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PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE I. PHASE E,--ETC(U)
JUN 78 J A THOMPSON

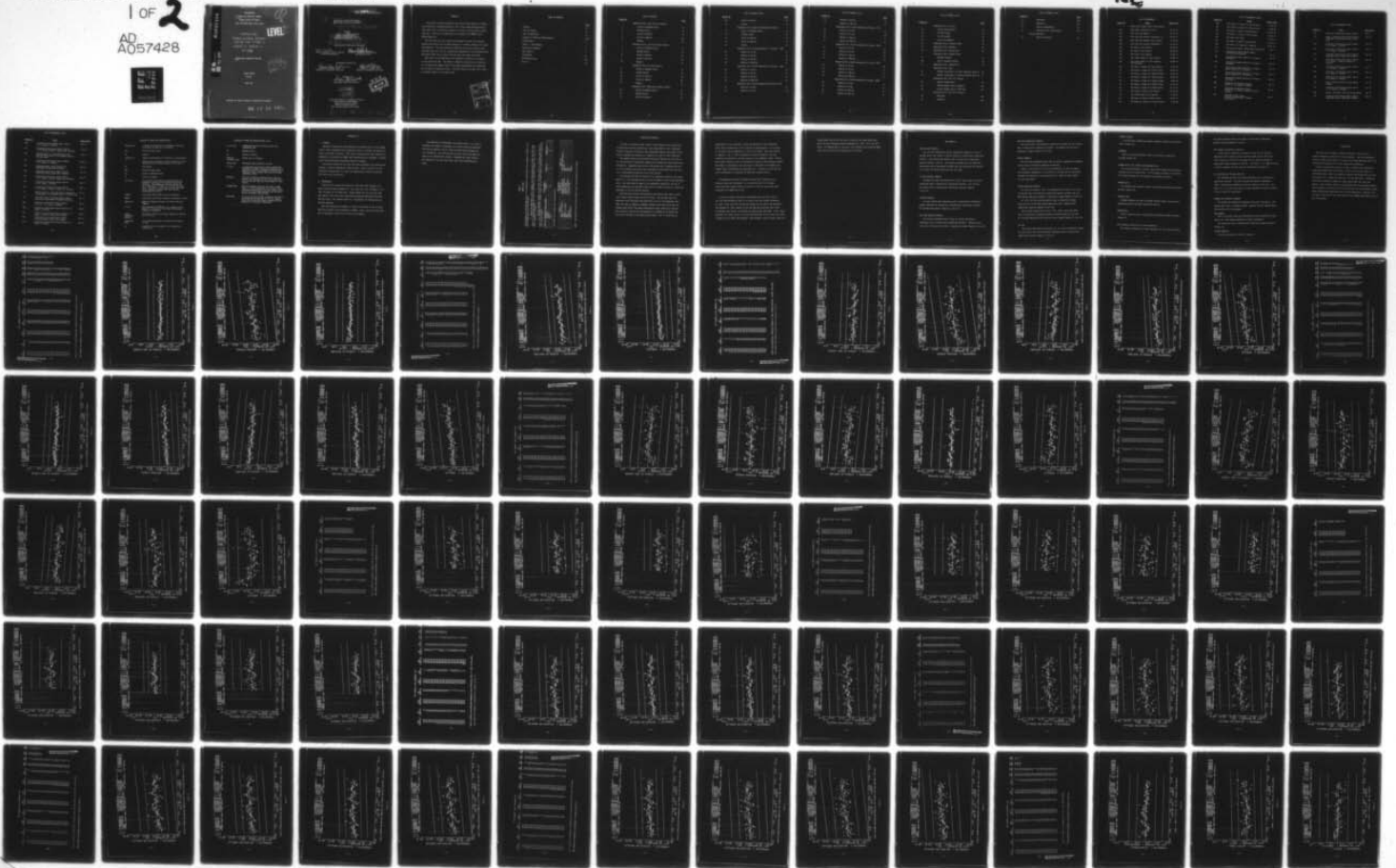
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LOGDEN AIR LOGISTICS CENTER

UNITED STATES AIR FORCE

HILL AIR FORCE BASE, UTAH 84406

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LEVEL 4

PROPELLANT
SURVEILLANCE REPORT
LGM-30 F&G STAGE 1
PHASE E, SERIES V

TP - H 1011

PROPELLANT LABORATORY SECTION

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MANCP REPORT

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MANCP REPORT 396(78)

MMWRM PROJECT M82934C-WNL17514

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PROPELLANT SURVEILLANCE REPORT
LGM-30 F & G STAGE I, (TP-H1011).

and

Phase E, Series V.

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ABSTRACT

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M82934C-WNL17514.

The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (thirteen years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system.

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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
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32A	Zero Time, Wings II-V Test Results	17 Mar 65
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32C	ATP Phase I, Wings II-V Test Results	3 Nov 65
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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

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<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
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223	Surveillance Report LGM-30 Stage I (TP-H1011)	Sep 71
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290	Propellant Surveillance Report LGM-30 F & G, Stage I, Phase B, Series I TP-H1011	Mar 74
300	Minuteman Stage I 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	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

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<u>Report Nr</u>	<u>Title</u>	<u>Report Date</u>
343	Propellant Sureveillance Report LGM-30 A & B, Stage 1, TP-H1011	Jun 76
345	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase B, Series III, TP-H1011	Jun 76
350	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman, Stage 1, UF-2121 Liner	Sep 76
351	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Sep 76
354	Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Sep 76
358	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VIII, TP-H1011	Oct 76
360	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase E, Series III, TP-H1011	Nov 76
367	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Apr 77
370	Propellant Surveillance Report LGM-30 F & G, Stage 1, Phase E, Series II, TP-H1011	Apr 77
377	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman Stage 1, UF-2121 Liner	Oct 77
379	Final RIP Report, Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Oct 77
385	Propellant Surveillance Report LGM-30 A, B, F, & G, Stage 1, TP-H1043	Dec 77
388	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jan 78
390	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase E, Series IV, TP-H1011	Feb 78
392	Propellant Surveillance Report LGM-30 Dissected Motors, Phase IX, TP-H1011	Mar 78
393	Propellant Surveillance Report LGM-30 A & B Stage I, TP-H1011	May 78

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:

Laboratory testing has been performed for thirteen years on First Stage LGM-30 F and G Minuteman Motor propellant blocks to evaluate the effects of aging on TP-H1011 propellant. This report contains those tests conducted on propellant as instructed in MMEMP Test Directive GTD-1C, Amendment 2, LGM-30 First Stage Operational Propellant Laboratory Testing.

Statistical analysis of the data from tests performed will provide early warning if serious degradation trends develop. Annual evaluation of the propellant provides data for input into engineering reliability analysis for service life predictions.

B. BACKGROUND:

LGM-30 F and G testing was started in 1966 with phase testing at 24 month intervals (Report Numbers 78 - zero time; 104, 162, 185-Phase I; 176, 239, 257-Phase II; 271-Phase III). Report Number 257 was the first time that LGM-30 F and G data were statistically analyzed separately from LGM-30A and B data. The present report is a continuation of testing and statistical analysis.

Zero time testing for LGM-30A, B, F and G 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 parameter.

The LGM-30F and G propellant test matrix (Table 1) is used to determine the number of specimens to be taken from each propellant loaf and the specific test or tests to which these specimens are to be subjected. Very low rate and low rate tensile specimens are taken on all LGM-30F and G blocks. Specimens for other physical and combustion tests are taken from every third (LGM-30F and G) block.

TABLE 1

SAMPLE PLAN

The Procedure for determining tests to be performed on propellant batch samples of IGM-30 F & G First Stage Motors are as follows:

1. Divide the USAF motor serial numbers into three groups by dividing the last three digits of each serial number by three to determine the remainder integer, e.g., 154 ÷ 3 = 51 with a remainder integer of 1.
2. Use the remainder integer to enter the following matrix to determine the group of tests to be performed on the forward, middle, and aft batch samples associated with a particular motor serial number.

TP-H1011 PROPELLANT BATCH SAMPLE	GROUP MATRIX		
	GROUP I	GROUP II	GROUP III
Forward	1	2	0
Middle	0	1	2
Aft	2	0	1

Each group will receive the following tests:

	TEST MATRIX		
	GROUP I	GROUP II	GROUP III
High Rate Triaxial	Dynamic Response	High Rate Hydrostatic	
Creep	Stress Relaxation	Sol Gel	
Biaxial Low Rate	Burning Rate	DSC	
TCLC	Heat of Explosion	TGA	
Hardness	Pressure Time	DTA	
Ignitability		Impact	

NOTE: Low Rate and Very Low Rate Tensile tests are performed on all blocks.

STATISTICAL APPROACH

In order to determine aging trends for shelf/service life predictions, as directed by Service Engineering, First Stage LGM-30 F and G Minuteman TP-H1011 propellant blocks have been undergoing testing since 1966, statistically analyzed and reported on a regular test cycle by this laboratory.

The primary reason for performing statistical analysis on test data is for the detection of propellant changes due to aging that would affect motor reliability. Regression analysis was the method used to examine data and to aid in drawing conclusions about dependency relationships that may exist i.e., relationship between age versus test results.

In selecting the best fit model for the regression equation, the linear model $Y = a + bX$ was found to be the best fit model for 96% of the regression plots. The model used is shown in the regression equation at the top of every regression plot and those which are not linear will also be listed and discussed in the test results section.

Individual data points from different time periods were used 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 motor tested. The 't' value 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 the regression plot. Variance at each test age can be determined by consulting the G085 data storage system.

In comparing the present regression slopes and Y intercepts with previous slopes and intercepts, it is noted that more of the aging trend lines have become flatter or closer to a line of zero slope which indicates less change due to age.

A post cure effect (propellant stabilizing after the first year or two) has been observed on some of the early test data (stress relaxation at -65°F, -40°F, and 20°F; TGA percent weight loss at 250°C; DTA exotherm 1, and exotherm 2); which tended to bias and skew the projected trend lines. To overcome this factor, two methods of analysis were performed: First, where possible, non-linear models were used that would best fit the total data (TGA) % weight loss at 250°C, DTA exotherm 1 and exotherm 2 data); second, where non-

linear models did not fit the data as good as the linear model this early data was eliminated (Stress Relaxation at -60°F , -40°F , and 20°F data). By compensating for this post cure biasing a more accurate aging trend line for service life prediction is provided.

TEST RESULTS

VERY LOW RATE TENSILE:

Very low rate regressions show no significant change for strain at maximum stress with strain at rupture showing a statistically significant decrease. The stresses and modulus show a statistically significant increase (Figure 1 thru 5). The trends are gradual for the respective regressions and no operational problems from the propellant are expected for at least two years beyond the last test date.

LOW RATE BIAXIAL TENSILE:

Although the trend line approaches a line of zero slope, the strain regressions show a statistically significant decrease. The stresses and modulus show a statistically significant increase (Figures 6 thru 10).

LOW RATE TENSILE:

Low rate tensile data regressions show a statistically significant gradual decrease for strains and a statistically significant increase for stresses and modulus (Figures 11 thru 15).

HIGH RATE TRIAXIAL TENSILE:

The strain at maximum stress, strain at rupture and modulus regressions show a statistically significant decrease. Maximum stress and stress at rupture do not show a significant change (Figures 16 thru 20).

HIGH RATE HYDROSTATIC TENSILE:

The strains show a statistically significant decrease and the stresses show a statistically significant increase. The modulus did not show a significant change (Figures 21 thru 25).

TENSILE SUMMARY:

The test data regressions show that the strain is gradually decreasing and the stress and modulus gradually increasing.

Based on the analysis of test data regressions, it does not appear that meaningful degradation is occurring at this time and no operational problems are expected in the propellant for at least two years beyond the last data point.

STRESS RELAXATION MODULUS:

For the 0.5% strain at -65°F , the regressions for data at 10, 50 and 100 seconds show a statistically significant gradual increase with the 1000 second regression showing no significant change (Figures 26 thru 29).

At -40°F , the 10 second regression shows no significant change while the 50, 100 and 1000 second regressions show a statistically significant decrease (Figures 30 thru 33).

The 3% strain regressions at 20°F , 77°F , 100°F , 140°F , and 180°F show a statistically significant gradual increase except for the 20°F at 10 second regression which does not show a change (Figures 34 thru 53).

SOL GEL:

The percent extractables and density do not show a significant change. Gel swell ratio and crosslink density regressions show a statistically significant increase (Figures 54 thru 57).

CONSTANT STRAIN:

A statistically significant gradual decrease is shown for constant strain (Figure 58).

HARDNESS:

Shore A ten second hardness shows a statistically significant increase (Figure 59).

SUMMARY OF SOL GEL, TENSILE AND HARDNESS DATA:

The crosslink density, constant strain and hardness data regressions correlate with the tensile data. As the polymer continues to crosslink, the strains decrease and the stresses and hardness increases.

BURNING RATE:

The burning rate regression shows a statistically significant gradual decrease (Figure 60).

PRESSURE TIME:

Maximum pressure and time to maximum pressure shows a statistically significant gradual decrease (Figures 61 and 62).

IGNITABILITY:

Time to ignition shows a statistically significant gradual increase (Figure 63).

TCLE (Thermal Coefficient of Linear Expansion)

The thermal coefficient of linear expansion for both above and below

the glass transition point (T_g) shows a statistically significant gradual increase (Figures 64 and 65).

TGA (Thermal Gravimetric Analysis):

A statistically significant increase is shown for the ignition temperature (9°C rise/min) and the percent weight loss at 250°C hold (12°C rise/min to hold) with the weight loss at ignition showing no significant change (Figures 66 thru 68). The model $Y = a + b\left(\frac{1}{X}\right)$ was found to better represent the data than the linear model in Figure 67.

DTA (Differential Thermal Analysis):

The endotherm and first and second exotherms show a statistically significant decrease. The third exotherm and ignition temperature shows a statistically significant increase (Figures 69 thru 73). The model $Y = a + b (\text{LOG } X)$ was found to better represent the data on Figures 70 and 71 than the linear model.

THERMAL AND COMBUSTION SUMMARY:

The thermal and combustion regressions show good correlation. The burning rate, time to maximum pressure, ignition time for ignitability, TGA and DTA are all increasing.

TEAR ENERGY:

This is the first time that sufficient data were available for preparation of a tear energy regression on Wing 6 propellant.

The regression shows a statistically significant gradual decrease (Figure 74).

FAILURE ENVELOPE:

The failure envelope is shown in Figure 75.

CONCLUSIONS

Thirteen years of aging at ambient temperature (77°F) has not greatly changed the properties of the propellant. Some test parameters indicate slight aging trends, but nothing that would adversely affect the operational characteristics of the rocket motor propellant.

From the statistical analysis, it does not appear that significant propellant degradation is occurring. Based on the thirteen years of accumulated data, there is no reason to suspect that properties will show much change for at least two years past the last data point. Therefore, propellant reliability should not change appreciably over that time period. Since failure limits are not available for the parameters tested, this statement is based on the fact that the slope of the regression curves where statistically significant are, with few exceptions, relatively flat or close to the line of zero slope and have not changed appreciably from the last test period.

