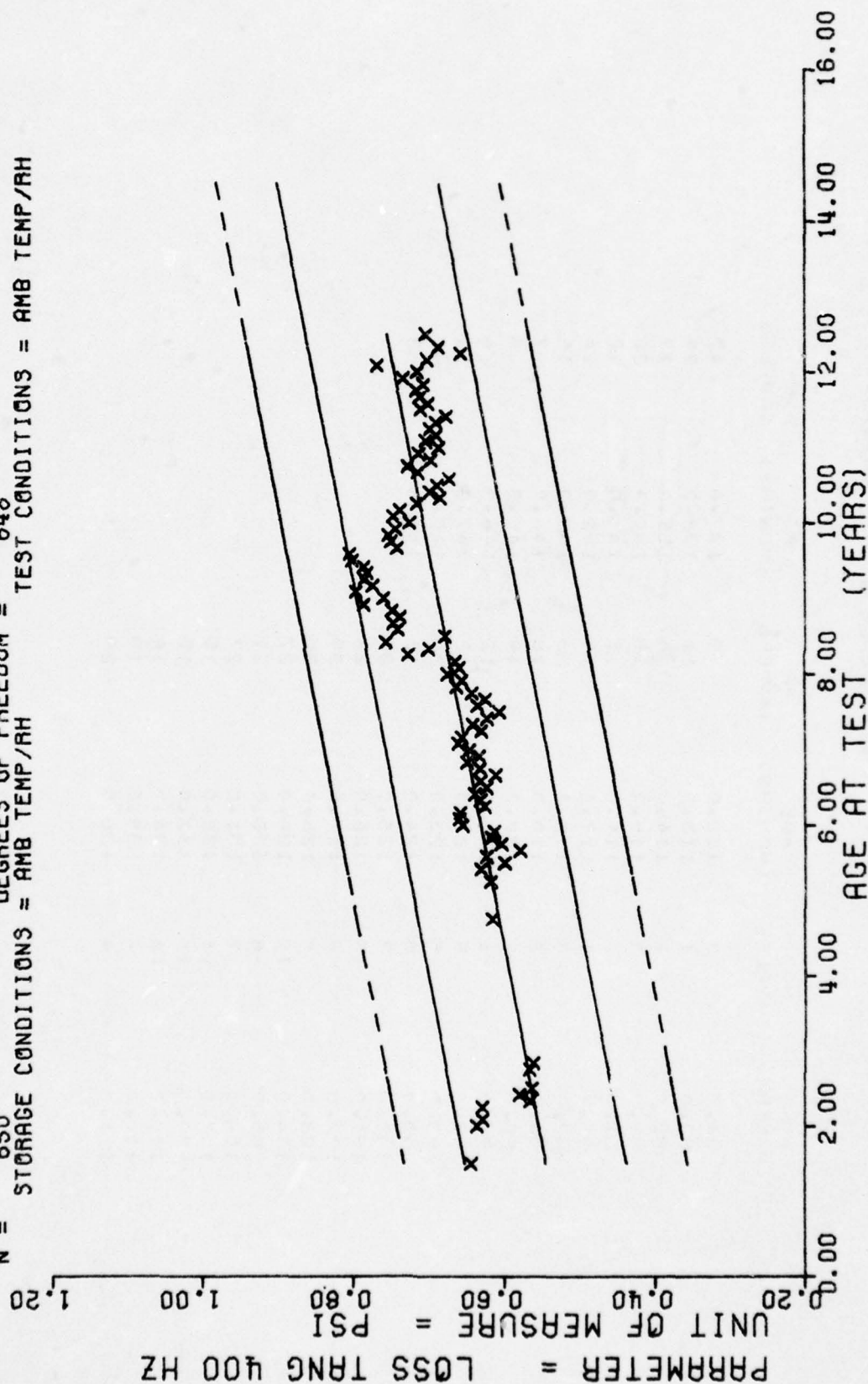


Figure 38

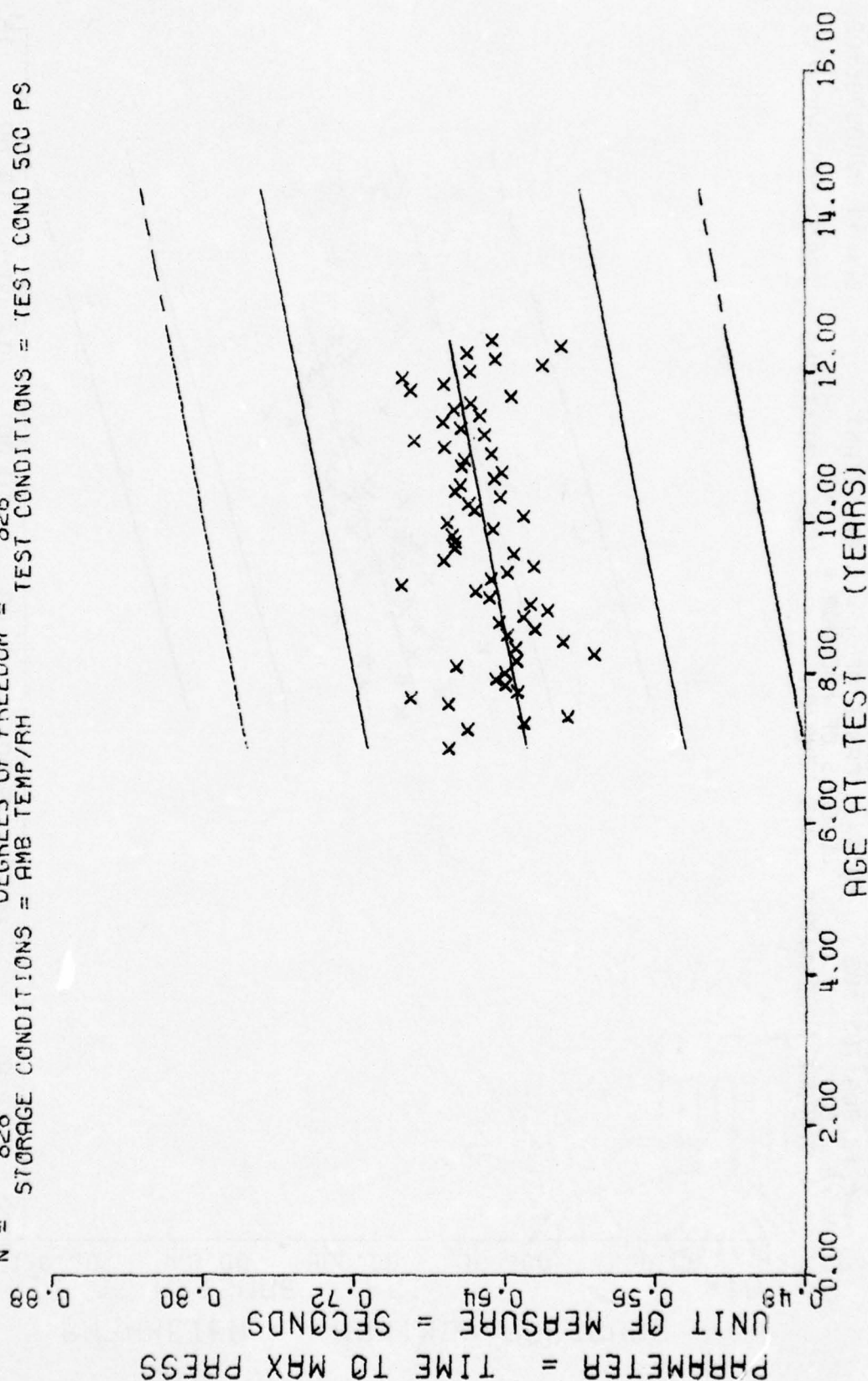
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
84.0	2	112.0	9	137.0	47
87.0	1	113.0	11	138.0	24
88.0	2	114.0	4	139.0	17
89.0	3	115.0	25	140.0	26
91.0	3	116.0	15	141.0	12
92.0	1	117.0	17	142.0	24
93.0	3	118.0	23	143.0	16
94.0	2	119.0	18	144.0	7
95.0	2	120.0	19	145.0	3
96.0	1	121.0	12	146.0	4
97.0	5	122.0	10	147.0	2
98.0	5	123.0	36	148.0	2
99.0	9	124.0	15	149.0	3
100.0	7	125.0	30		
101.0	10	126.0	24		
102.0	8	127.0	39		
103.0	5	128.0	30		
104.0	10	129.0	27		
105.0	6	130.0	21		
106.0	7	131.0	27		
107.0	11	132.0	15		
108.0	14	133.0	10		
109.0	16	134.0	14		
110.0	4	135.0	19		
111.0	4	136.0	29		

STAGE 1, WING 182, PRESSURE TIME, TIME TO MAXIMUM PRESSURE

This sample size summary is applicable to figures 39 and 40.