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
9.0	7	33.0	152	58.0	325	83.0	72	108	90	133	79		
9.0	19	34.0	154	59.0	287	84.0	32	109	108	134	84		
10.0	11	35.0	110	60.0	392	85.0	36	110	48	135	36		
11.0	15	36.0	222	61.0	242	86.0	67	111	27	136	48		
12.0	30	37.0	141	62.0	295	87.0	113	112	115	137	90		
13.0	48	38.0	123	63.0	219	88.0	124	113	282	138	237		
14.0	28	39.0	105	64.0	130	89.0	142	114	142	139	139		
15.0	38	40.0	119	65.0	90	90.0	129	115	118	140	39		
16.0	46	41.0	153	66.0	61	91.0	86	116	297	141	10		
17.0	55	42.0	120	67.0	24	92.0	55	117	241	142	15		
18.0	28	43.0	142	68.0	131	93.0	99	118	137	143	176		
19.0	49	44.0	100	69.0	183	94.0	84	119	129	144	83		
20.0	24	45.0	135	70.0	216	95.0	122	120	195	146	3		
21.0	56	46.0	116	71.0	117	96.0	158	121	117	147	6		
22.0	27	47.0	163	72.0	116	97.0	123	122	9	148	6		
23.0	67	48.0	144	73.0	83	98.0	138	123	42				
24.0	55	49.0	175	74.0	137	99.0	165	124	36				
25.0	63	50.0	182	75.0	168	100.0	145	125	75				
26.0	47	51.0	347	76.0	129	101.0	121	126	44				
27.0	50	52.0	314	77.0	161	102.0	51	127	101				
28.0	56	53.0	292	78.0	88	103.0	55	128	60				
29.0	40	54.0	232	79.0	108	104.0	45	129	63				
30.0	73	55.0	468	80.0	104	105.0	9	130	160				
31.0	88	56.0	437	81.0	134	106.0	11	131	191				
32.0	153	57.0	377	82.0	132	107.0	16	132	144				

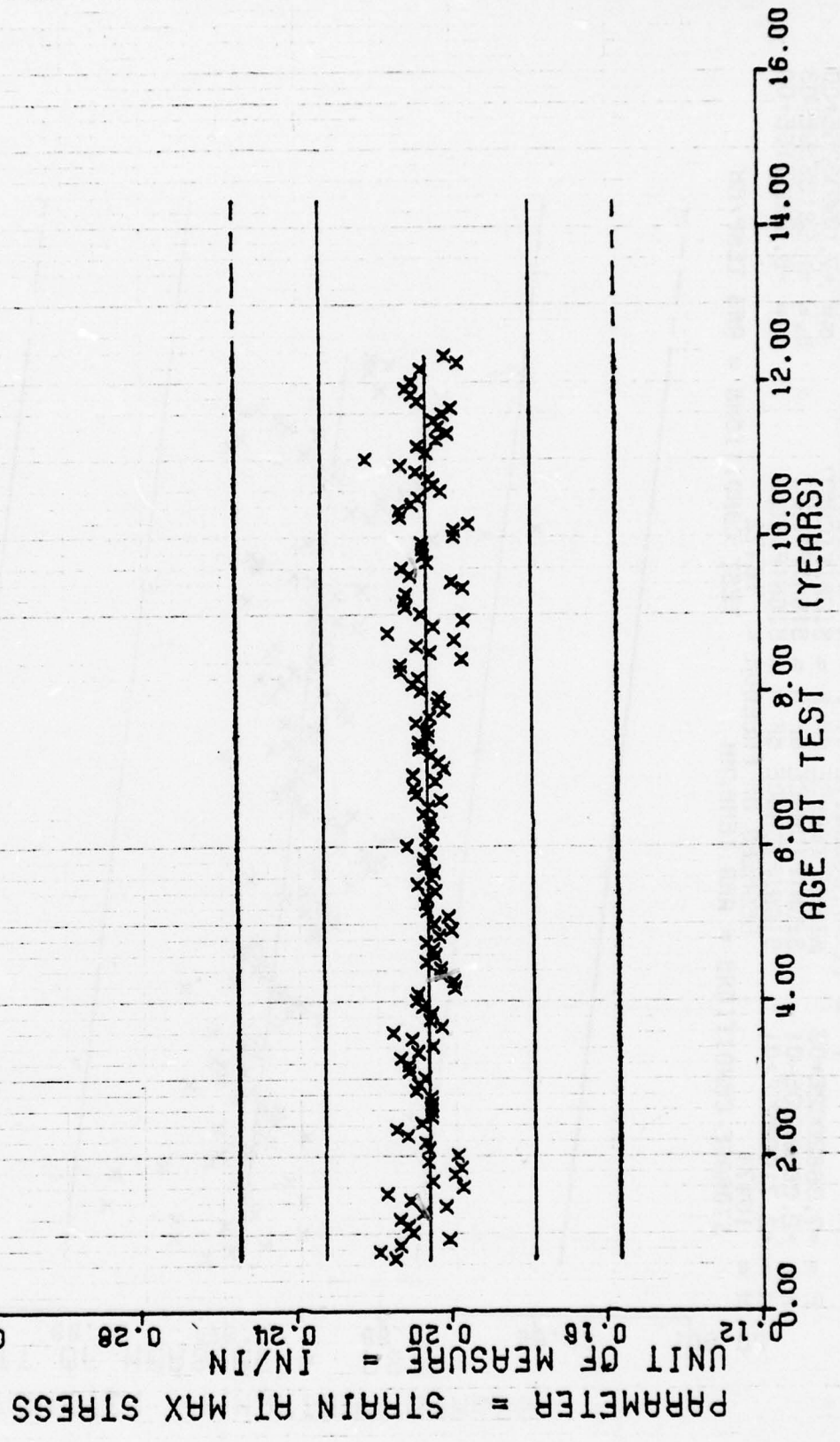
THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC

WING 6.V.L.R,TFNSILE,MAXIMUM STRESS,CHS=0,002 IN/MIN TP-H1011

This sample size summary is applicable to figures 1 thru 3 and 5.

Y = ((+2.053388E-01) + (+4.0751842E-06) * X)
 F = +1.1592532E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_f = +1.6419172E-02
 R = +8.3890714E-03 SIGNIFICANCE OF R = NOT SIGNIFICANT S_R = +3.7849320E-06
 t = +1.0766862E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT S_t = +1.6419092E-02
 N = 16473 DEGREES OF FREEDOM = 16471

STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



HING 6.V.L.R. TENSILE, STRAIN AT MAX STRESS, CHS=0.002 IN/MIN TP-H1011

Y = ((+7.6666477E+01) + (+4.3190707E-02) * X)
 F = +7.3662602E+02 SIGNIFICANCE OF F = SIGNIFICANT σ^2 = +7.0560326E+00
 R = +2.0689520E-01 SIGNIFICANCE OF R = SIGNIFICANT S_e = +1.5913539E-03
 t = +2.7140855E+01 SIGNIFICANCE OF t = SIGNIFICANT S_e = +6.9035715E+00
 N = 16474 DEGREES OF FREEDOM = 16472

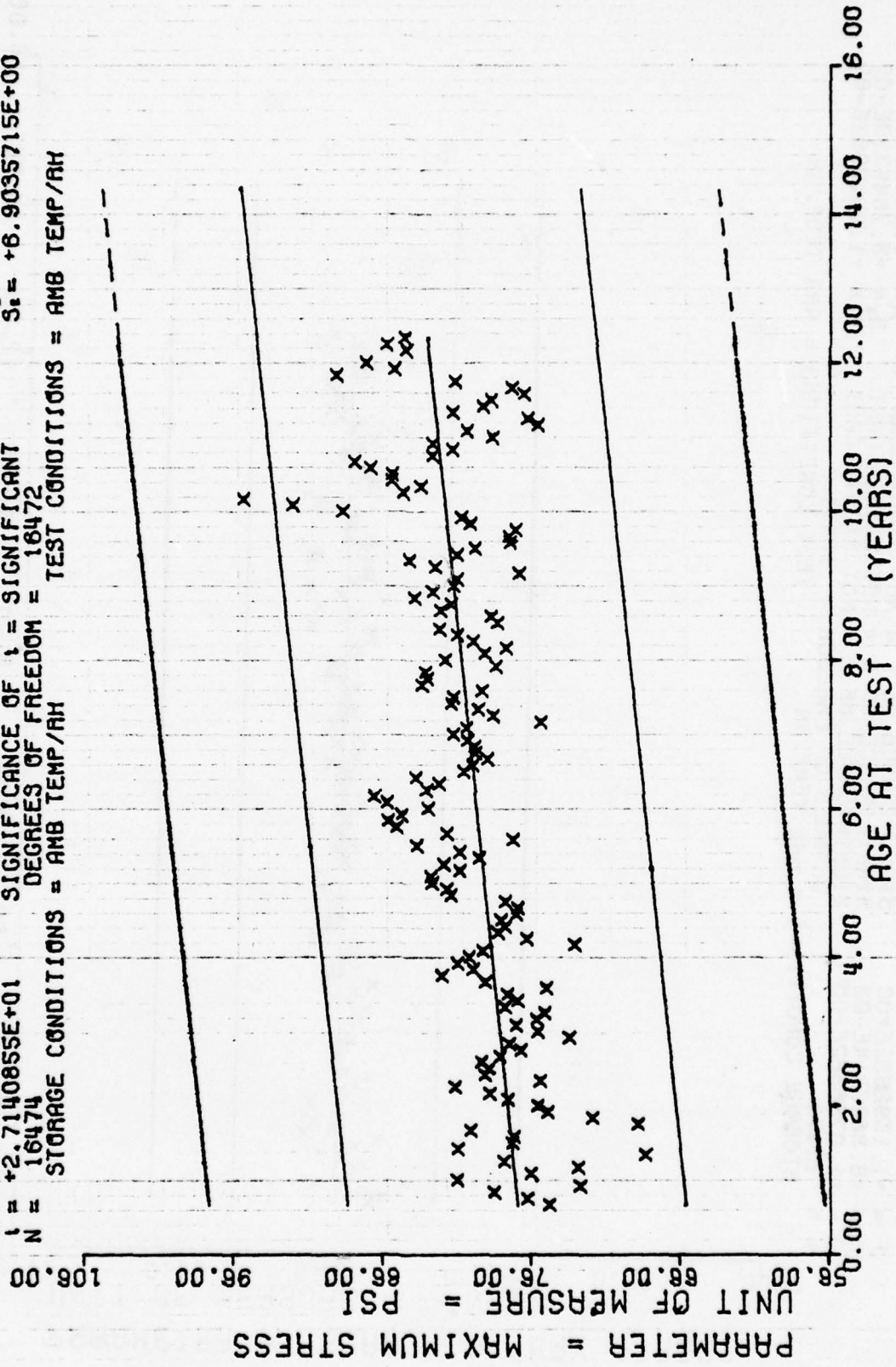
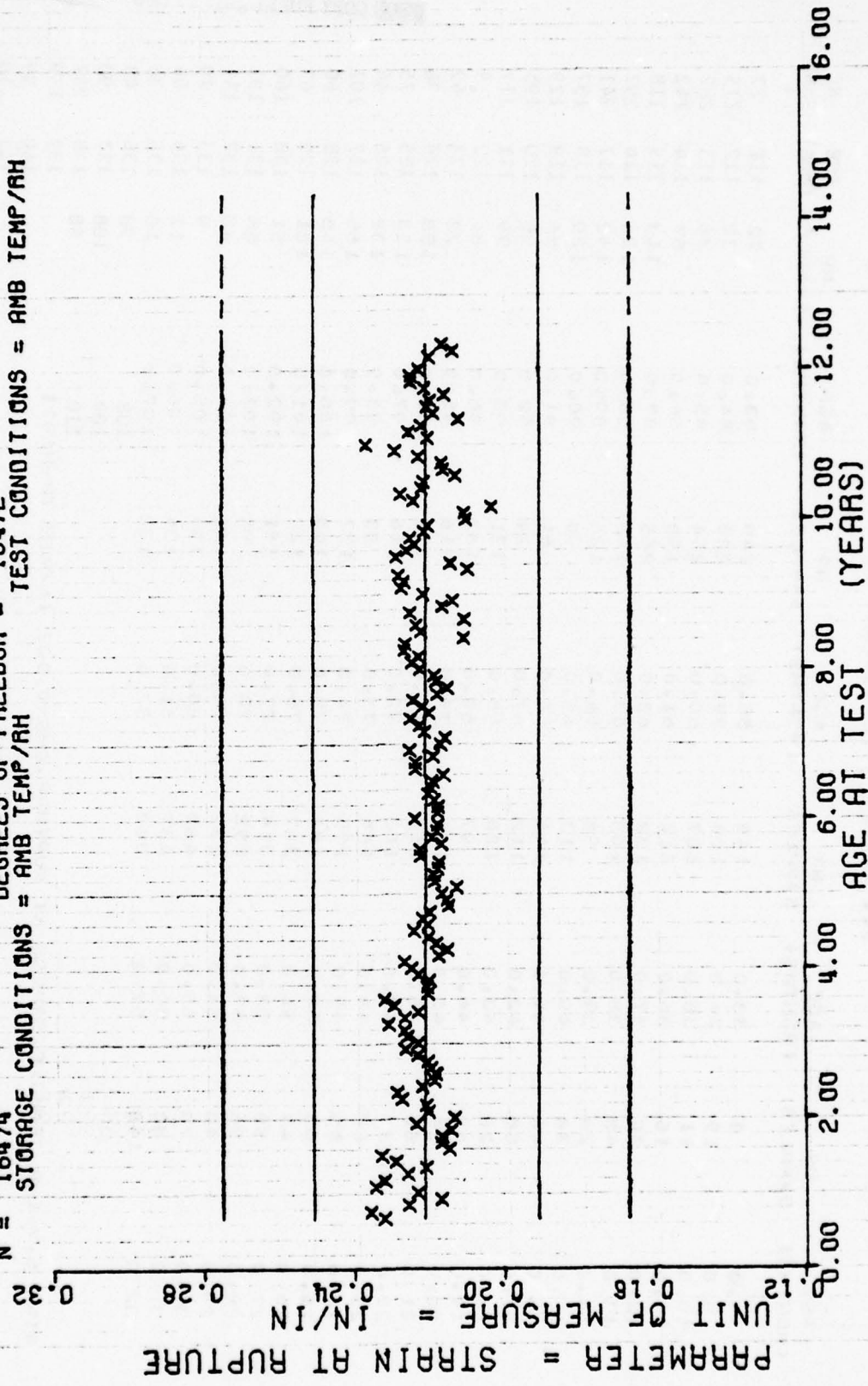


FIGURE 2. V.L.R. TENSILE, MAXIMUM STRESS, CHS=0.002 IN/MIN TP-H1011

$Y = ((+2.2140540E-01) + (-1.2909898E-05) * X)$
 $F = +9.5234685E+00$ SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +1.8012261E-02$
 $R = -2.4038031E-02$ SIGNIFICANCE OF R = SIGNIFICANT $S_o = +4.1509568E-06$
 $t = +3.0860117E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_e = +1.8007603E-02$
 $N = 16474$ DEGREES OF FREEDOM = 16472
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6, V.L.A. TENSILE STRAIN AT RUPTURE, CHS=0.002 IN/MIN TP-H1011

Figure 3

*** SAMPLE SIZE SUMMARY ***

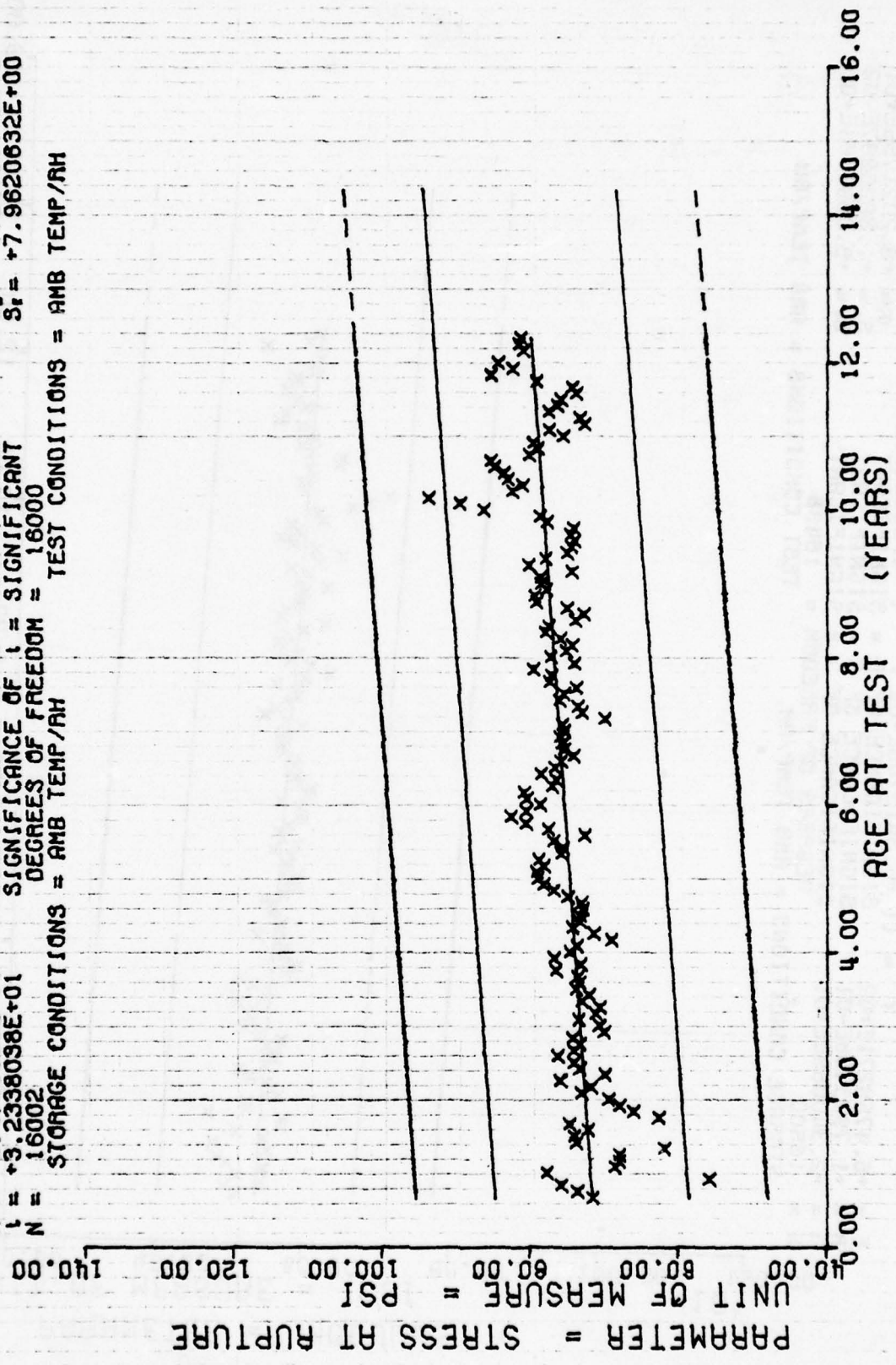
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
9.0	3	33.0	140	58.0	249	83.0	72	111	27
9.0	19	34.0	139	59.0	220	84.0	32	112	115
10.0	11	35.0	107	60.0	294	85.0	36	113	282
11.0	15	36.0	212	61.0	198	86.0	67	114	142
12.0	30	37.0	132	62.0	265	87.0	113	115	118
13.0	48	38.0	108	63.0	196	88.0	124	116	297
14.0	28	39.0	96	64.0	126	89.0	142	117	241
15.0	38	40.0	113	65.0	90	90.0	129	118	137
16.0	46	41.0	146	66.0	61	91.0	86	119	129
17.0	55	42.0	112	67.0	24	92.0	55	120	195
18.0	28	43.0	120	68.0	131	93.0	99	121	117
19.0	49	44.0	97	69.0	183	94.0	84	122	9
20.0	24	45.0	135	70.0	216	95.0	122	123	42
21.0	56	46.0	116	71.0	117	96.0	159	124	36
22.0	27	47.0	163	72.0	116	97.0	123	125	75
23.0	67	48.0	144	73.0	83	98.0	138	126	44
24.0	55	49.0	175	74.0	137	99.0	165	127	101
25.0	63	50.0	182	75.0	168	100.0	145	128	60
26.0	47	51.0	347	76.0	129	101.0	121	129	63
27.0	50	52.0	314	77.0	161	102.0	51	130	160
28.0	56	53.0	292	78.0	88	103.0	55	131	191
29.0	40	54.0	232	79.0	108	104.0	45	132	144
30.0	73	55.0	468	80.0	104	105.0	9	133	79
31.0	82	56.0	437	81.0	134	106.0	11	134	84
32.0	149	57.0	367	82.0	132	107.0	16	135	36
						108	90	136	48
						109	108	137	90
						110	48	138	237
								139	139
								140	39
								141	10
								142	15
								143	176
								144	83
								146	3
								147	6
								148	6