$F = +2.3046174E+01$
 $R = +1.6475316E-01$
 $t = +4.8006431E+00$
 $N = 828$
 $Y = ((+5.7561080E-01) + (+6.2982588E-04) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 826
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = TEST COND 500 PS



STAGE 1, WING 142, PRESSURE TIME, TIME TO MAXIMUM PRESSURE

Figure 39

$Y = ((+3.9316354E+03) + (-2.4416539E+00) * X)$
 $F = +3.0985169E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -2.9365058E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +8.9991750E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 829$ DEGREES OF FREEDOM = 827
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = TEST COND 500 PS

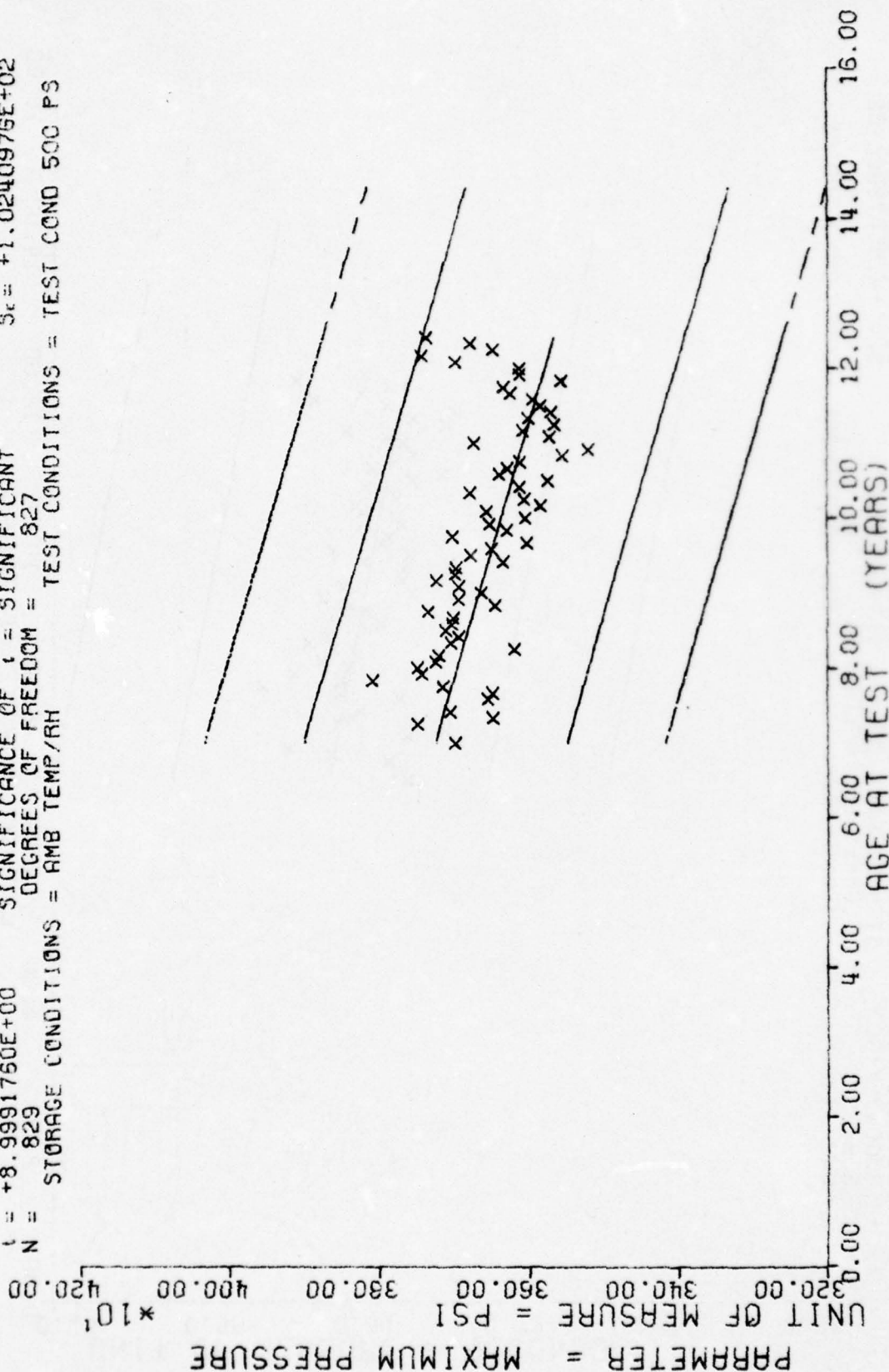


Figure 40

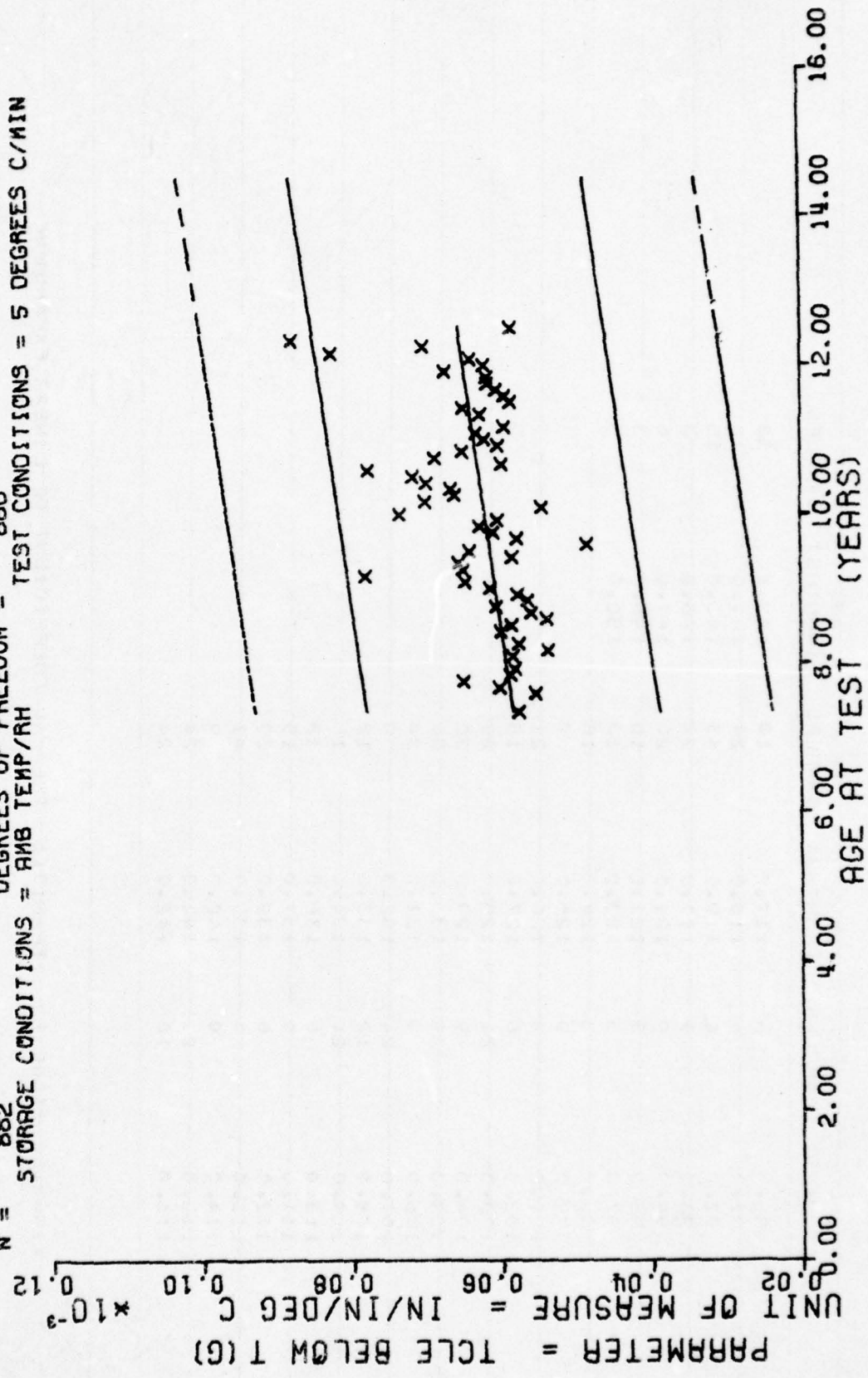
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
88.0	3	117.0	19	143.0	33
91.0	6	118.0	24	144.0	18
92.0	6	119.0	43	145.0	15
93.0	9	120.0	29	146.0	3
94.0	9	121.0	20	147.0	6
95.0	3	122.0	15	148.0	3
97.0	3	123.0	13	150.0	3
98.0	3	124.0	18		
99.0	9	125.0	9		
101.0	9	126.0	21		
102.0	6	127.0	18		
103.0	21	128.0	24		
104.0	9	129.0	30		
105.0	9	130.0	30		
106.0	9	131.0	24		
107.0	24	132.0	9		
108.0	12	133.0	12		
109.0	24	134.0	15		
110.0	6	136.0	18		
111.0	9	137.0	15		
112.0	6	138.0	30		
113.0	24	139.0	41		
114.0	9	140.0	9		
115.0	21	141.0	24		
116.0	18	142.0	24		

WING 162 STAGE 1 TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION

This sample size summary is applicable for figures 41 and 42.

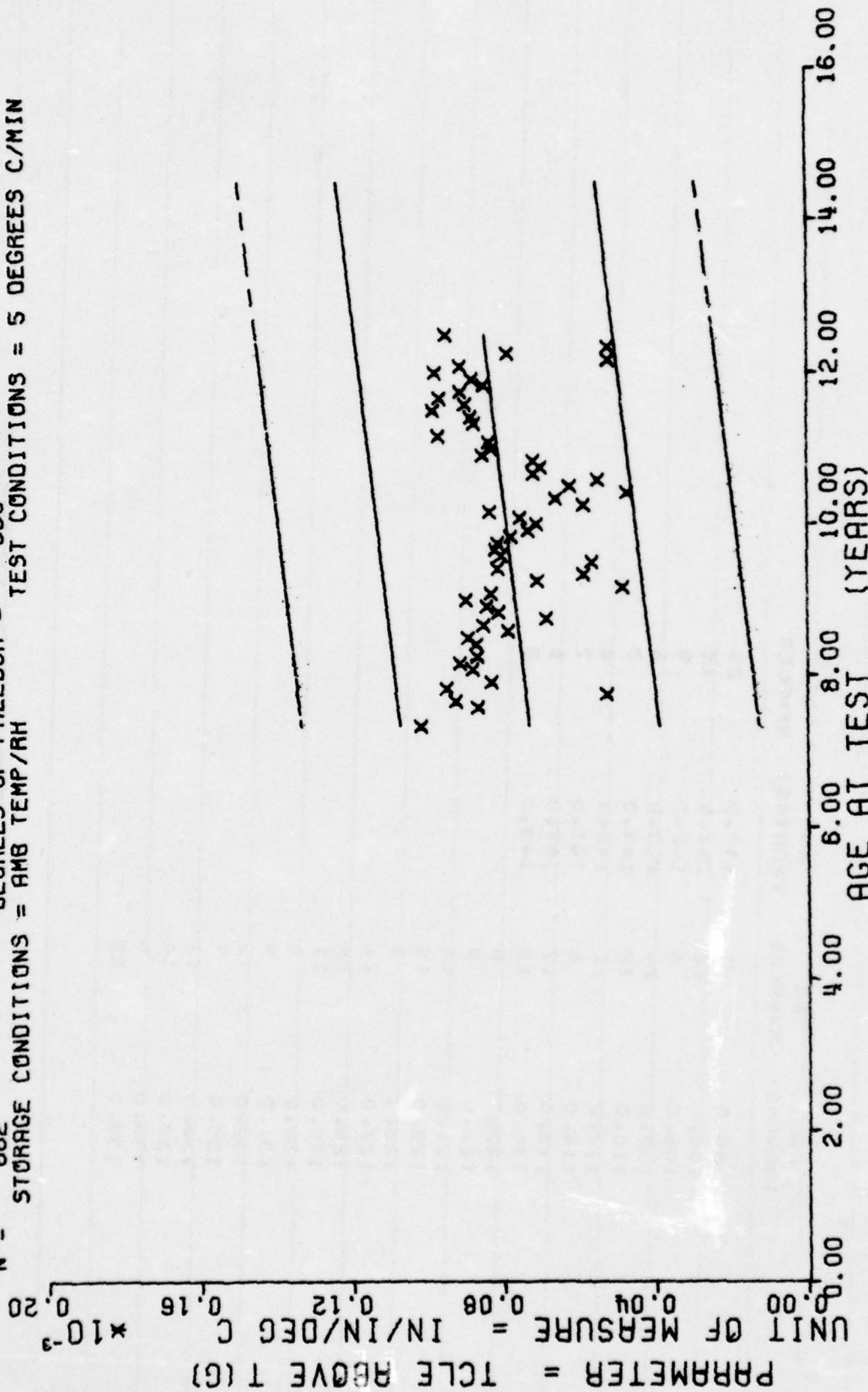
$Y = ((+4.8024974E-05) + (+1.1762064E-07) \times X)$
 F = +1.8599278E+01 SIGNIFICANCE OF F = SIGNIFICANT $\alpha = +1.1670165E-05$
 R = +1.4386826E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +2.7273161E-09$
 t = +4.3126881E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +1.1555319E-05$
 N = 882 DEGREES OF FREEDOM = 880
 STORAGE CONDITIONS = AMB TEMP/4H TEST CONDITIONS = 5 DEGREES C/MIN



WING 142 STAGE 1 TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TC

Figure 41

$Y = ((+5.6522277E-05) + ((+1.9015555E-07) * X)$
 $F = +1.5950487E+01$ SIGNIFICANCE OF F = SIGNIFICANT $\sigma_r = +2.0343353E-05$
 $R = +1.3342798E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_e = +4.7612614E-08$
 $t = +3.9938061E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_t = +2.0172907E-05$
 $N = 882$ DEGREES OF FREEDOM = 880
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 5 DEGREES C/MIN