WING 6.V.L.R. IFNSILE, STRESS AT RUPTURE, CHS=0.002 IN/MIN TP-H:011

This sample size summary is applicable to figure 4

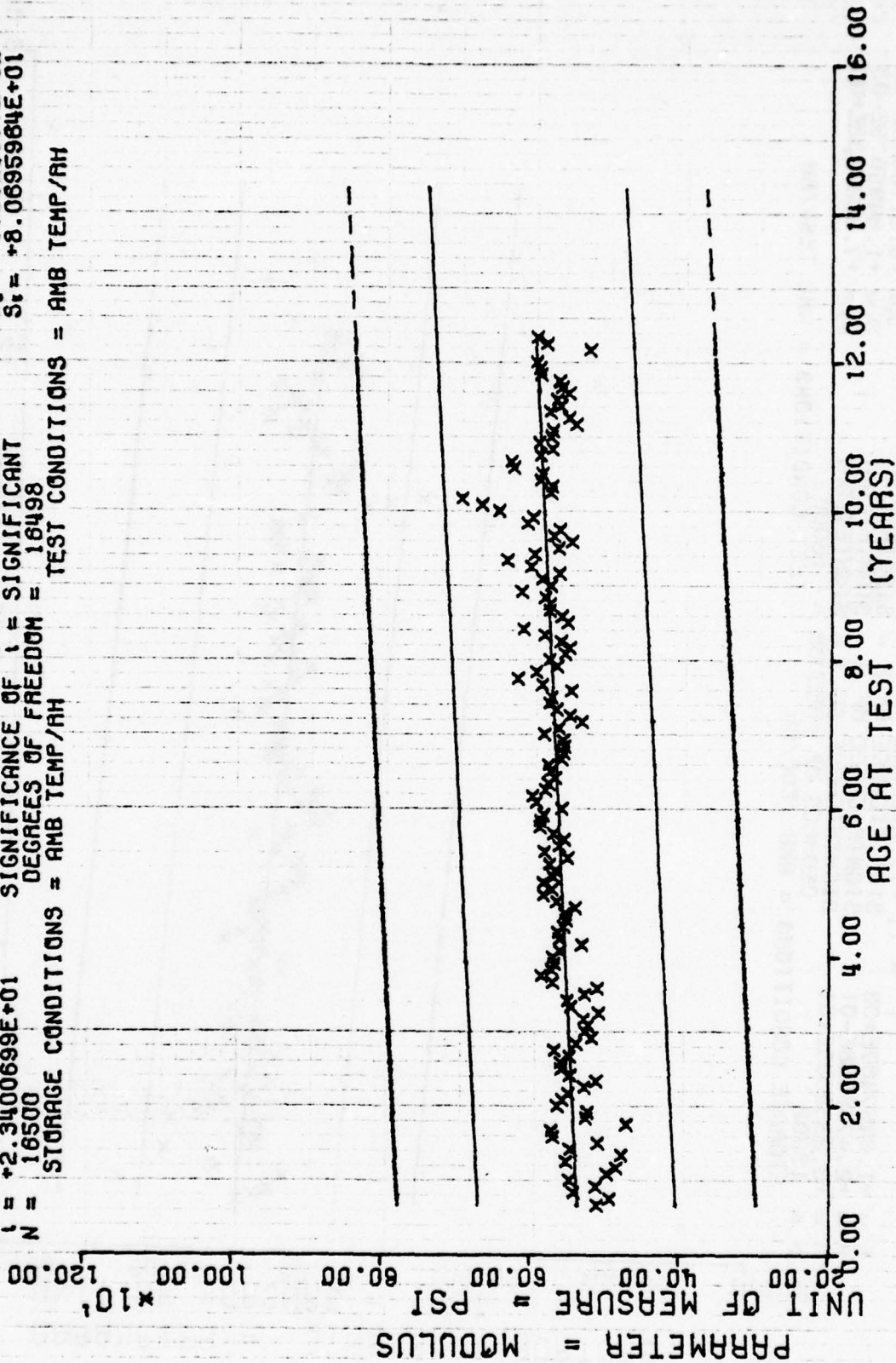
$Y = ((+7.1219225E+01) + (+5.9809480E-02) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 $\sigma^2 = +8.2178858E+00$
 SIGNIFICANCE OF R = SIGNIFICANT
 $S_e = +1.8495079E-03$
 SIGNIFICANCE OF t = SIGNIFICANT
 $S_t = +7.9620632E+00$
 DEGREES OF FREEDOM = 16000
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

F = +1.0457487E+03
 R = +2.4768838E-01
 t = +3.2338038E+01
 N = 16002



KING 6, V. L. R. TENSILE STRESS AT RUPTURE, CHS=0.002 IN/MIN TP-H1011

$Y = ((+5.3413709E+02) + (+4.3595495E-01) * X)$
 F = +5.4759271E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.7923498E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +2.3400699E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 16500 DEGREES OF FREEDOM = 16498
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6.V.L.A. TENSILE, MODULUS, CHS=0.002 IN/MIN TP-H1011

Figure 5

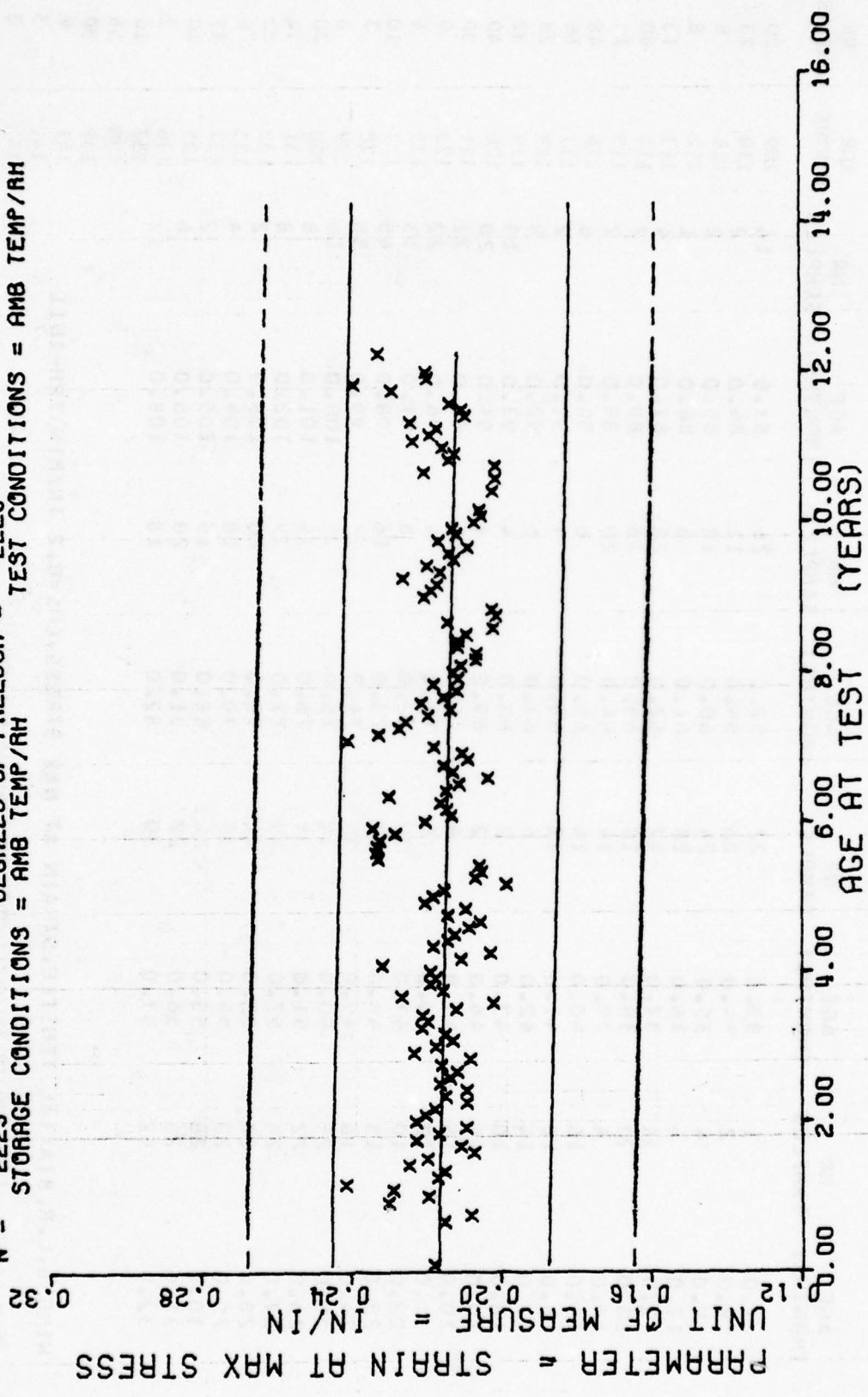
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	1	33.0	22	58.0	26	83.0	14	109	20
8.0	2	34.0	26	59.0	12	84.0	2	110	23
9.0	4	35.0	24	60.0	18	85.0	2	111	8
11.0	6	36.0	28	61.0	8	86.0	1	112	8
12.0	14	37.0	12	62.0	28	87.0	4	113	13
13.0	22	38.0	10	63.0	28	88.0	2	114	60
14.0	4	39.0	14	64.0	20	89.0	2	115	14
15.0	16	40.0	14	65.0	6	90.0	6	116	48
16.0	12	41.0	12	66.0	7	91.0	2	117	66
17.0	14	42.0	6	67.0	6	92.0	8	118	28
18.0	16	43.0	2	68.0	4	93.0	10	119	32
19.0	14	44.0	2	69.0	4	94.0	20	120	40
20.0	16	45.0	4	70.0	8	95.0	22	121	30
21.0	12	46.0	6	71.0	4	96.0	22	122	6
22.0	10	47.0	10	72.0	8	97.0	33	125	4
23.0	13	48.0	12	73.0	16	98.0	45	127	10
24.0	16	49.0	16	74.0	18	99.0	38	128	3
25.0	25	50.0	14	75.0	29	100.0	16	129	6
26.0	22	51.0	34	76.0	14	101.0	8	130	20
27.0	24	52.0	49	77.0	19	102.0	8	131	74
28.0	28	53.0	41	78.0	20	103.0	2	132	22
29.0	23	54.0	18	79.0	18	104.0	4	133	6
30.0	26	55.0	28	80.0	15	105.0	2	134	17
31.0	26	56.0	22	81.0	20	106.0	6	135	10
32.0	42	57.0	30	82.0	18	108.0	12	136	2
								137	16
								138	56
								139	30
								141	4
								142	5
								143	2
								144	2
								147	2

WING 6.L.R. BIAXIAL TENSILE, STRAIN AT MAX STRESS, CHS=0.2 IN/MIN TPH-1011

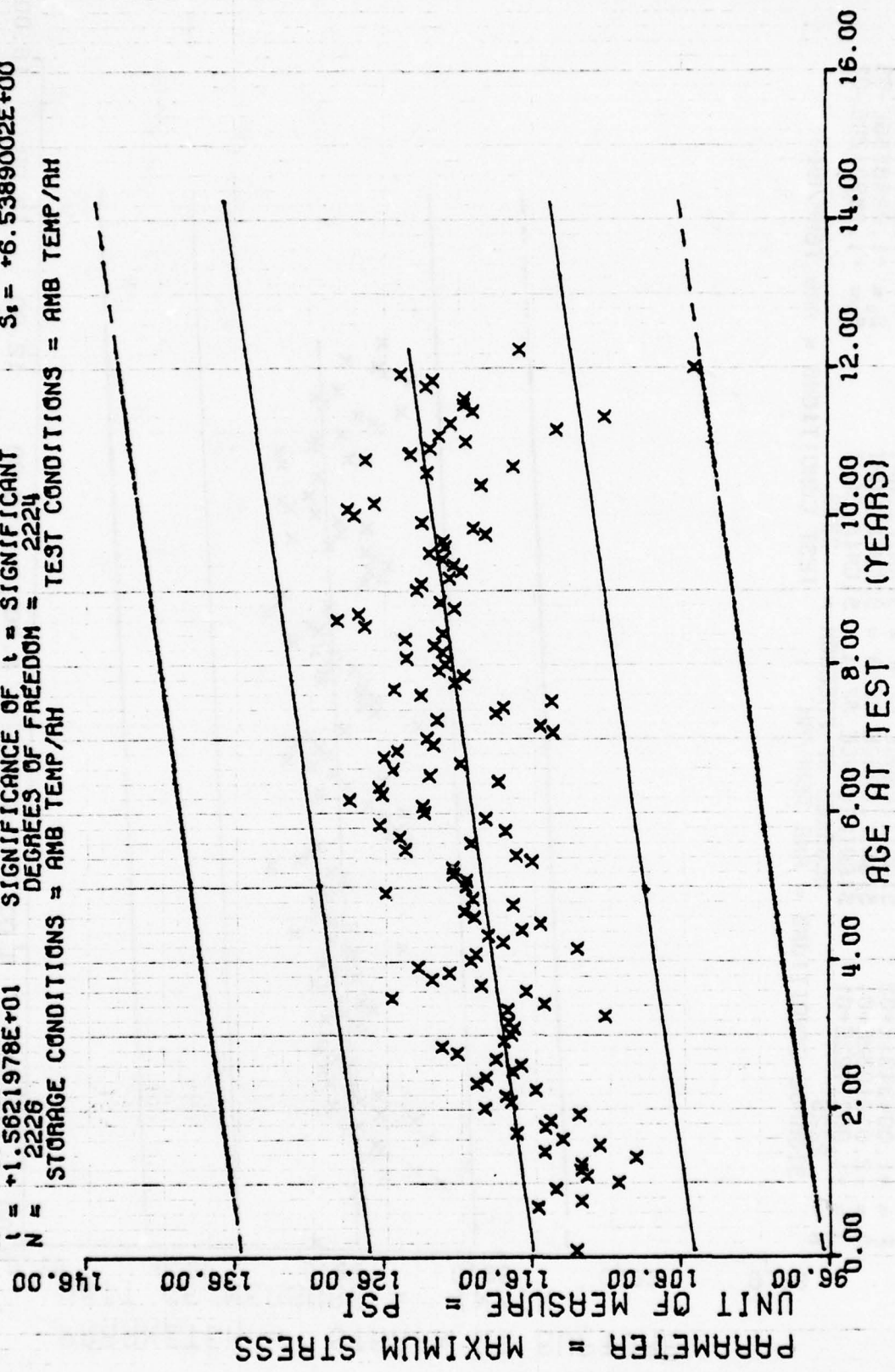
This sample size summary is applicable to Figures 6 thru 10.