WING 142 STAGE 1 TP-H1011. THERMAL COEFFICIENT OF LINEAR EXPANSION ABOVE TG

Figure 42

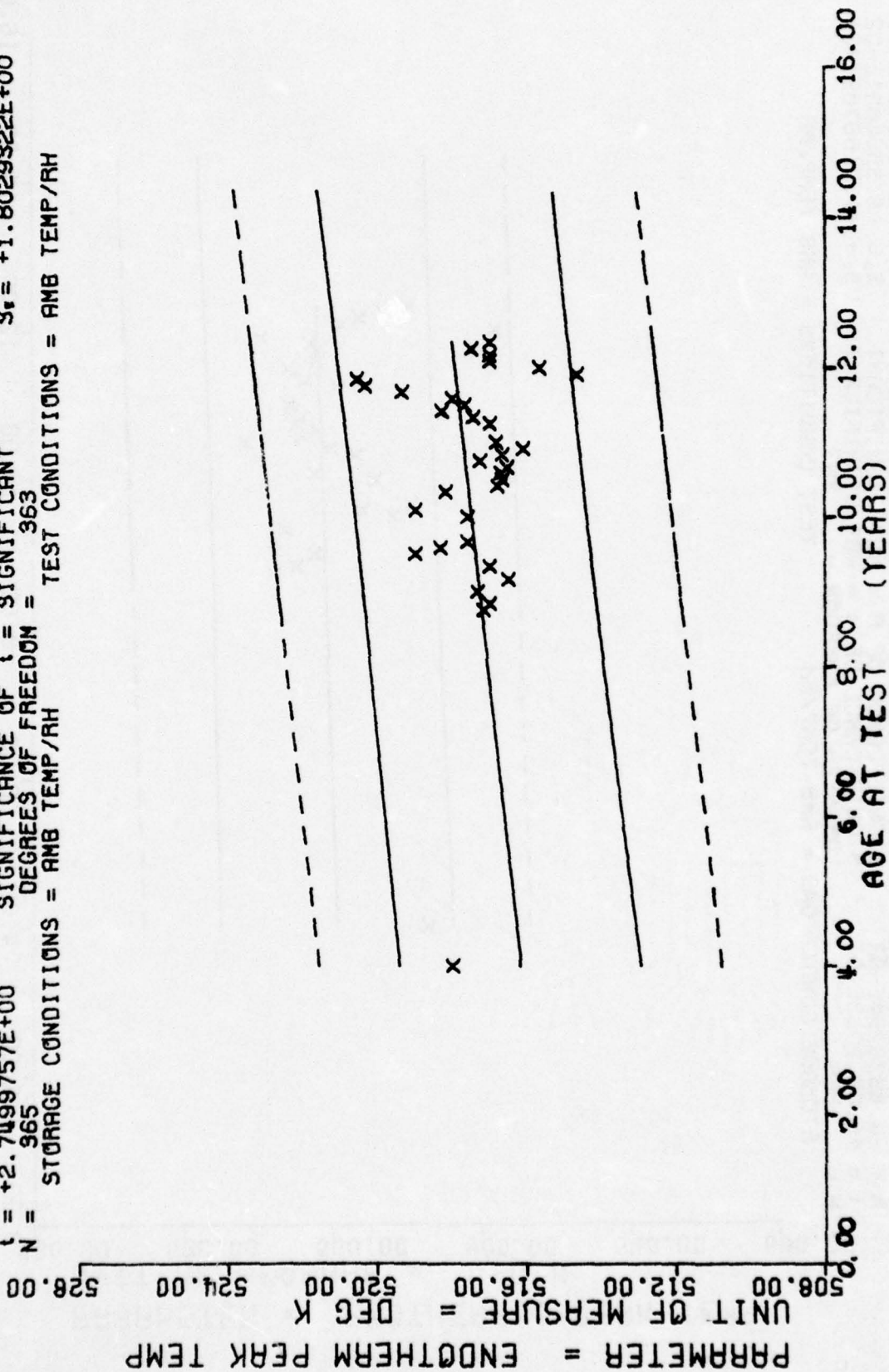
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
48.0	3	140.0	23
105.0	12	141.0	15
106.0	6	142.0	9
108.0	24	143.0	3
110.0	12	144.0	3
112.0	12	145.0	5
114.0	6	146.0	7
115.0	12	147.0	6
116.0	15	148.0	3
120.0	5		
121.0	9		
124.0	16		
125.0	15		
126.0	3		
127.0	21		
128.0	19		
129.0	11		
130.0	9		
131.0	9		
132.0	12		
135.0	7		
136.0	11		
137.0	14		
138.0	6		
139.0	22		

STAGE I WING 162 DIFFERENTIAL SCANNING CALORIMETER

This sample size summary is applicable for figures 43 thru 45.

$Y = ((+5.1530789E+02) + (+1.8363070E-02) * X)$
 $F = +7.5629668E+00$ SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +1.8191117E+00$
 $R = +1.4285591E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_e = +6.6775390E-03$
 $t = +2.7499757E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_e = +1.8029322E+00$
 $N = 365$ DEGREES OF FREEDOM = 363
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

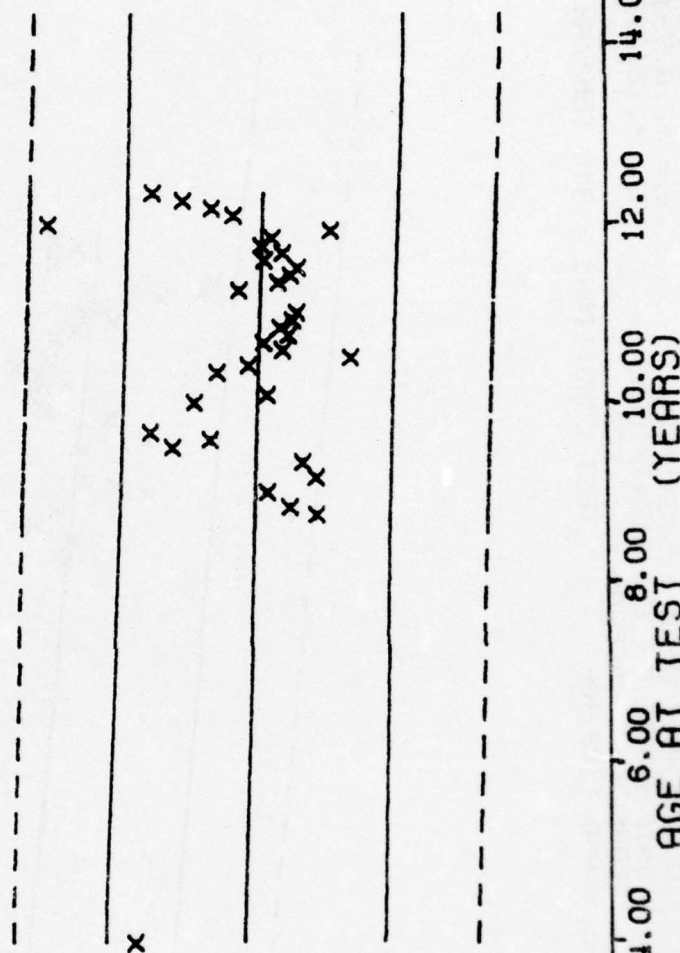


STAGE I WING 142 DIFFERENTIAL SCANNING CALORIMETER ENDOTHERM PEAK TEMP

Figure 43

$Y = ((+5.6412535E+02) + (-5.4069796E-02) * X)$
 $F = +7.2151591E-01$ SIGNIFICANCE OF F = NOT SIGNIFICANT $G_1 = +1.7180213E+01$
 $R = -4.4538794E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_1 = +6.3654891E-02$
 $t = +8.4942093E-01$ SIGNIFICANCE OF t = NOT SIGNIFICANT $S_2 = +1.7186789E+01$
 $N = 365$ DEGREES OF FREEDOM = 363
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