Y = ((+2.1659826E-01) + (-4.0498579E-05) * X)
 F = +1.8809188E+01 SIGNIFICANCE OF F = SIGNIFICANT S_r = +1.7216854E-02
 R = -9.1597940E-02 SIGNIFICANCE OF R = SIGNIFICANT S_b = +9.3380191E-06
 t = +4.3369561E+00 SIGNIFICANCE OF t = SIGNIFICANT S_e = +1.7148331E-02
 N = 2225 DEGREES OF FREEDOM = 2223
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



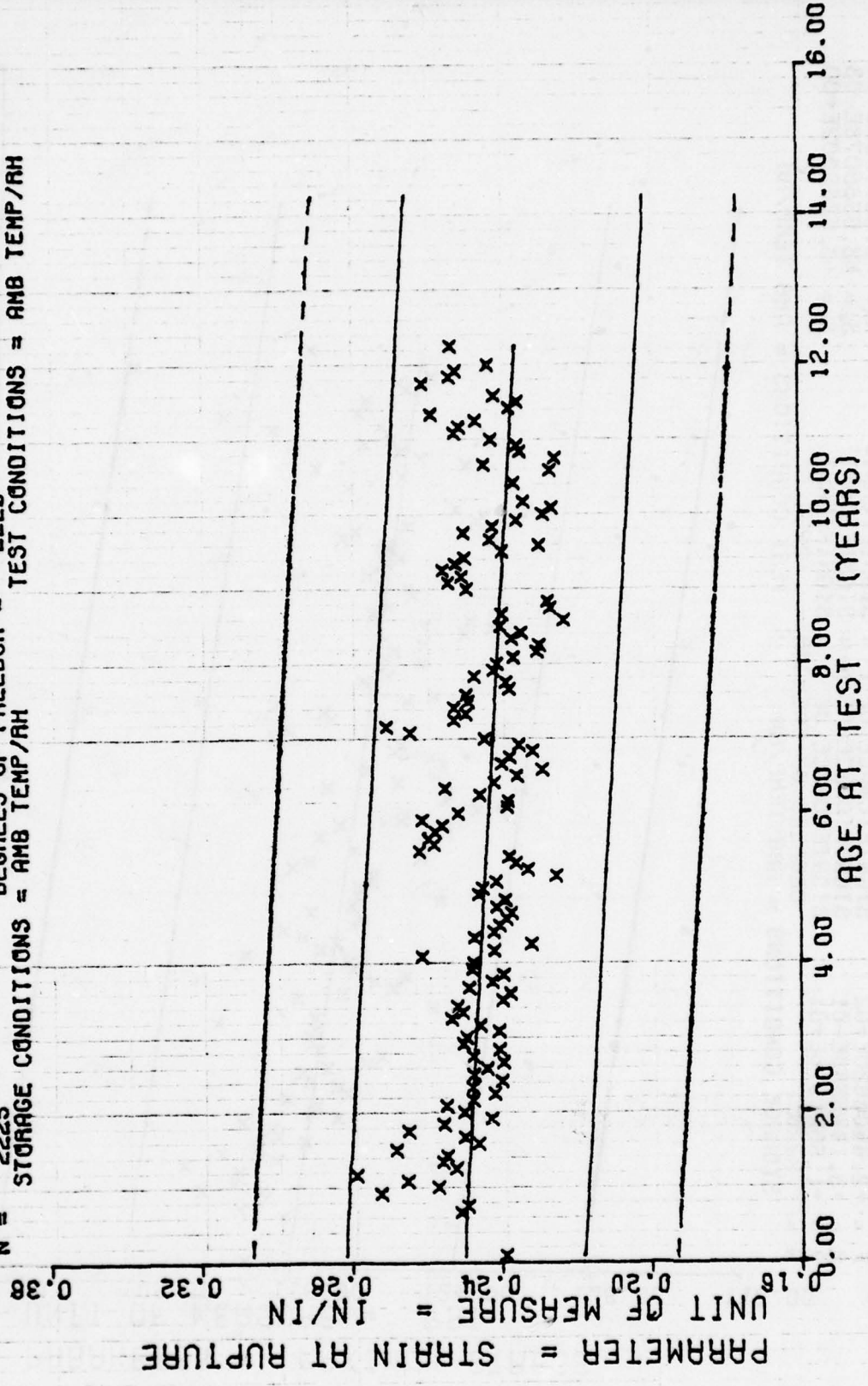
WING 6, L. R. BIAXIAL TENSILE. STRAIN AT MAX STRESS, CHS=0.2 IN/MIN TPH-1011

$Y = ((+1.1595217E+02) + (+5.5595618E-02) * X)$
 F = +2.4404620E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +6.8867822E+00$
 R = +3.1445563E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +3.5588078E-03$
 t = +1.5621978E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +6.5389002E+00$
 N = 2226 DEGREES OF FREEDOM = 2224
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



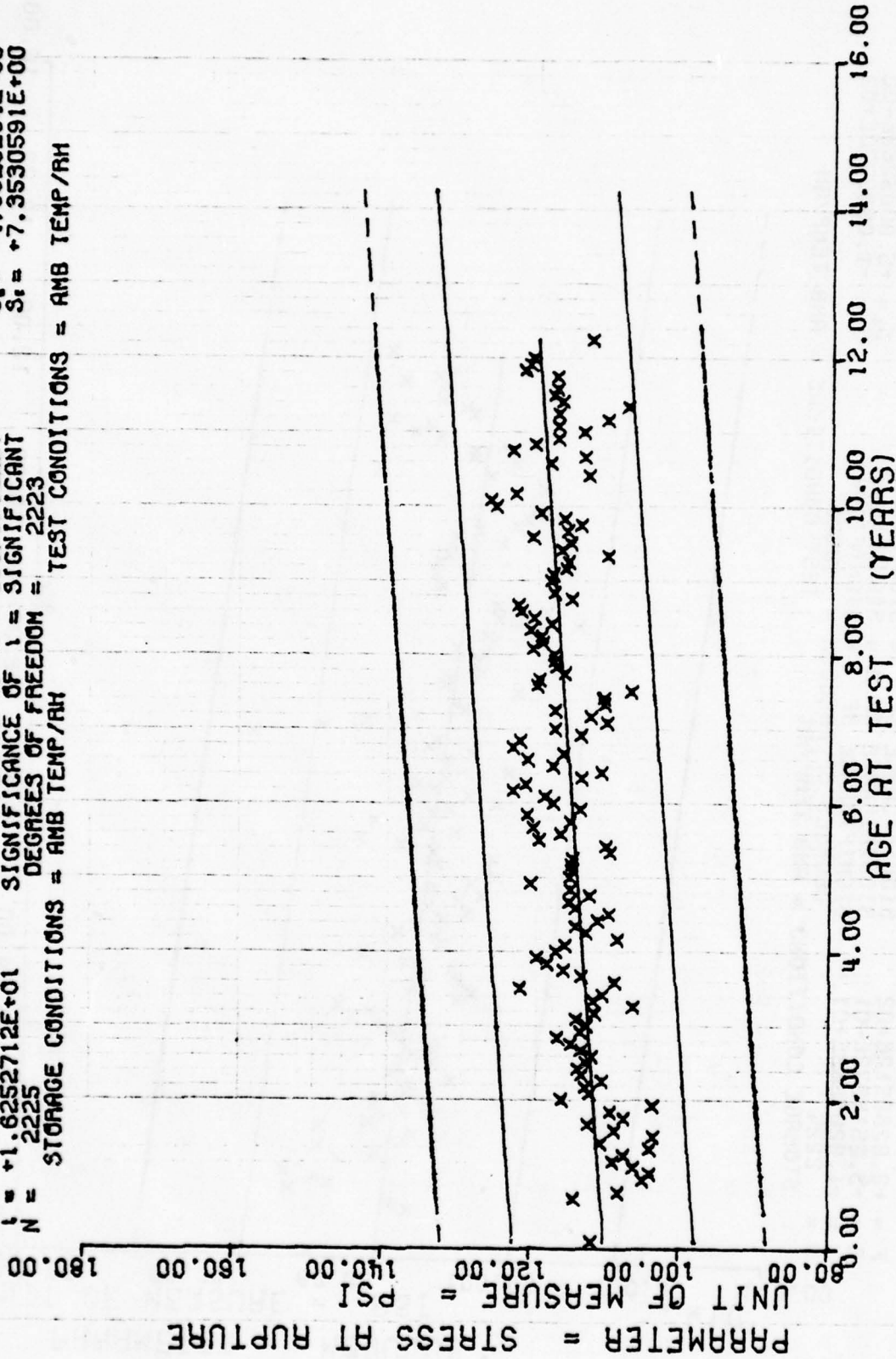
WING 6, L.A. BIAxIAL TENSILE, MAXIMUM STRESS, CHS=0.2 IN/MIN TPH-1011

Y = ((+2.5018113E-01) + (-1.0305903E-04) * X) * X
 F = +1.0043491E+02 SIGNIFICANCE OF F = SIGNIFICANT S = +1.9307795E-02
 R = -2.0791082E-01 SIGNIFICANCE OF R = SIGNIFICANT S₀ = +1.0283565E-05
 t = +1.0021722E+01 SIGNIFICANCE OF t = SIGNIFICANT S_t = +1.8890124E-02
 N = 2225 DEGREES OF FREEDOM = 2223
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



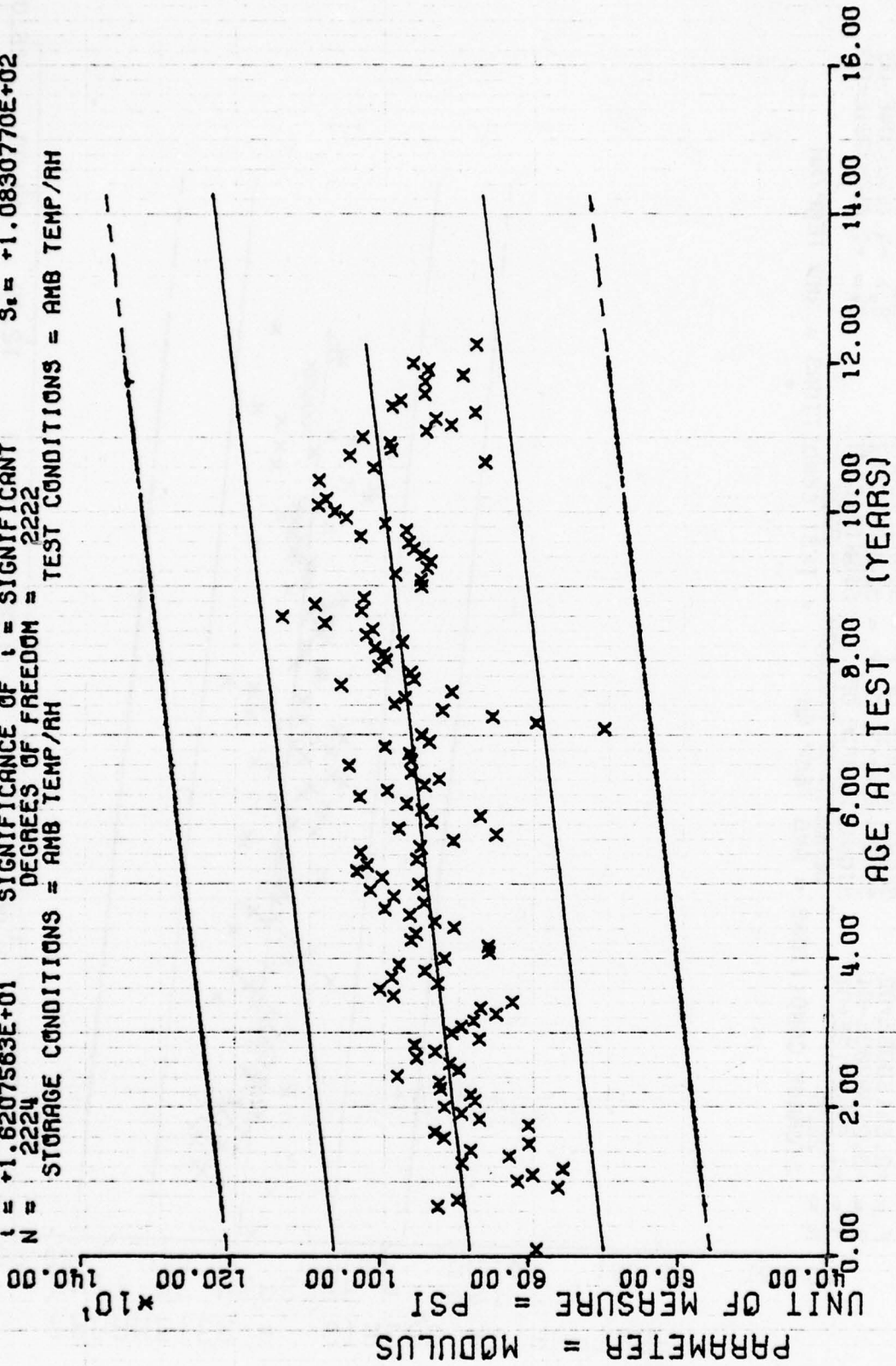
WING 6, L. R. BIAXIAL TENSILE, STRAIN AT RUPTURE, CHS=0.2 IN/MIN TPFH-1011

$Y = ((+1.1008123E+02) + (+6.5058314E-02) * X)$
 F = +2.6415066E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +7.7759187E+00$
 R = +3.2589283E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +4.0029204E-03$
 t = +1.6252712E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +7.3530591E+00$
 N = 2225 DEGREES OF FREEDOM = 2223
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.L.R. BIAXIAL TENSILE, STRESS AT RUPTURE, CHS=0.2 IN/MIN TPRH-1011

$Y = ((+8.7991549E+02) + (+9.5639167E-01) * X)$
 F = +2.6268512E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = +3.2514872E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +1.6207563E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2224 DEGREES OF FREEDOM = 2222
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6.L.R. BIAXIAL TENSILE. MODULUS. CHS=0.2 IN/MIN TPB-1011

Figure 10

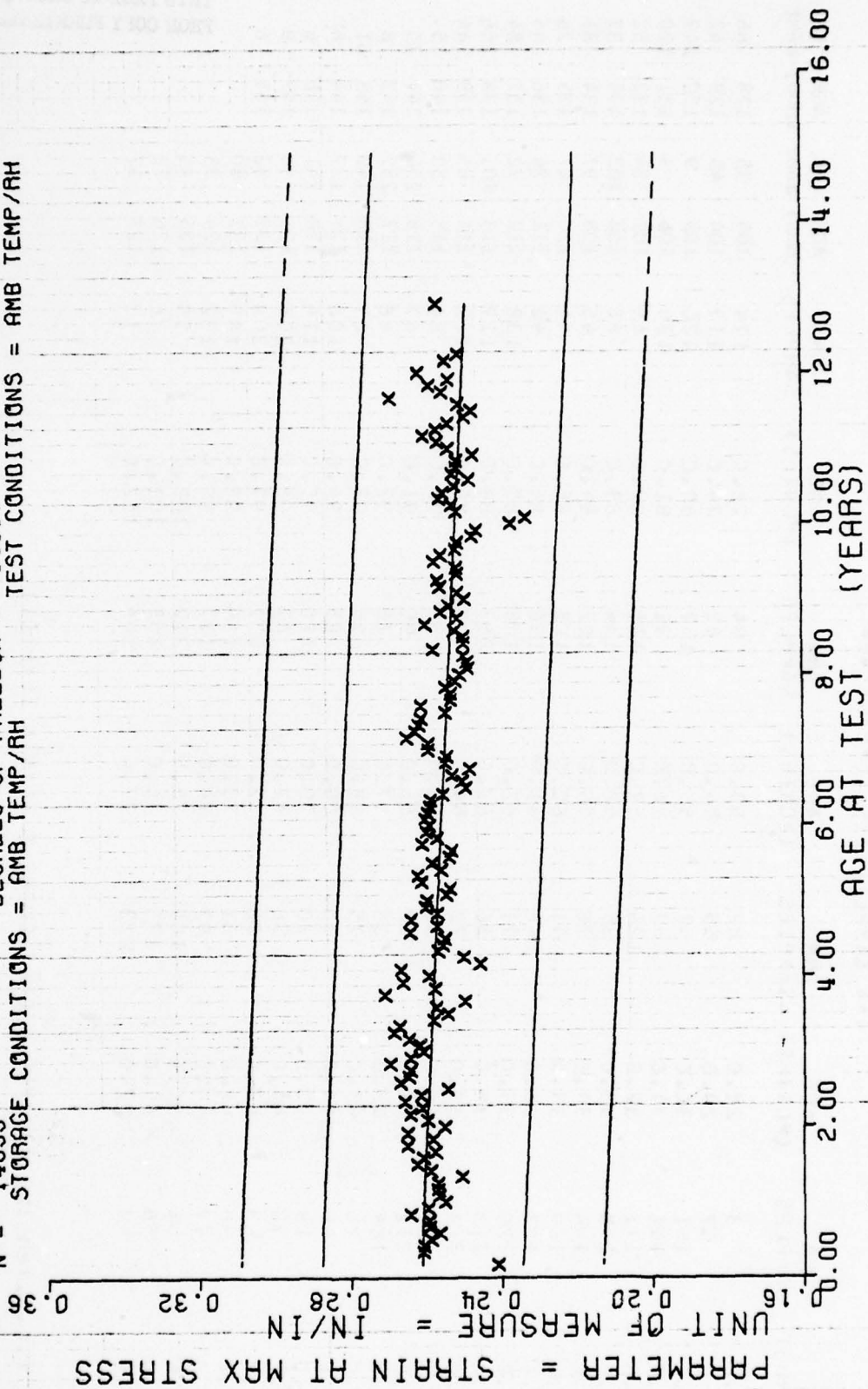
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
2.C	3	28.0	82	53.C	94	78.C	174	103	35
4.C	57	29.0	55	54.0	83	79.C	117	104	45
5.C	151	30.C	52	55.0	137	80.0	120	105	9
6.0	191	31.C	52	56.C	91	81.C	139	106	3
7.C	171	32.C	124	57.C	145	82.C	65	107	24
8.C	143	33.C	85	58.0	134	83.0	88	108	102
9.C	194	34.C	78	59.C	102	84.C	45	109	97
10.C	189	35.0	41	60.C	108	85.C	41	110	47
11.C	192	36.C	148	61.0	150	86.C	42	111	24
12.C	220	37.C	77	62.0	185	87.C	138	112	72
13.0	213	38.C	36	63.0	253	88.C	117	113	105
14.C	222	39.0	72	64.0	98	89.C	122	114	65
15.C	223	40.C	59	65.0	58	90.0	84	115	59
16.0	212	41.0	32	66.C	40	91.C	67	116	258
17.C	184	42.0	66	67.0	76	92.C	68	117	252
18.C	26	43.C	75	68.0	65	93.0	67	118	149
19.C	60	44.0	15	69.C	85	94.C	104	119	117
20.C	18	45.0	20	70.C	120	95.C	114	120	241
21.C	78	46.C	58	71.0	87	96.C	206	121	93
22.C	43	47.C	88	72.0	131	97.C	208	122	32
23.0	30	48.C	61	73.0	144	98.C	185	123	30
24.C	77	49.C	92	74.0	172	99.C	132	124	33
25.C	51	50.C	105	75.0	217	100.C	59	125	45
26.0	56	51.C	175	76.C	155	101.C	76	126	72
27.C	59	52.0	223	77.0	154	102.C	13	127	57

MINI 6, L.R. TENSILE, MAXIMUM STRESS, CHS=2.C IN/MIN IP-F1011

This sample size summary is applicable to figures 11 thru 15

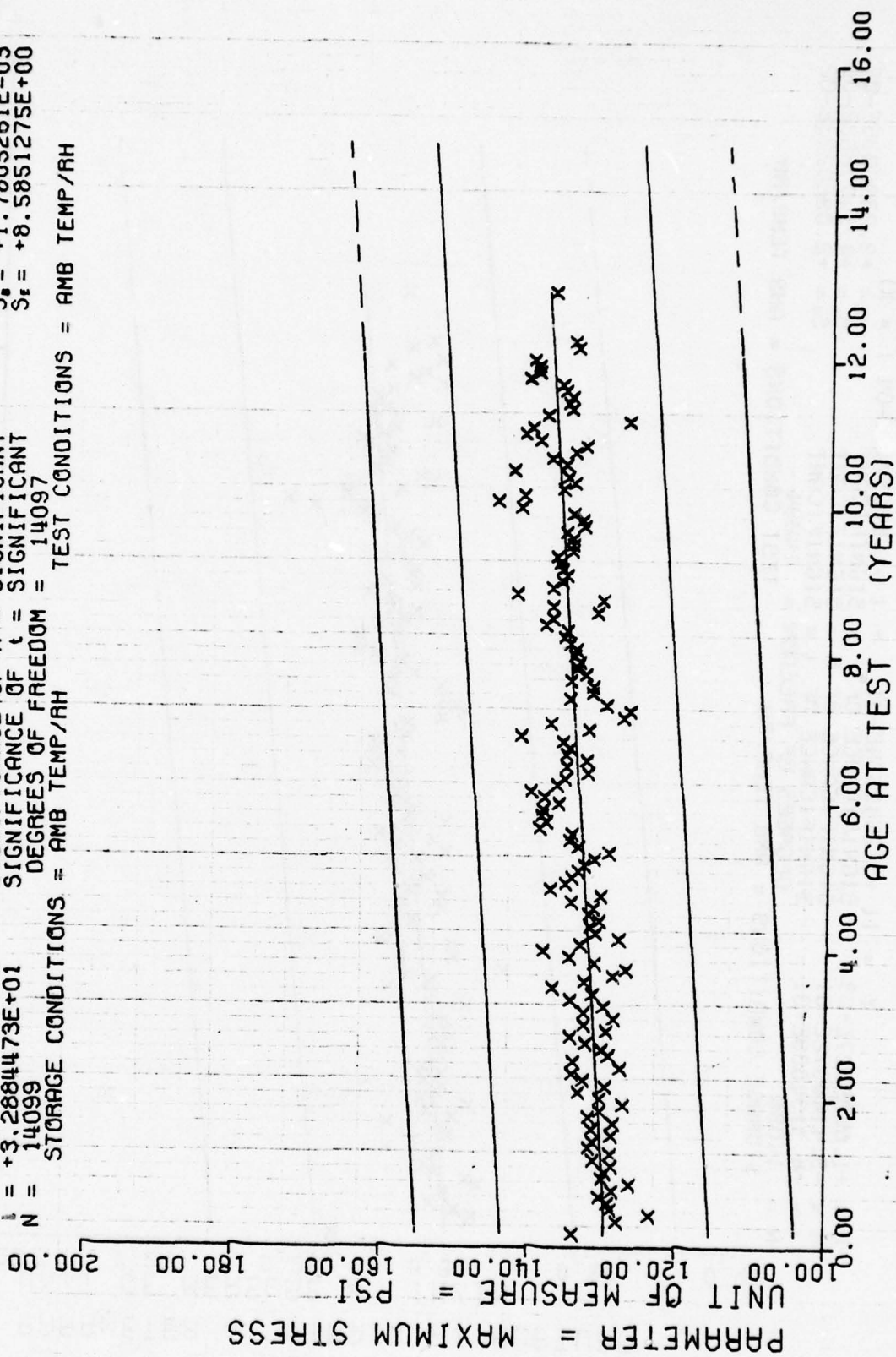
$Y = ((+2.6164230E-01) + (-8.5952002E-05) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF I = SIGNIFICANT
 DEGREES OF FREEDOM = 14097
 N = 14099
 STORAGE CONDITIONS = AMB TEMP/AH
 TEST CONDITIONS = AMB TEMP/AH



WING 6.L.A. TENSILE, STRAIN AT MAX STRESS, CHS=2.0 IN/MIN TP-H1011

Figure 11

$Y = ((+1.2938927E+02) + (+5.8551665E-02) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_t = +8.9080127E+00$
 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +1.7805261E-03$
 SIGNIFICANCE OF χ^2 = SIGNIFICANT $S_t = +8.5851275E+00$
 N = 14099 DEGREES OF FREEDOM = 14097
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

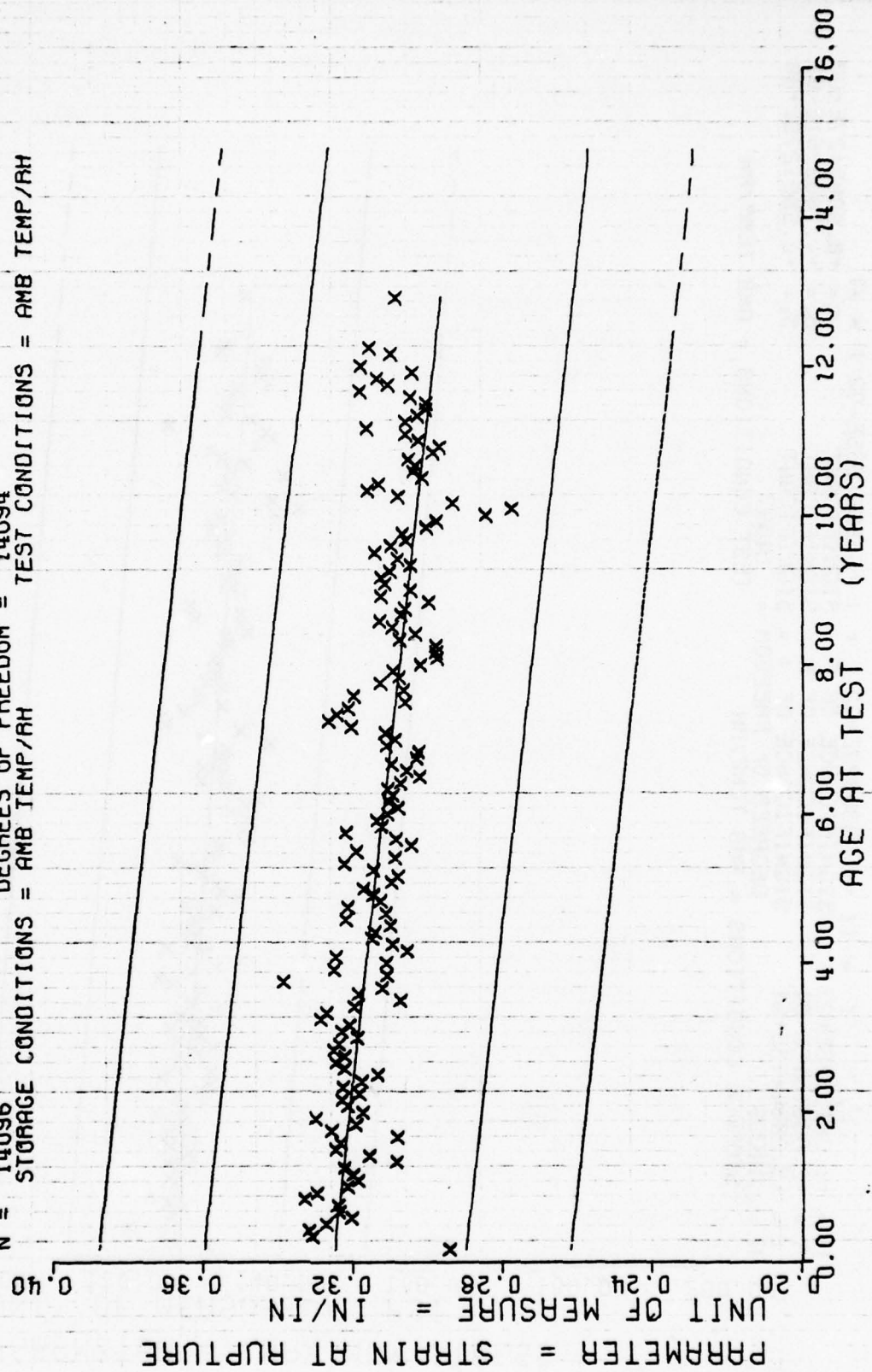


WING 6.L.A. TENSILE, MAXIMUM STRESS, CHS=2.0 IN/MIN TP-H1011

$Y = ((+3.2542534E-01) + (-1.8753745E-04) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 14094
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

$\sigma = +2.2300035E-02$
 $S_b = +4.3477863E-06$
 $S_t = +2.0960223E-02$

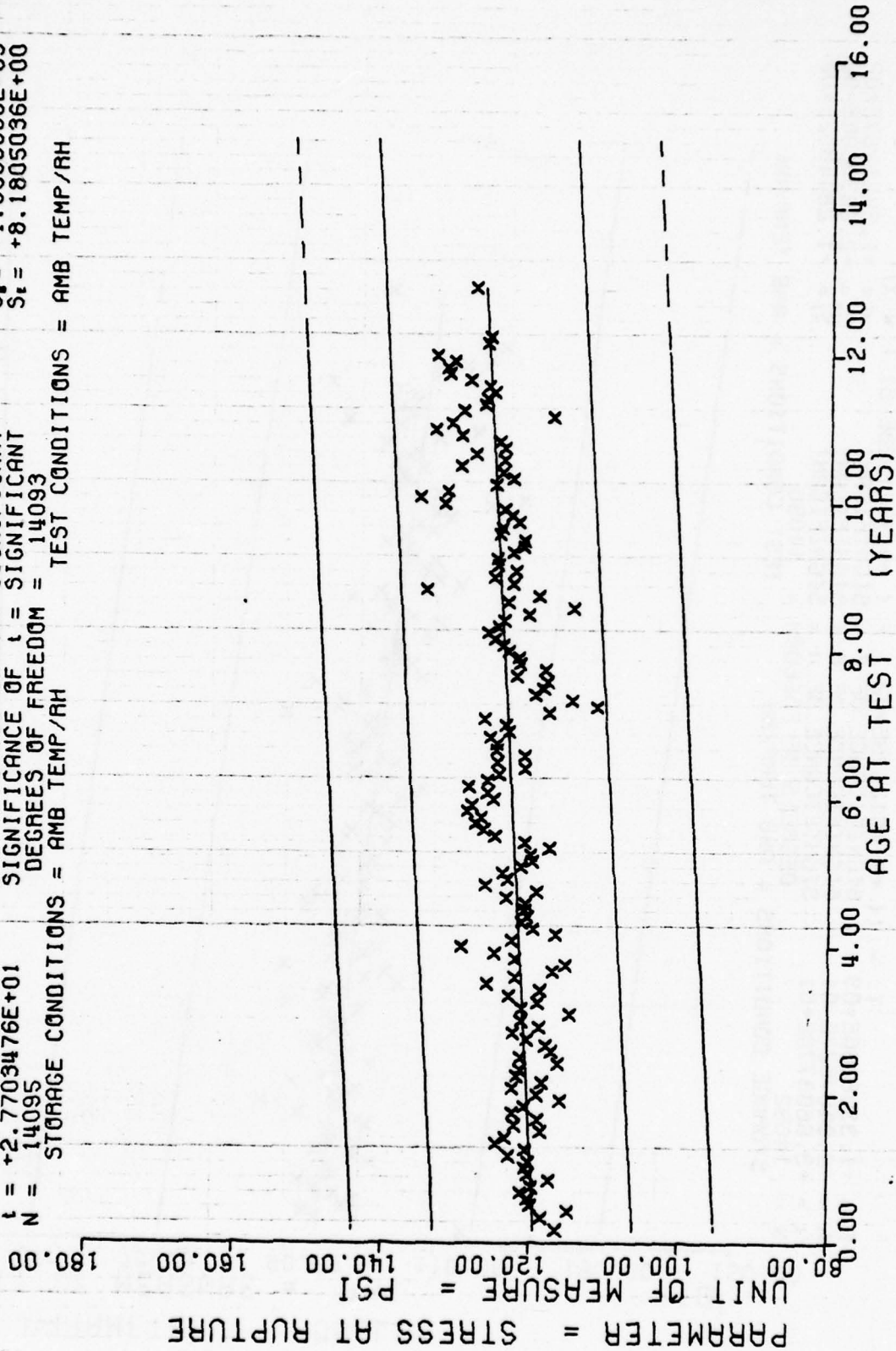
$F = +1.8605427E+03$
 $R = -3.4148972E-01$
 $t = +4.3134008E+01$
 $N = 14096$



WING 6.L.R. TENSILE, STRAIN AT RUPTURE, CHS=2.0 IN/MIN TP-H1011

Figure 13

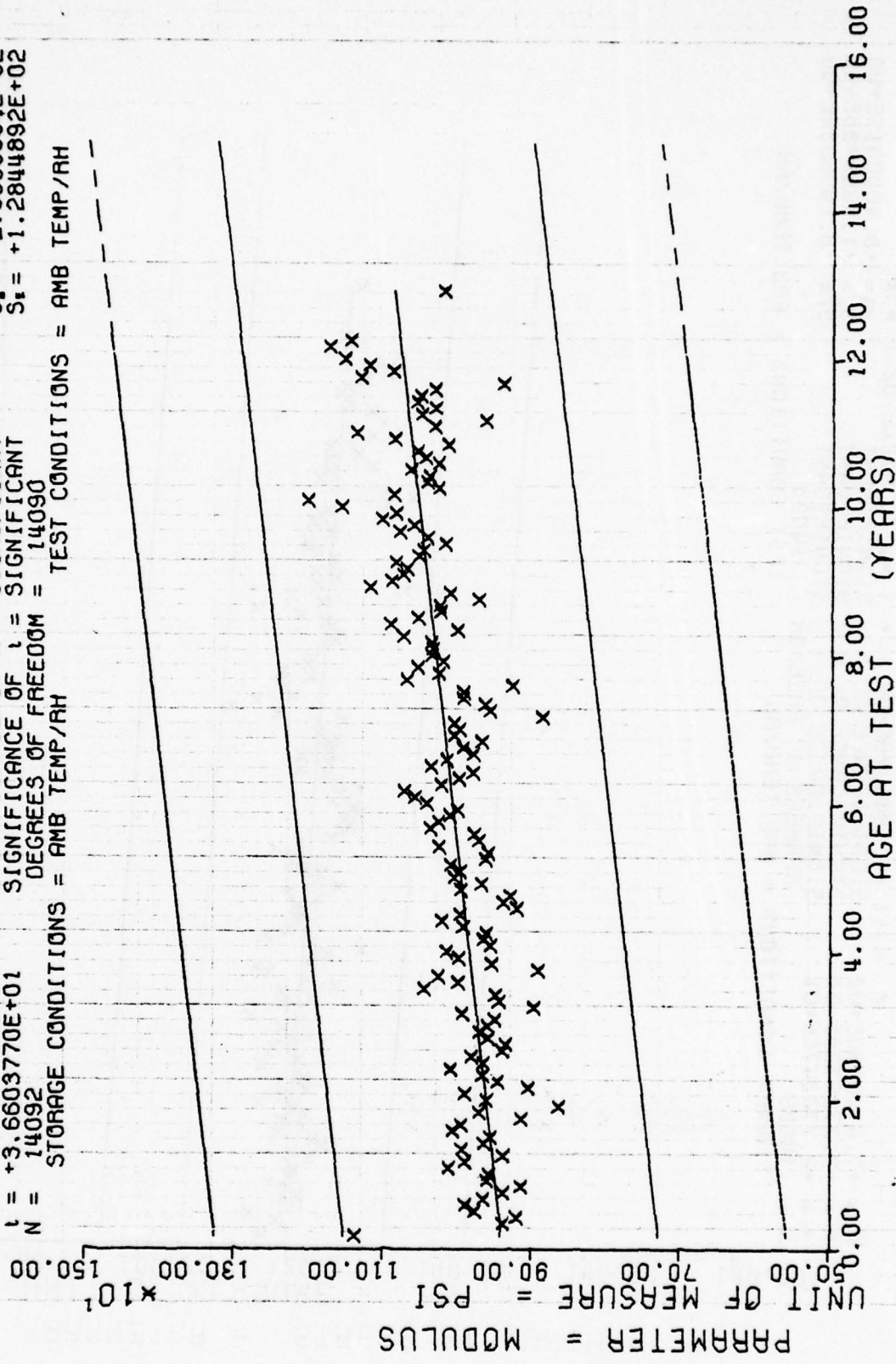
$Y = ((+1.1944078E+02) + (+4.7009721E-02) * X)$
 $F = +7.6748260E+02$ SIGNIFICANCE OF F = SIGNIFICANT $\sigma_T = +8.4000015E+00$
 $R = +2.2725728E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +1.6968888E-03$
 $t = +2.7703476E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_t = +8.1805036E+00$
 $N = 14095$ DEGREES OF FREEDOM = 14093
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6.L.R. TENSILE, STRESS AT RUPTURE, CHS=2.0 IN/MIN TP-H1011