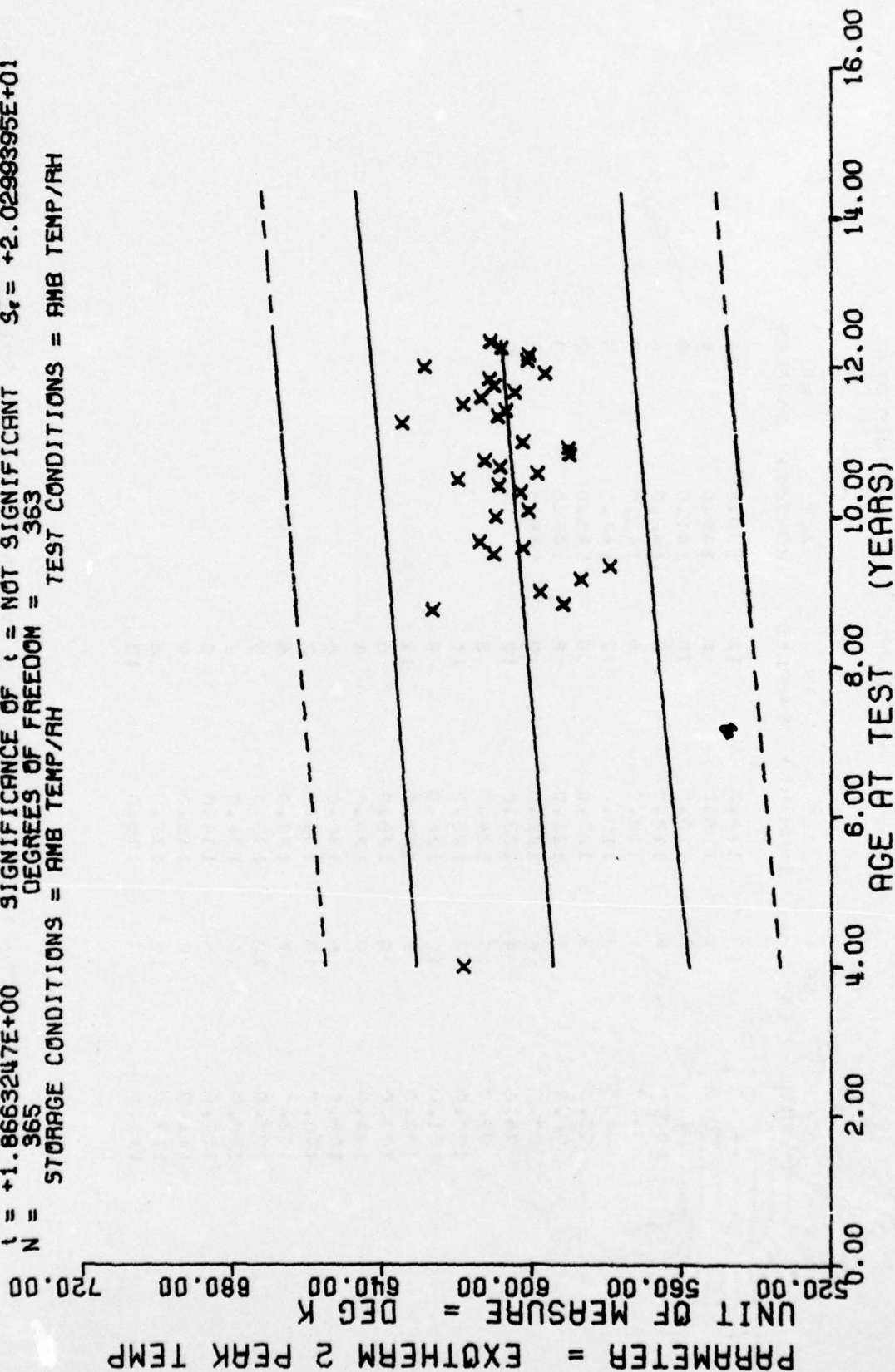
PARAMETER = EXOTHERM 1 PEAK TEMP
 UNIT OF MEASURE = DEG K
 480.00
 520.00
 560.00
 600.00
 640.00
 680.00



STAGE 1 WING 142 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 1 PEAK TEMP

Figure 44

$Y = ((+5.8773621E+02) + (+1.4031604E-01) * X)$
 F = +3.4831680E+00
 R = +9.7490028E-02
 t = +1.8663247E+00
 N = 365
 STORAGE CONDITIONS = AMB TEMP/RH
 DEGREES OF FREEDOM = 363
 TEST CONDITIONS = AMB TEMP/RH
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 S_e = +2.0299395E+01
 S_a = +7.5183081E-02
 S_r = +2.0968517E+01



STAGE I WING 142 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 2 PEAK TEMP

Figure 45

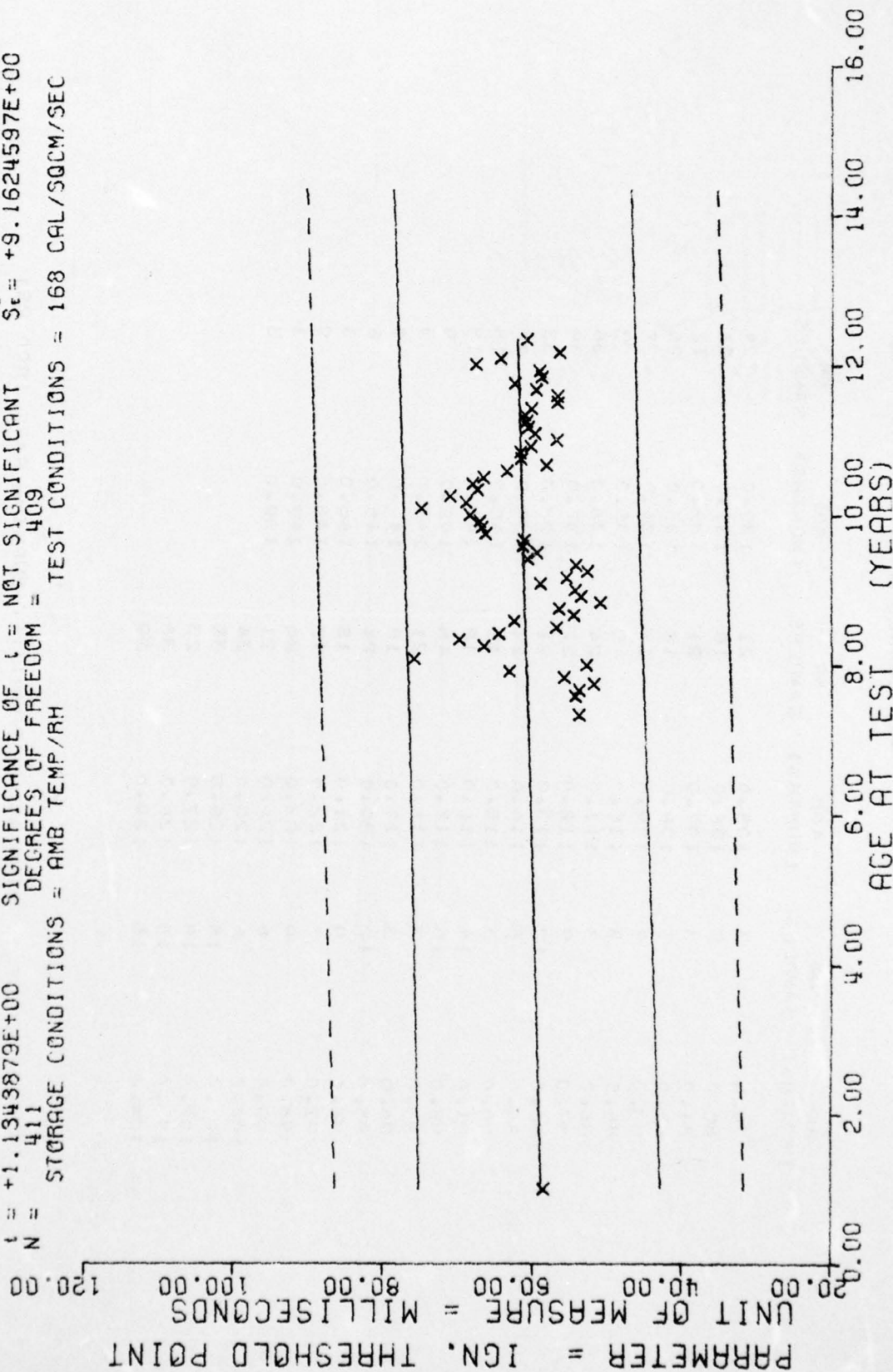
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	10	114.0	12	139.0	11
88.0	1	115.0	6	140.0	4
91.0	2	116.0	10	141.0	5
92.0	4	117.0	6	142.0	5
93.0	1	118.0	6	143.0	7
94.0	3	119.0	12	144.0	5
95.0	3	120.0	8	145.0	2
96.0	3	121.0	8	146.0	3
97.0	4	122.0	9	148.0	2
98.0	4	123.0	12		
99.0	10	124.0	5		
100.0	7	125.0	11		
101.0	10	126.0	9		
102.0	8	127.0	11		
103.0	9	128.0	8		
104.0	0	129.0	4		
105.0	6	130.0	6		
106.0	10	131.0	7		
107.0	7	132.0	5		
108.0	12	133.0	9		
109.0	6	134.0	11		
110.0	8	135.0	5		
111.0	8	136.0	4		
112.0	12	137.0	6		
113.0	7	138.0	13		