Figure 14

$Y = ((+9.4012679E+02) + (+9.7511328E-01) * X)$
 F = +1.3398360E+03 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +1.3441267E+02$
 R = +2.9467627E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +2.6639694E-02$
 l = +3.6603770E+01 SIGNIFICANCE OF l = SIGNIFICANT $S_t = +1.2844892E+02$
 N = 14092 DEGREES OF FREEDOM = 14090
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6.L.A. TENSILE MODULUS, CHS=2.0 (N/MIN TP-H1011)

Figure 15

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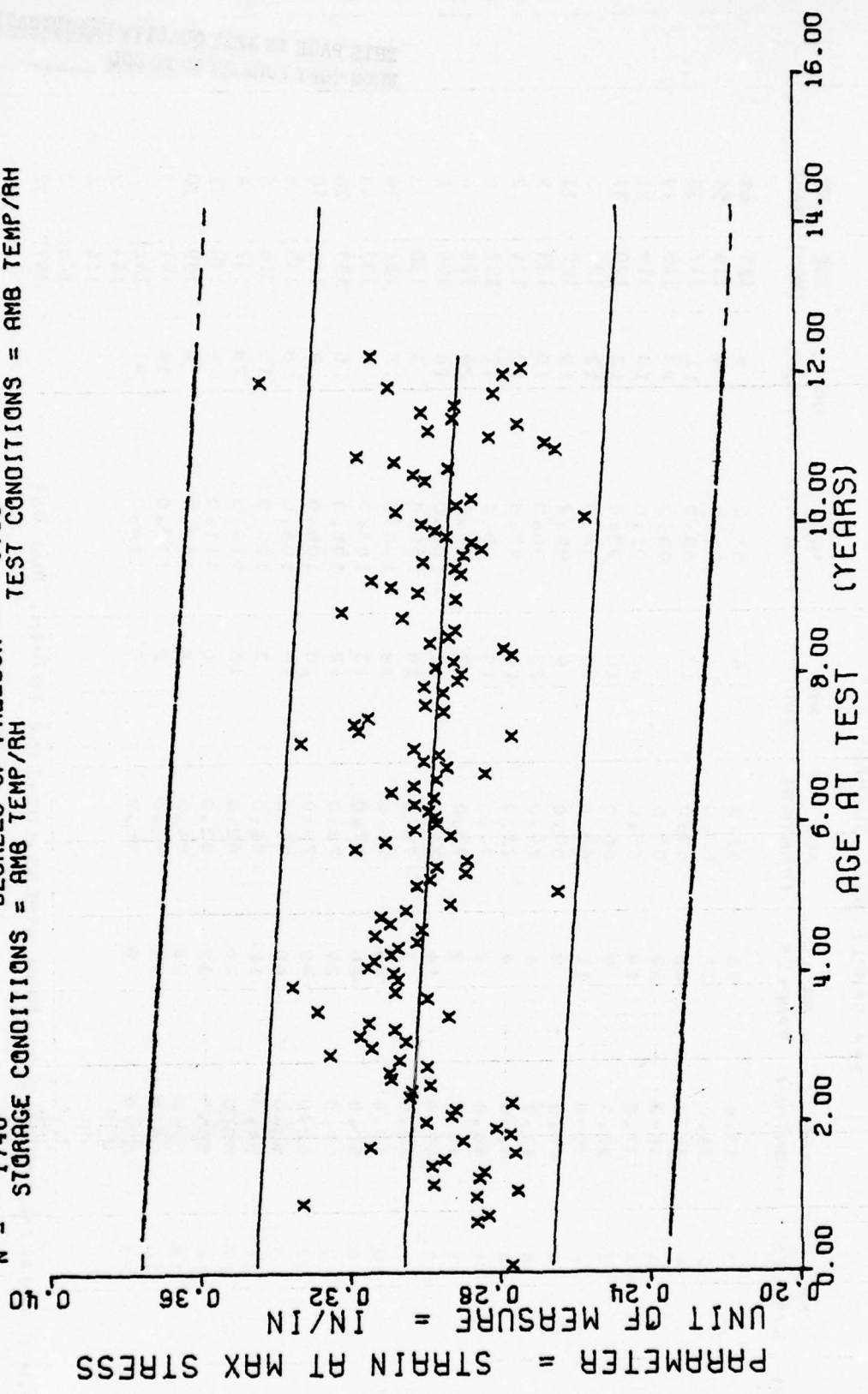
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1,0	2	33,0	23	61,0	4	87,0	8	115	49
8,0	2	34,0	22	62,0	12	88,0	8	116	55
9,0	4	35,0	22	63,0	13	89,0	11	117	38
11,0	4	36,0	20	64,0	20	90,0	13	118	19
12,0	14	37,0	14	65,0	20	91,0	18	119	21
13,0	17	38,0	9	66,0	10	93,0	12	120	37
14,0	6	39,0	11	68,0	10	94,0	12	121	2
15,0	6	40,0	9	69,0	4	95,0	10	122	11
16,0	8	41,0	6	70,0	12	96,0	10	123	9
17,0	4	42,0	4	71,0	14	97,0	17	124	2
18,0	14	45,0	2	72,0	15	98,0	12	127	6
19,0	11	46,0	2	73,0	22	99,0	24	128	4
20,0	20	47,0	14	74,0	22	100,0	16	129	4
21,0	4	48,0	3	75,0	18	101,0	9	130	13
22,0	10	49,0	20	76,0	18	102,0	8	131	14
23,0	6	50,0	16	77,0	13	103,0	4	132	43
24,0	8	51,0	24	78,0	12	105,0	5	133	26
25,0	23	52,0	42	79,0	23	106,0	4	134	10
26,0	13	53,0	40	80,0	12	108,0	8	135	6
27,0	11	54,0	12	81,0	7	109,0	15	136	4
28,0	17	55,0	26	82,0	18	110,0	28	137	8
29,0	14	56,0	12	83,0	6	111,0	8	138	21
30,0	18	57,0	22	84,0	2	112,0	4	139	10
31,0	16	58,0	12	85,0	2	113,0	14	141	3
32,0	23	59,0	5	86,0	3	114,0	41	142	2
								143	2
								144	4
								145	2
								147	2

WING 6.H.R., TRIAXIAL TENSILE, MAXIMUM STRESS, CHS=1750 IN/MIN., 800 PSI

This sample size summary is applicable to figures 16 thru 20

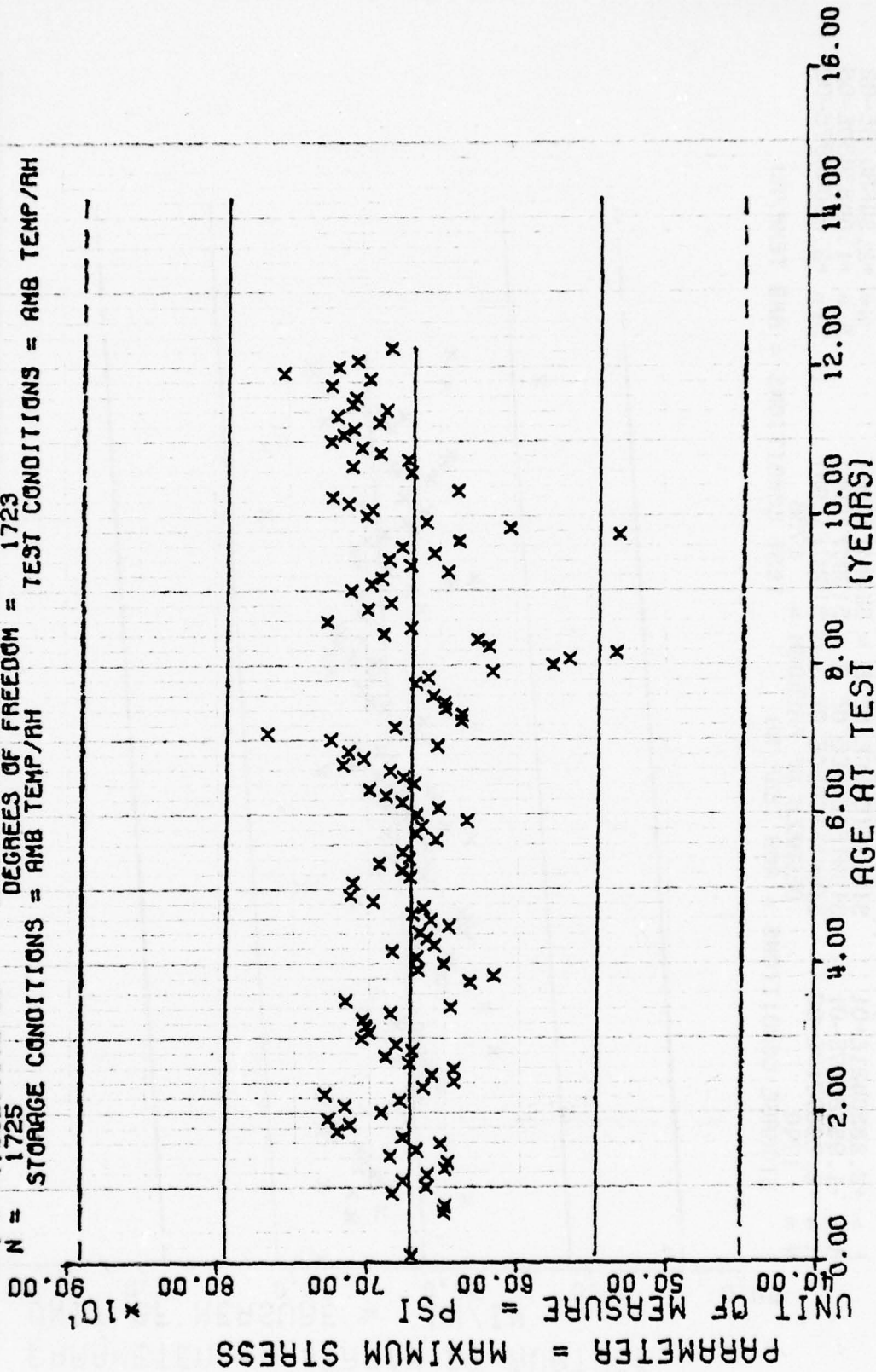
$Y = ((+3.0607156E-01) + (-1.1658622E-04) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF I = SIGNIFICANT
 DEGREES OF FREEDOM = 1738
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
 $F = +6.1265217E+01$
 $R = -1.8452677E-01$
 $I = +7.8272100E+00$
 $N = 1740$
 $\sigma = +2.3757475E-02$
 $S_s = +1.4894990E-05$
 $S_r = +2.3356216E-02$



WING 6, H. A. TRIAXIAL TENSILE STRAIN AT MAX STRESS, CHS=1750 IN/MIN, 800 PSI

$Y = ((+6.7155045E+02) + (-6.2355015E-02) * X)$
 F = +1.7755990E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT S_F = +7.3915402E+01
 R = -3.2065303E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_R = +4.6794944E-02
 L = +1.3325160E+00 SIGNIFICANCE OF L = NOT SIGNIFICANT S_L = +7.3298915E+01
 N = 1725 DEGREES OF FREEDOM = 1723

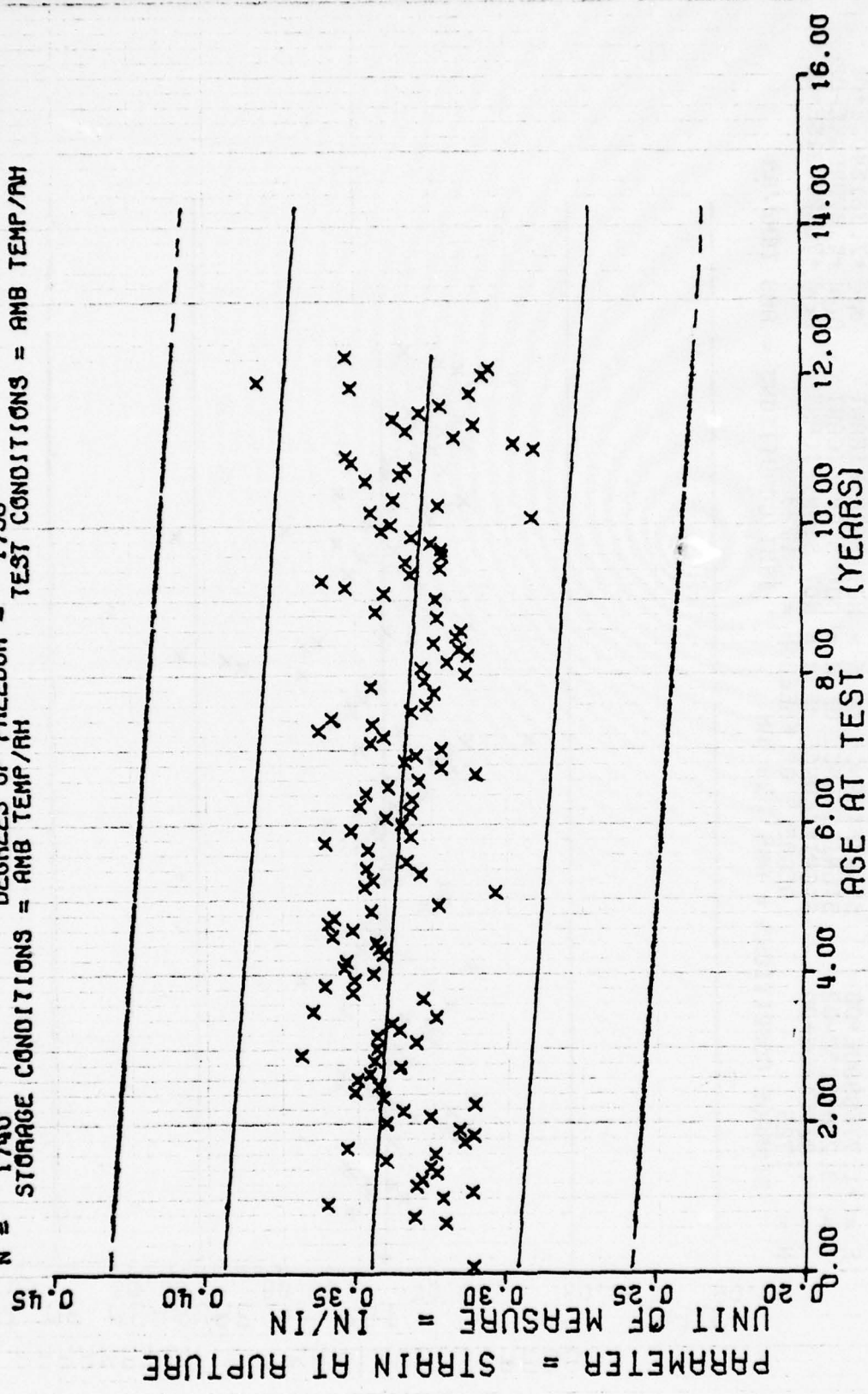
STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6, H.R. TRIAXIAL TENSILE, MAXIMUM STRESS, CHS=1750 IN/MIN, 800 PSI