STAGE 1 WING 182 TP-41011 IGNITABILITY, IGN THRESHOLD POINT, 168 CAL/SO CM/SEC

This sample size summary is applicable to figure 46

$F = +1.2868359E+00$
 $R = +5.6003839E-02$
 $t = +1.1343879E+00$
 $N = 411$
 $Y = ((+5.3836708E+01) + (+2.3575737E-02) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 409
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = 168 CAL/SQCM/SEC



STAGE 1 WING 142 TP-H1011 IGNITABILITY. IGN THRESHOLD POINT, 168 CAL/SQ CM/SEC

*** SAMPLE SIZE SUMMARY ***

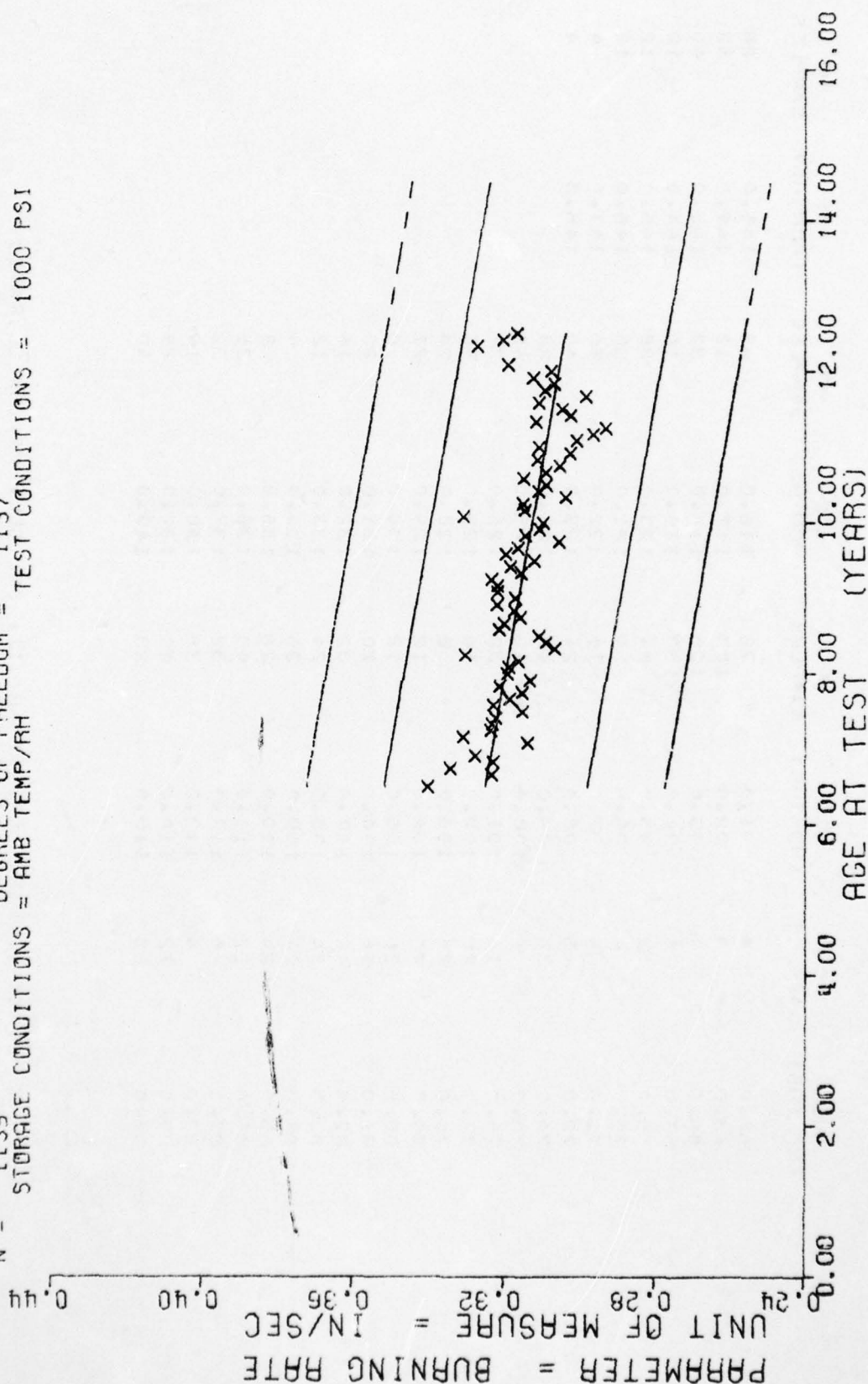
AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES
78.0	3	105.0	21	130.0	24
80.0	8	106.0	18	131.0	21
81.0	3	107.0	21	132.0	12
82.0	3	108.0	18	133.0	26
83.0	9	109.0	15	134.0	27
85.0	3	110.0	9	135.0	9
86.0	3	111.0	24	136.0	36
87.0	9	112.0	27	137.0	39
88.0	12	113.0	21	138.0	33
89.0	6	114.0	21	139.0	48
90.0	3	115.0	18	140.0	18
91.0	14	116.0	18	141.0	18
92.0	15	117.0	45	142.0	9
93.0	3	118.0	21	143.0	9
94.0	3	119.0	18	144.0	9
95.0	12	120.0	24	145.0	6
96.0	9	121.0	18	146.0	3
97.0	3	122.0	18	148.0	9
98.0	9	123.0	26	149.0	3
99.0	6	124.0	21	150.0	3
100.0	6	125.0	24		
101.0	15	126.0	36		
102.0	18	127.0	23		
103.0	18	128.0	36		
104.0	15	129.0	29		

STAGE 1, WING AER. TP-H1011, BURNING RATE 1000 PSI

This sample size summary is applicable to figure 47.

$Y = 1(+3.4792753E-01) + (-2.9417620E-04) * X$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 1137
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = 1000 PSI