Figure 17

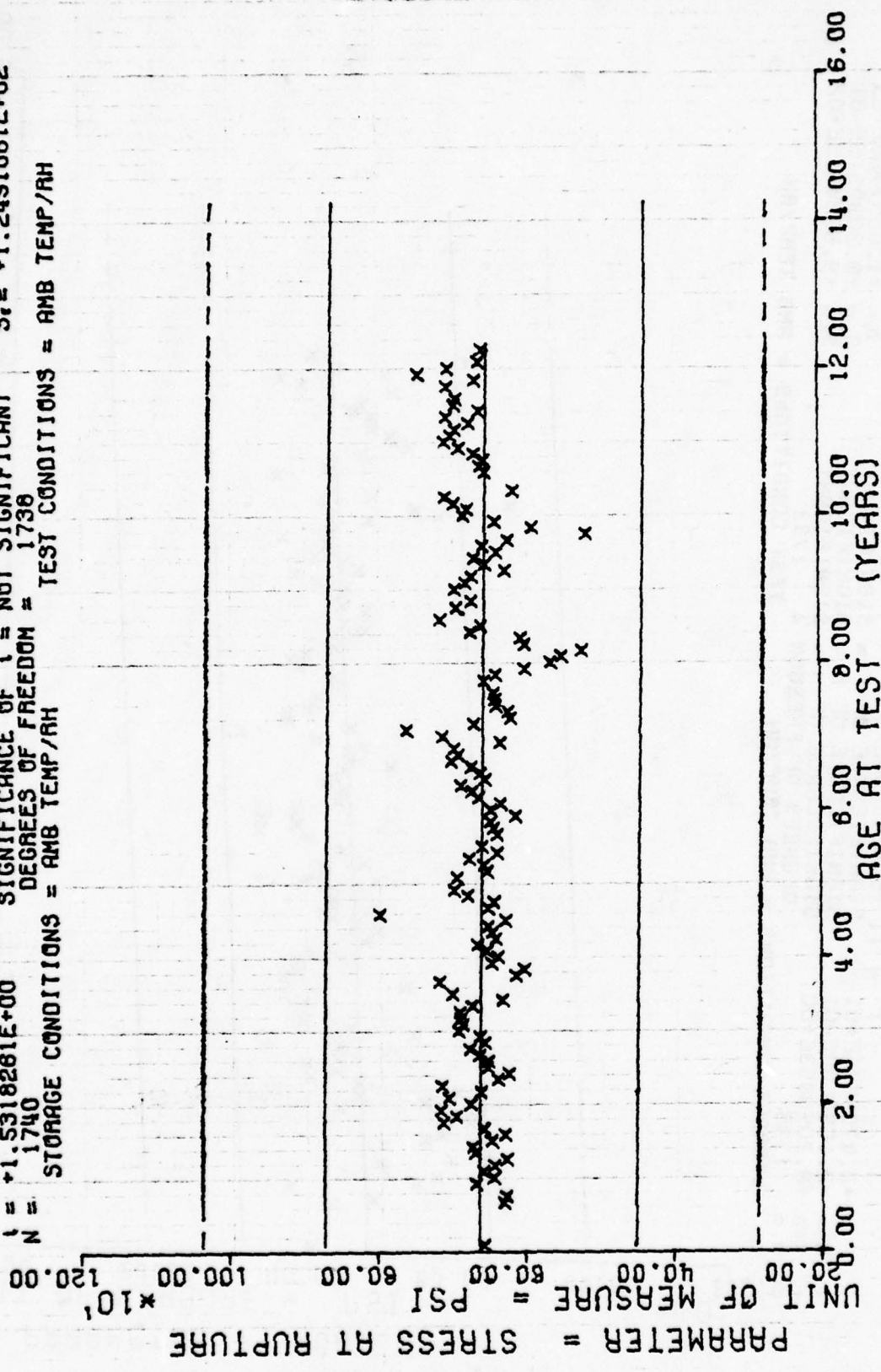
$Y = ((+3.4493304E-01) + (-1.5293796E-04) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 $G = +2.9463079E-02$
 $A = -1.9518647E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $S_1 = +1.8433430E-05$ SIGNIFICANCE OF I = SIGNIFICANT
 $S_2 = +2.8904697E-02$
 $N = 1740$ DEGREES OF FREEDOM = 1738
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



WING 6.H.A. TRIAXIAL TENSILE, STRAIN AT RUPTURE, CHS=1750 IN/MIN, 800 PSI

Figure 18

$Y = ((+6.6331260E+02) + (-1.2202437E-01) * X)$
 $F = +2.3464914E+00$ SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_f = +1.2495896E+02$
 $R = -3.6719065E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_o = +7.9658413E-02$
 $t = +1.5318281E+00$ SIGNIFICANCE OF t = NOT SIGNIFICANT $S_t = +1.2491061E+02$
 $N = 1740$ DEGREES OF FREEDOM = 1738
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

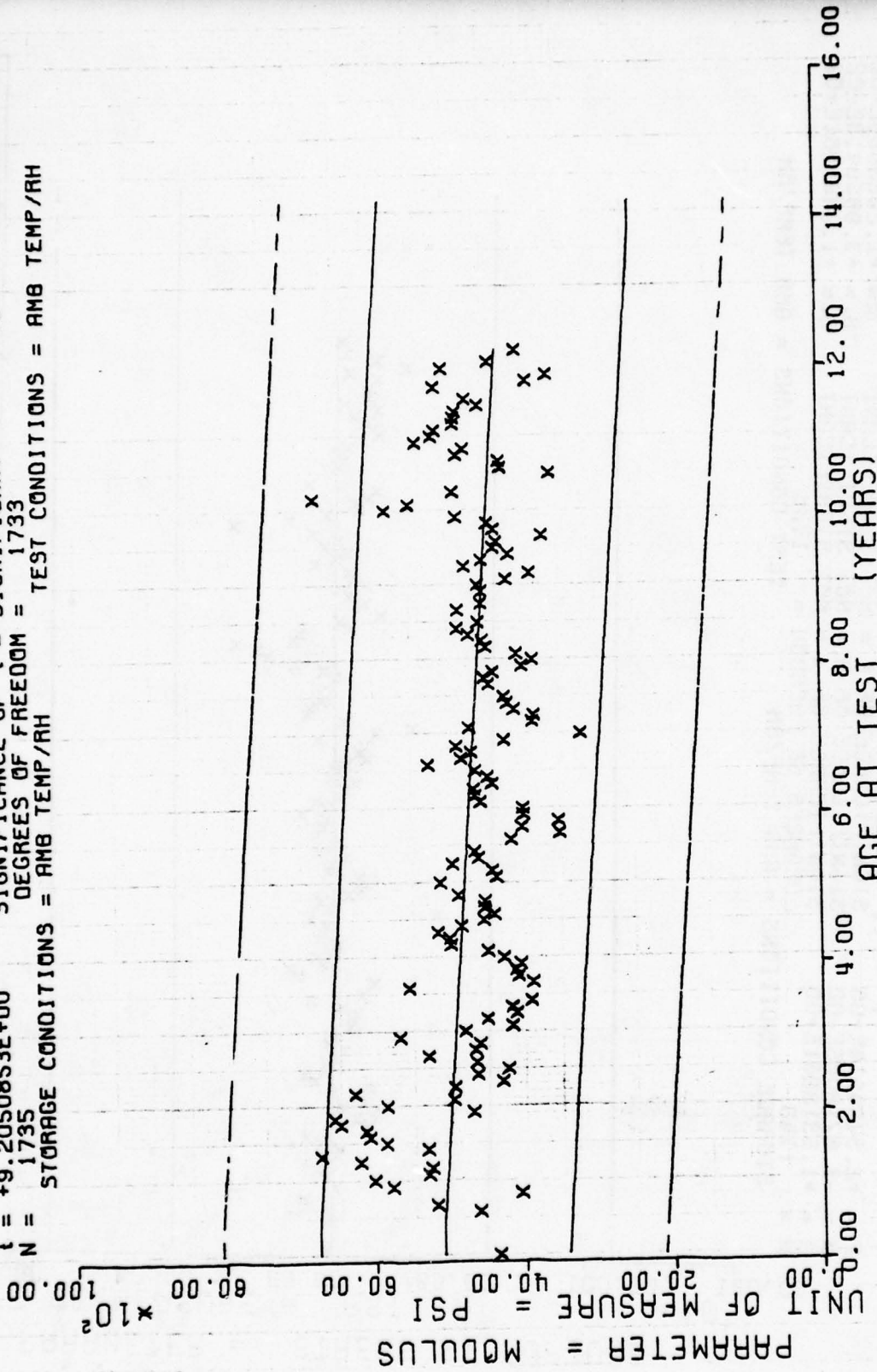


WING 6, H.A. TRIAXIAL TENSILE STRESS AT RUPTURE, CHS=1750 IN/MIN, 800 PSI

Figure 19

$Y = ((+5.1243258E+03) + (-5.8019942E+00) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 1733
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = AMB TEMP/RH

F = +8.4733595E+01
 R = -2.1590500E-01
 t = +9.2050853E+00
 N = 1735



WING 6, H.R. TRIAXIAL TENSILE, MODULUS, CHS=1750 IN/MIN AT 800 PSI

Figure 20

*** SAMPLE SIZE SUMMARY ***

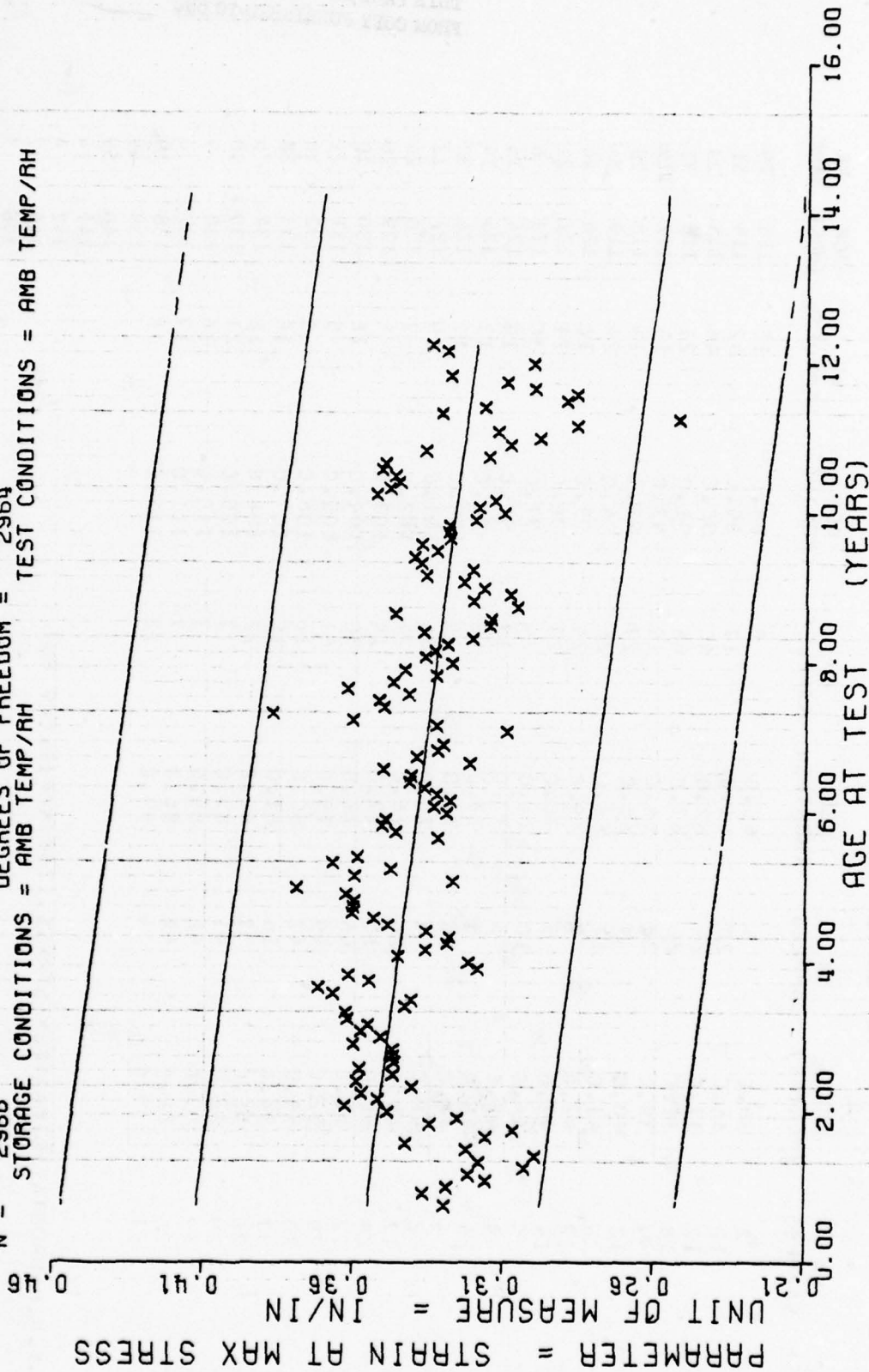
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
9.C	2	35.C	5	60.0	8	88.C	15	113	79
11.C	12	36.C	20	61.C	17	89.C	42	114	51
12.C	12	37.C	24	62.0	40	90.C	46	115	23
13.C	18	38.C	22	63.C	84	91.0	21	116	32
14.C	4	39.C	20	64.C	15	92.C	14	117	114
15.C	12	40.0	9	65.0	27	93.C	24	118	29
16.C	8	41.0	17	68.0	26	94.0	24	119	34
17.C	12	42.0	7	69.C	29	95.C	16	120	44
18.C	14	43.0	5	70.C	27	96.C	21	121	21
19.C	4	44.0	10	71.0	24	97.0	30	123	6
20.C	4	45.C	5	72.C	17	98.C	19	124	15
21.C	24	46.0	5	73.0	48	99.C	13	125	14
22.C	4	47.C	10	74.0	44	100.C	12	126	32
23.C	2	48.C	4	75.0	36	101.0	19	127	12
24.0	17	49.0	24	76.C	27	102.C	7	128	24
25.C	24	50.0	15	77.0	19	103.C	5	129	26
26.C	12	51.C	46	78.C	30	104.0	16	130	10
27.C	29	52.C	84	79.0	61	105.0	5	131	21
28.C	20	53.0	47	80.0	16	106.C	5	132	26
29.C	37	54.0	16	81.0	10	107.C	10	133	28
30.C	28	55.C	37	82.C	22	108.C	10	134	6
31.C	29	56.0	41	83.C	17	109.C	21	135	30
32.C	42	57.C	48	85.0	7	110.C	36	136	9
33.C	25	58.C	40	86.0	7	111.C	17	137	6
34.0	21	59.C	4	87.0	23	112.C	8	138	19
								139	49
								140	59
								141	4
								142	4
								144	2
								146	7
								147	2

WING 6.F.P. HYDROSTATIC, MAXIMUM STRESS, 1750 IN/IN, 800 PSI

This sample size summary is applicable to figures 21 thru 25

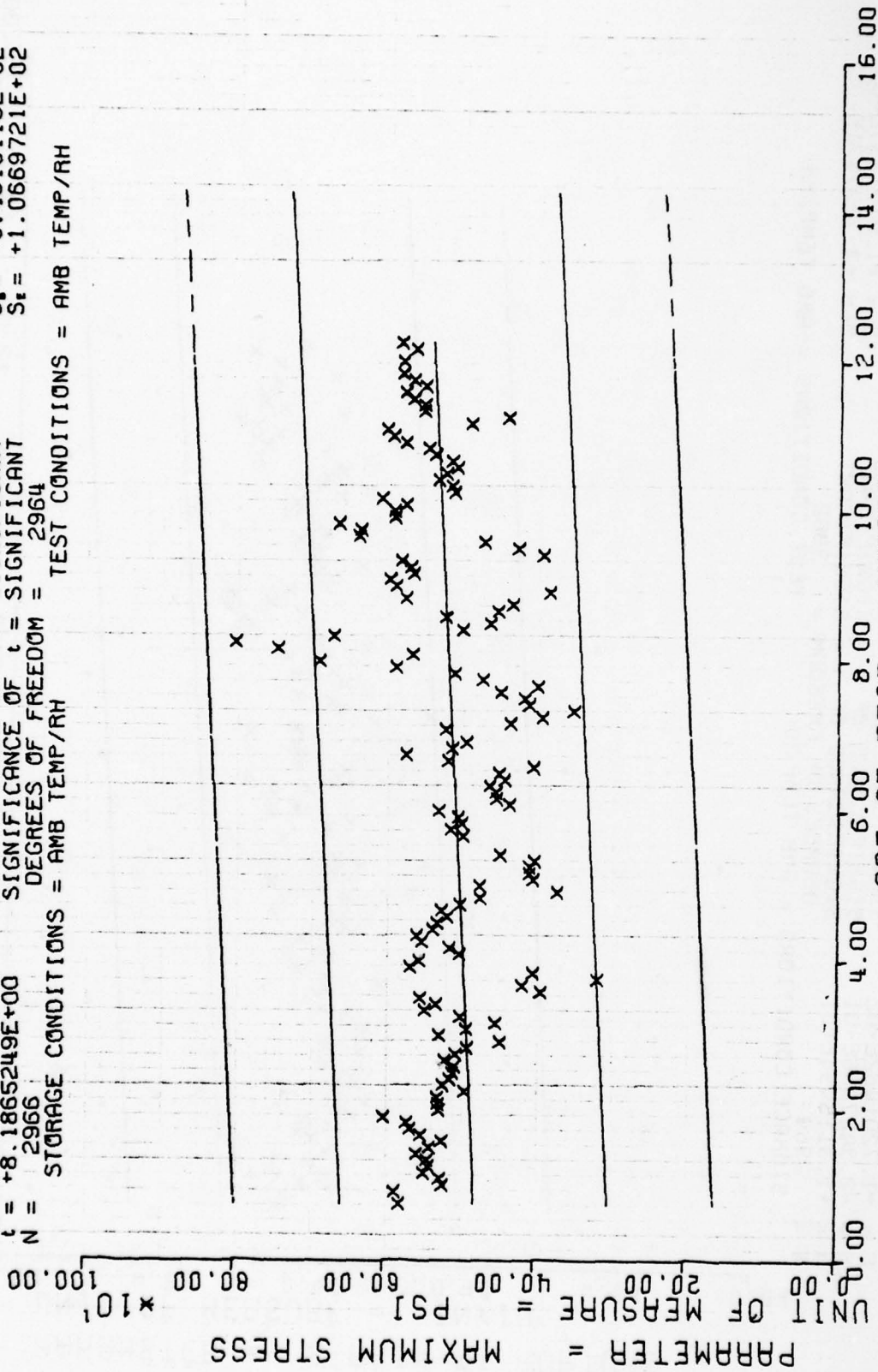
$Y = ((+3.5740130E-01) + (-2.5926457E-04) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2964
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