F = +1.0220215E+02
 R = -2.8718314E-01
 t = +1.0109508E+01
 N = 1139



STAGE L, WING A&B, TP-H1011, BURNING RATE 1000 PSI

Figure 47

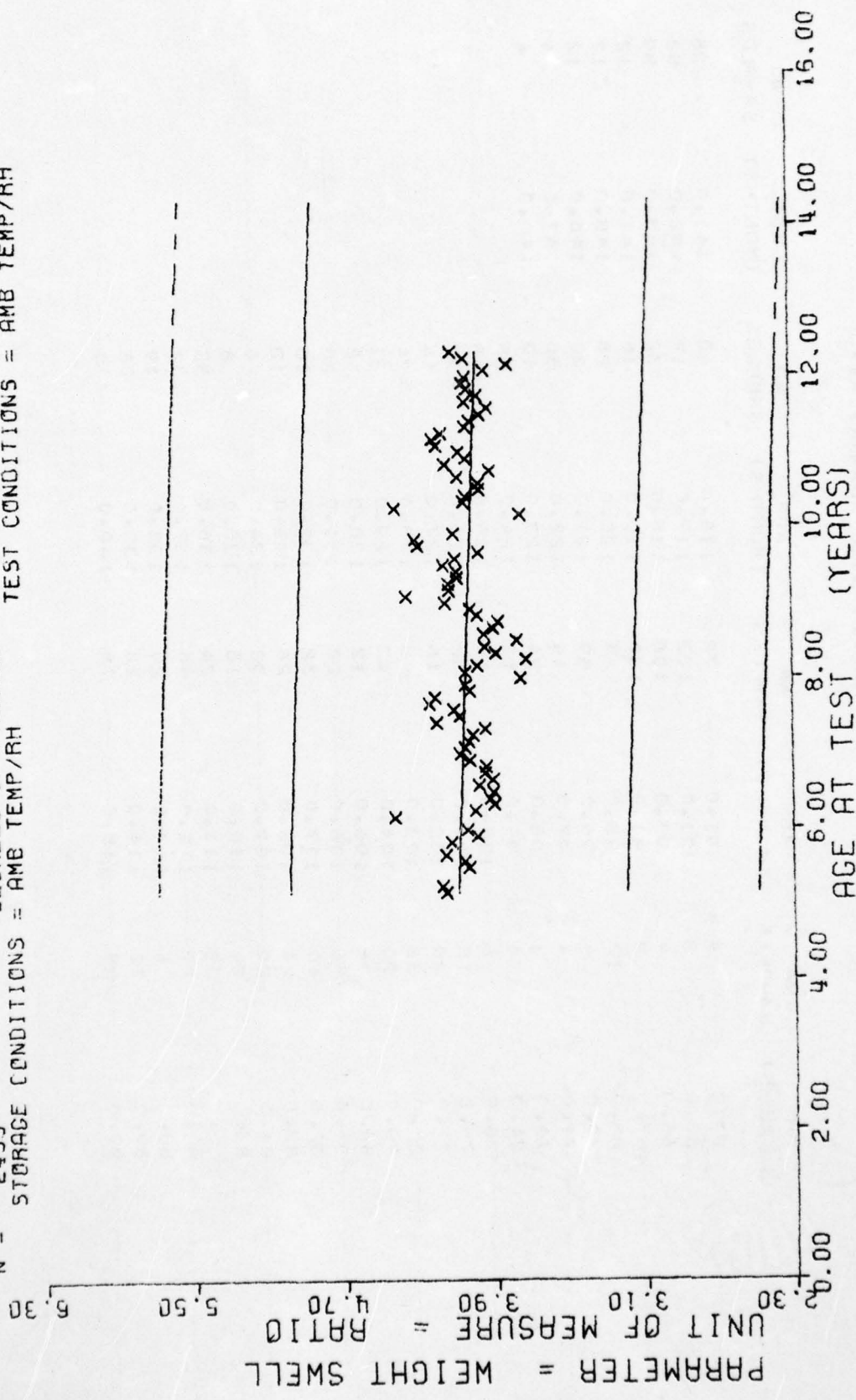
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
62.0	4	91.0	72	116.0	48	141.0	28
63.0	8	92.0	103	117.0	12	142.0	52
66.0	4	93.0	108	118.0	32	143.0	40
67.0	9	94.0	130	119.0	16	144.0	12
68.0	12	95.0	84	120.0	28	145.0	12
70.0	4	96.0	59	121.0	20	146.0	12
71.0	4	97.0	19	122.0	56	147.0	4
72.0	3	98.0	24	123.0	40	148.0	4
74.0	36	99.0	12	124.0	28		
75.0	8	100.0	16	125.0	48		
76.0	16	101.0	32	126.0	27		
77.0	20	102.0	16	127.0	44		
78.0	36	103.0	8	128.0	24		
79.0	20	104.0	12	129.0	21		
80.0	36	105.0	12	130.0	8		
81.0	56	106.0	20	131.0	20		
82.0	40	107.0	32	132.0	16		
83.0	24	108.0	24	133.0	12		
84.0	24	109.0	36	134.0	4		
85.0	24	110.0	28	135.0	8		
86.0	32	111.0	40	136.0	35		
87.0	20	112.0	32	137.0	32		
88.0	4	113.0	35	138.0	19		
89.0	72	114.0	40	139.0	28		
90.0	68	115.0	28	140.0	40		

STAGE 1, WING 1&2, TP-H1011, SOL GEL, WT. SWELL RATIO

This sample size summary is applicable to figure 48.

$Y = ((+4.1806842E+00) + (-1.4001919E-03) * X)$
 $F = +7.0835362E+00$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -5.3879395E-02$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +2.6614913E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 2435$ DEGREES OF FREEDOM = 2433
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 142, TP-H1011, SOL GEL, WT. SWELL RATIO

Figure 48

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
62.0	4	91.0	72	116.0	40	141.0	28
63.0	8	92.0	103	117.0	12	142.0	52
66.0	4	93.0	108	118.0	32	143.0	39
67.0	8	94.0	130	119.0	16	144.0	12
68.0	12	95.0	84	120.0	28	145.0	12
70.0	4	96.0	59	121.0	20	146.0	12
71.0	4	97.0	19	122.0	56	147.0	4
72.0	3	98.0	24	123.0	40	148.0	4
74.0	36	99.0	12	124.0	28		
75.0	8	100.0	16	125.0	48		
76.0	16	101.0	32	126.0	27		
77.0	20	102.0	16	127.0	44		
78.0	36	103.0	8	128.0	24		
79.0	20	104.0	12	129.0	21		
80.0	36	105.0	12	130.0	8		
81.0	56	106.0	20	131.0	20		
82.0	40	107.0	32	132.0	16		
83.0	24	108.0	24	133.0	12		
84.0	24	109.0	32	134.0	4		
85.0	24	110.0	16	135.0	8		
86.0	32	111.0	24	136.0	35		
87.0	20	112.0	20	137.0	32		
88.0	4	113.0	20	138.0	19		
89.0	72	114.0	20	139.0	28		
90.0	68	115.0	16	140.0	40		

STAGE 1, WING 182, SOL GEL, % EXTRACTABLE, TPH-1011

This sample size summary is applicable to figure 49.

$F = +8.8353188E+02$
 $R = -5.2416817E-01$
 $t = +2.9729310E+01$
 $N = 2335$
 $Y = ((+9.5931449E+00) + (-2.0878657E-02) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2333
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = AMB TEMP/RH

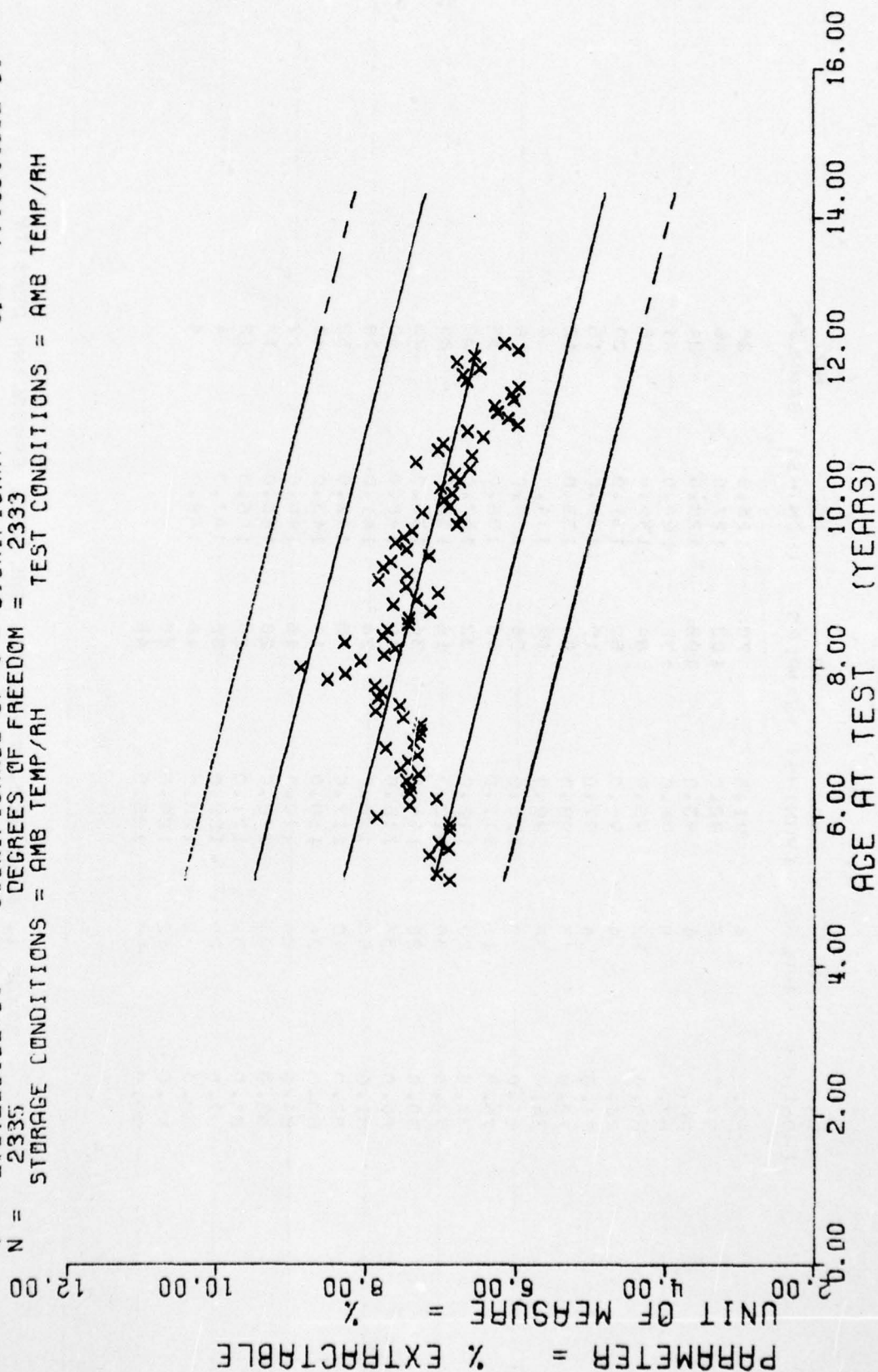


Figure 49

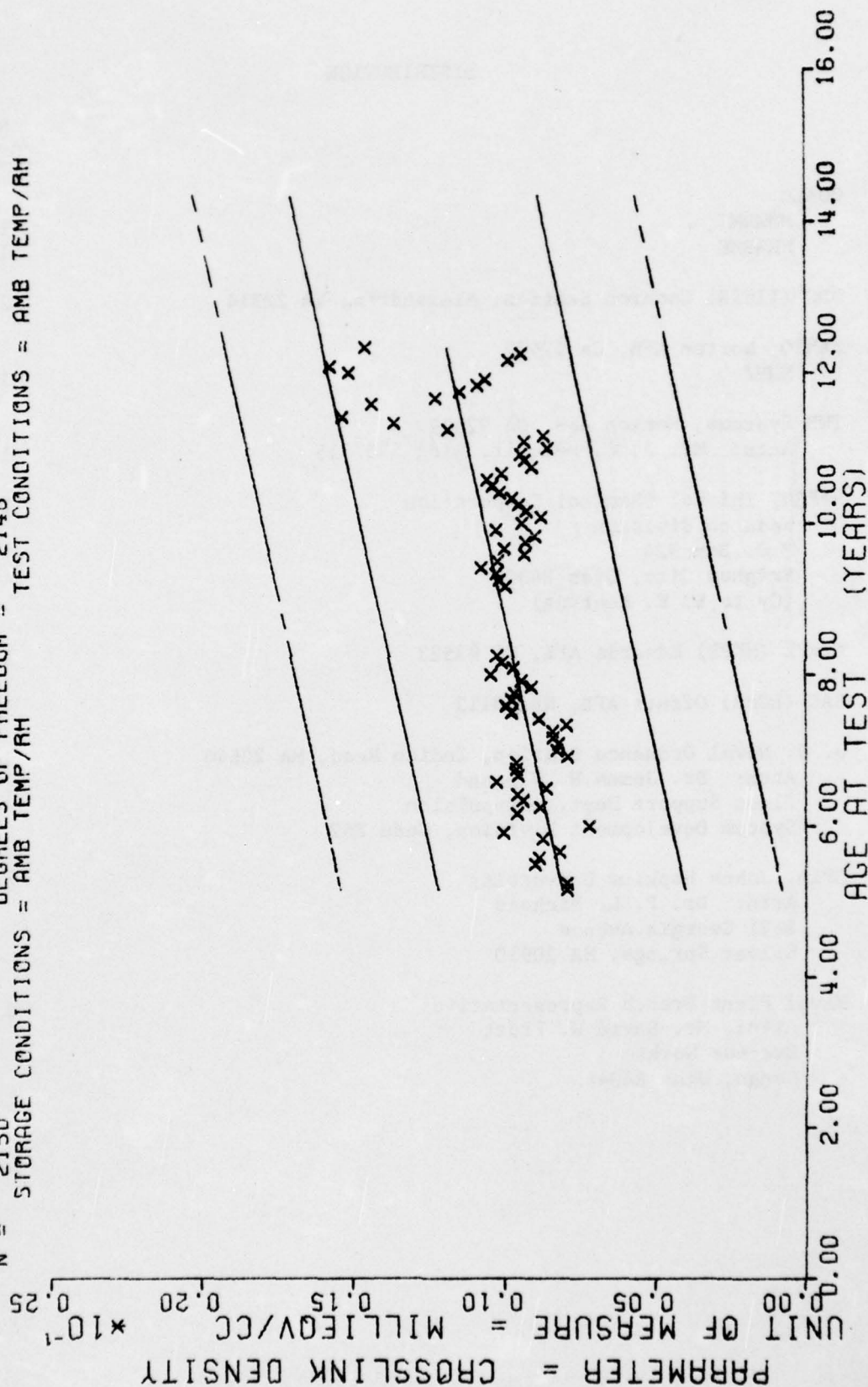
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NR SAMPLES
62.0	4	91.0	72	126.0	28
63.0	8	92.0	103	127.0	45
65.0	4	93.0	108	128.0	24
67.0	8	94.0	130	129.0	21
69.0	12	95.0	84	130.0	8
70.0	4	96.0	59	131.0	20
71.0	4	97.0	19	132.0	16
72.0	3	98.0	24	133.0	12
74.0	36	99.0	12	134.0	4
75.0	9	110.0	28	135.0	9
76.0	16	111.0	40	136.0	35
77.0	20	112.0	32	137.0	32
78.0	36	113.0	15	138.0	20
79.0	20	114.0	36	139.0	28
80.0	36	115.0	16	140.0	40
81.0	56	116.0	24	141.0	28
82.0	40	117.0	8	142.0	52
83.0	24	118.0	16	143.0	40
84.0	24	119.0	16	144.0	12
85.0	24	120.0	28	145.0	12
86.0	32	121.0	20	146.0	12
87.0	20	122.0	56	147.0	4
88.0	4	123.0	40	148.0	4
89.0	72	124.0	28		
90.0	68	125.0	48		

STAGE 1. WING 1&2, TP-H1011, SOL GEL. CROSSLINK DENSITY

This sample size summary is applicable to figure 50.

$\gamma = ((+5.3739948E-03) + (+4.4292168E-05) \times X)$
 $F = +3.3593632E+02$ SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +2.6271781E-03$
 $R = +3.6775472E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +2.4165648E-06$
 $t = +1.8328565E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +2.4436415E-03$
 $N = 2150$ DEGREES OF FREEDOM = 2148
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



STAGE 1, WING 142, TP-H1011, SOL GEL, CROSSLINK DENSITY

Figure 50

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 A & B First Stage Minuteman Motors. This report is the eleventh time that a statistical approach has been used to analyze First Stage bulk carton propellant. Testing was accomplished in accordance with MMEMP Project M72632-5MP116P. The purpose of testing was to determine and provide early warning of any serious degradation trends occurring in the propellant for service life predictions.			

Continued from Block 20:

An analysis of all parameters indicates that no potential problems are expected in the propellant for at least two years past the oldest data point.

Data stored in the G085 System were plotted utilizing the IBM 360-65 Computer and CAL-COMP Plotter. The data range at any age can be found by suitable inquiry of the G0 85 System.

Each point on the regression plot represents the mean of all samples at that particular age. The number of specimens at each point is indicated on the sample size summary sheet accompanying each regression plot or group of regression plots.