F = +2.1989147E+02
 R = -2.6279982E-01
 t = +1.4828738E+01
 N = 2966



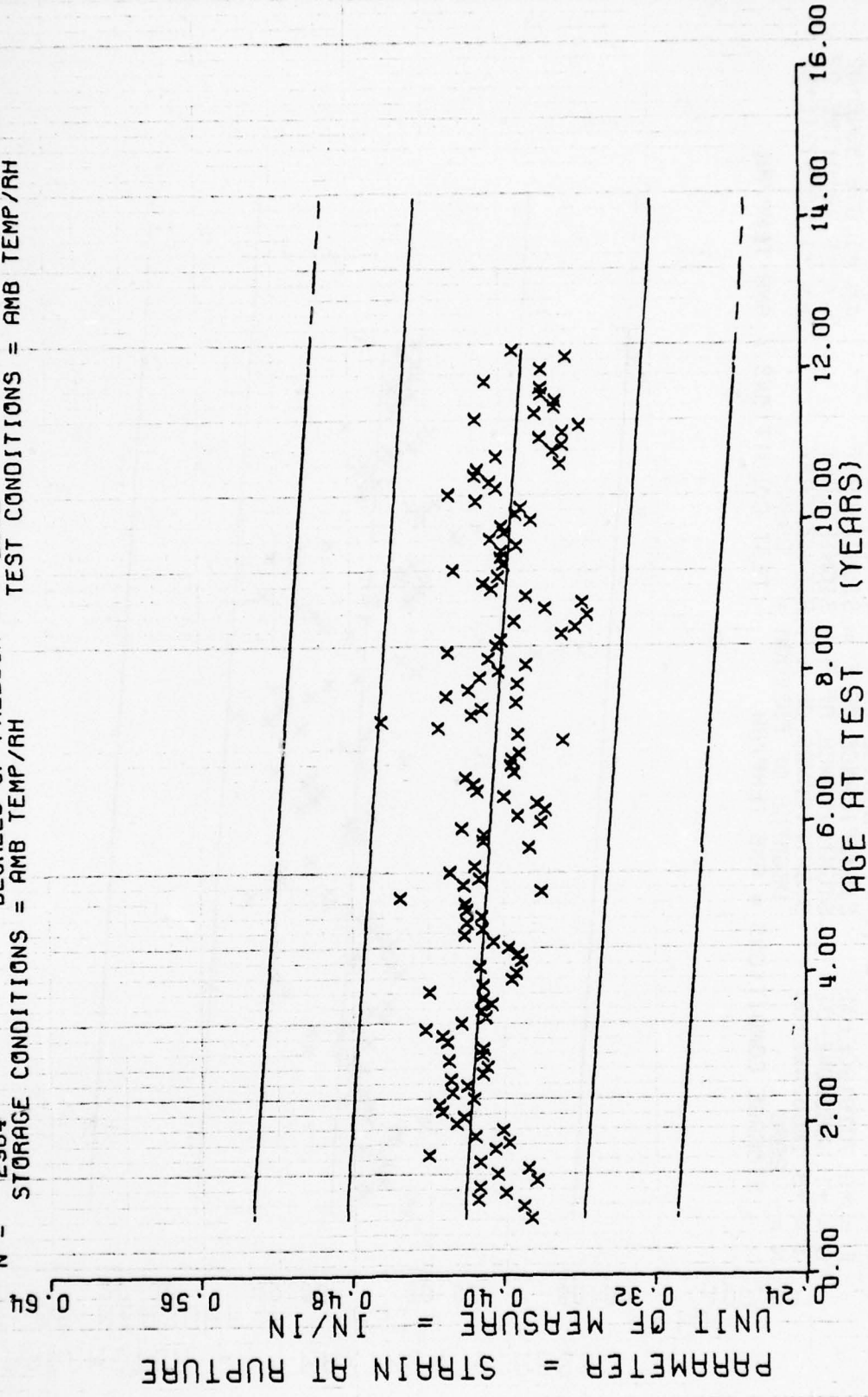
WING 6, H. R. HYDROSTATIC, STRAIN AT MAX STRESS, 1750 IN/MIN, 800 PSI

$Y = ((+4.7665513E+02) + (+4.4870440E-01) * X)$
 $F = +6.7019190E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +1.4869804E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +8.1865249E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 2966$ DEGREES OF FREEDOM = 2964
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



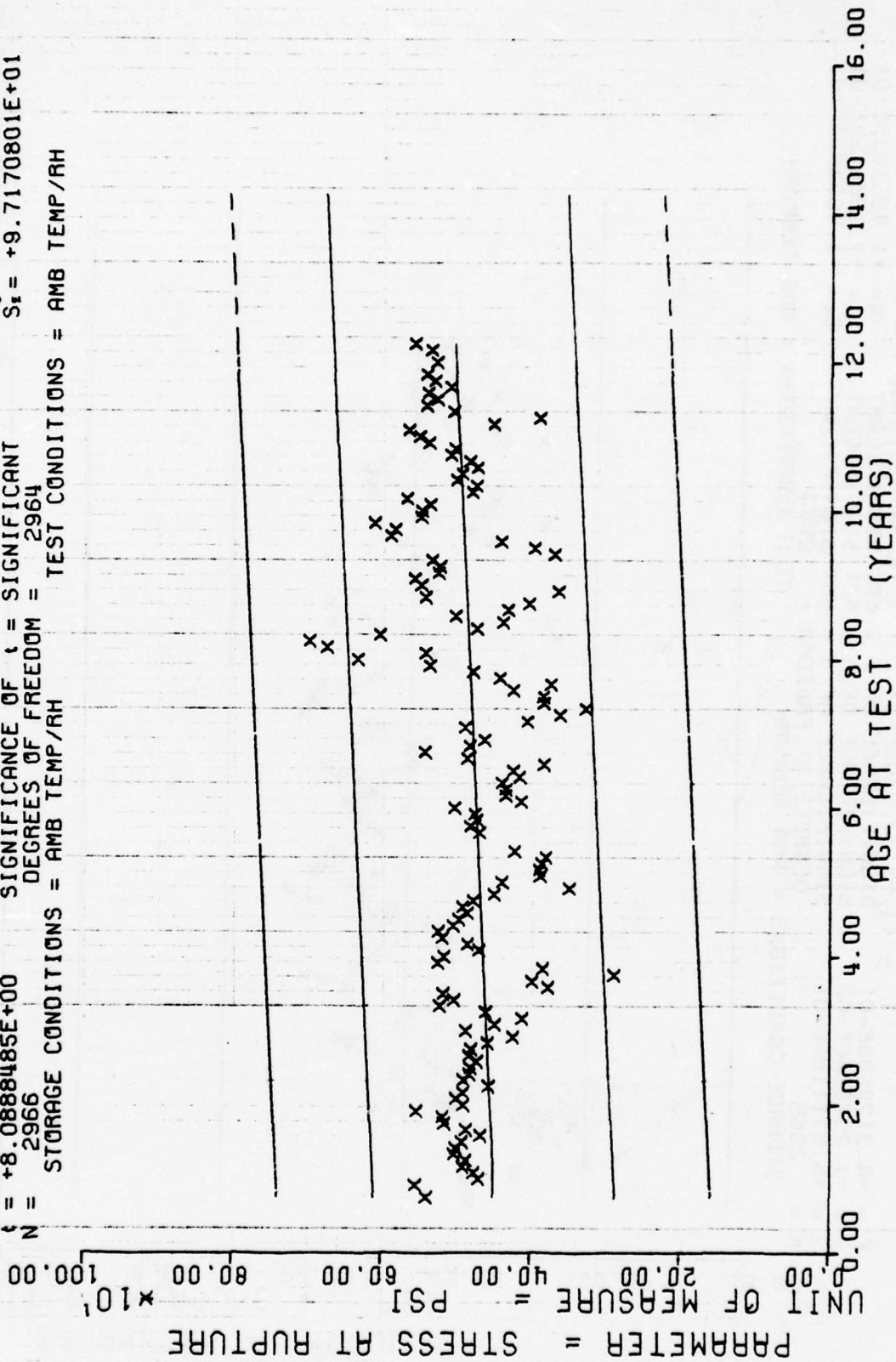
WING 6, H. R. HYDROSTATIC, MAXIMUM STRESS, 1750IN/MIN, 800 PSI

$Y = ((+4.2318840E-01) + (-2.5144041E-04) * X)$
 F = +1.7201462E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = -2.3427836E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +1.3115434E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2964 DEGREES OF FREEDOM = 2962
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



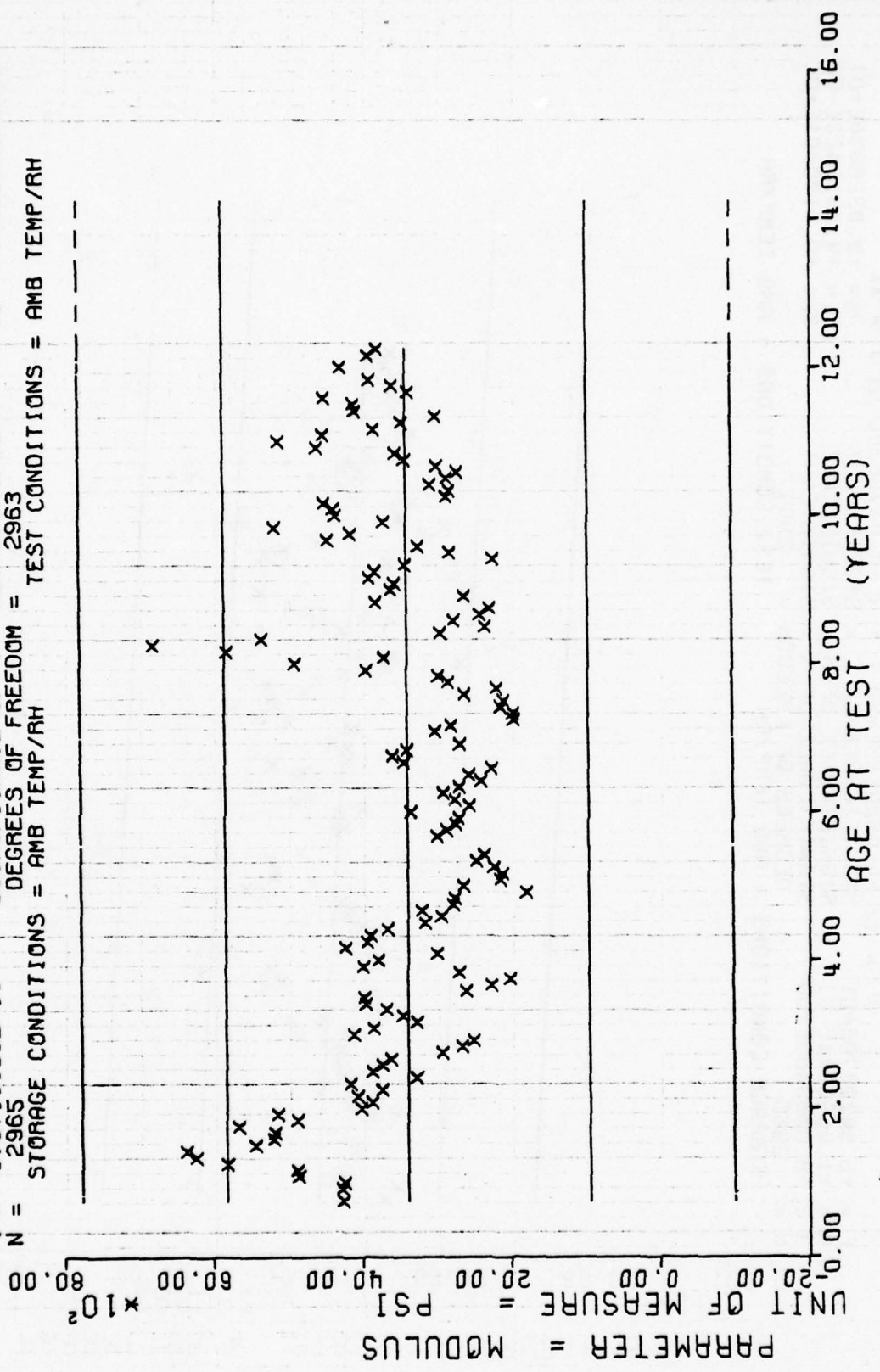
WING 6, H. R. HYDROSTATIC, STRAIN AT RUPTURE, 1750IN/MIN, 800 PSI

$Y = ((+4.4582183E+02) + (+4.0376638E-01) * X)$
 F = +6.5429470E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.4696241E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +8.0888485E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2966 DEGREES OF FREEDOM = 2964
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6, H. R. HYDROSTATIC, STRESS AT RUPTURE, 1750 IN/MIN, 800 PSI

$Y = ((+3.3774306E+03) + (+4.9470137E-01) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 2963
 N = 2965
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = AMB TEMP/RH



WING 6, H. A. HYDROSTATIC MODULUS, 1750 IN/MIN, 800 PSI

Figure 25

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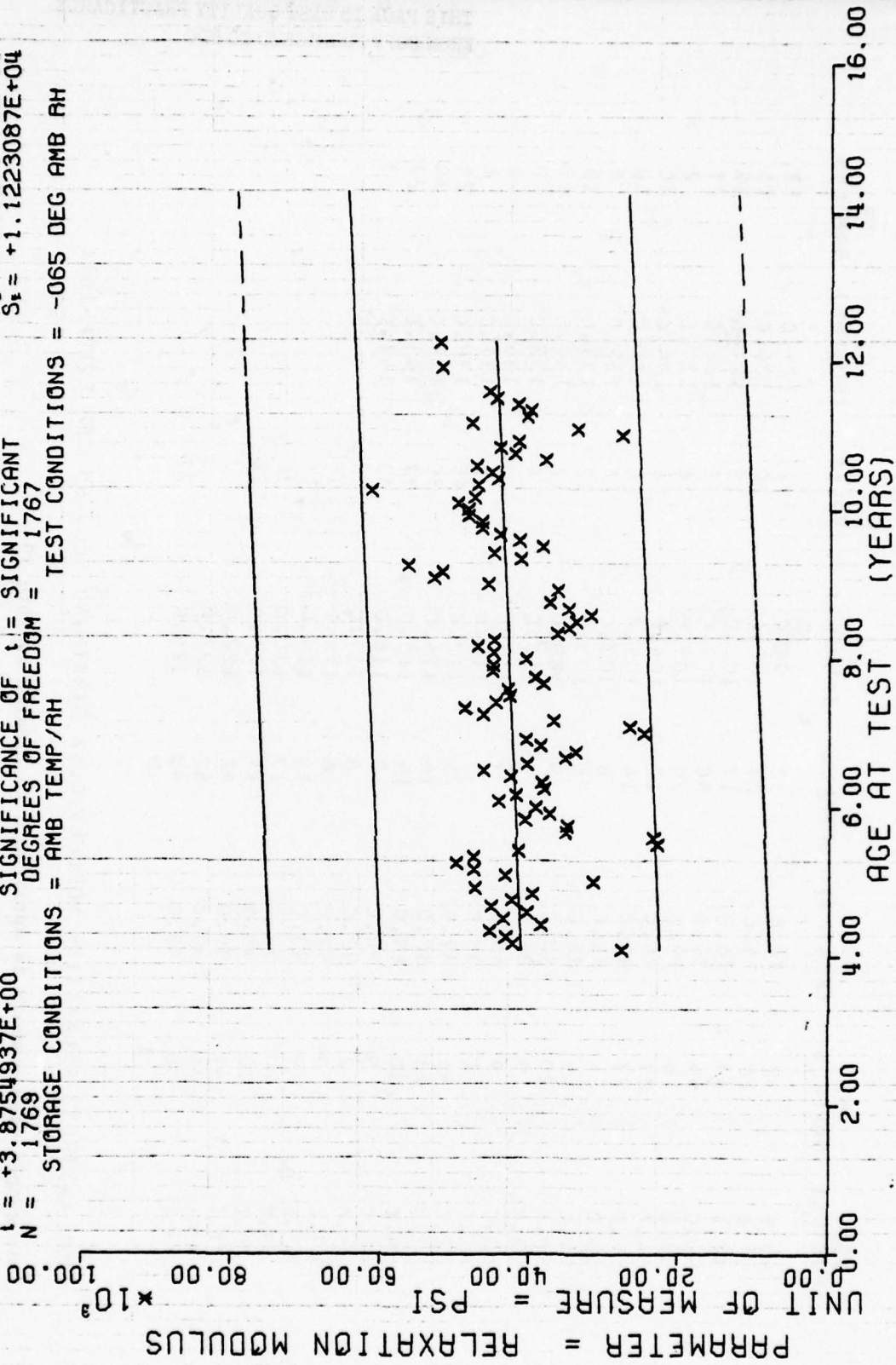
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	2	74.0	32	99.0	32	125.0	17
50.0	26	75.0	23	100.0	20	126.0	18
51.0	49	76.0	17	101.0	18	127.0	12
52.0	46	77.0	40	102.0	5	128.0	21
53.0	18	78.0	25	103.0	6	129.0	2
54.0	27	79.0	12	104.0	6	130.0	30
55.0	27	80.0	14	105.0	6	131.0	30
56.0	21	81.0	8	107.0	6	132.0	8
57.0	24	82.0	26	108.0	12	133.0	12
58.0	20	83.0	9	109.0	12	134.0	19
59.0	9	84.0	5	110.0	6	135.0	9
60.0	9	85.0	6	111.0	3	136.0	2
61.0	21	86.0	3	112.0	8	137.0	6
62.0	46	87.0	21	113.0	45	138.0	28
63.0	23	88.0	16	114.0	30	139.0	39
64.0	30	89.0	15	115.0	37	140.0	27
65.0	9	90.0	12	116.0	33	141.0	3
66.0	2	91.0	8	117.0	27	147.0	
67.0	9	92.0	6	118.0	15		
68.0	9	93.0	19	119.0	19		
69.0	20	94.0	17	120.0	30		
70.0	30	95.0	17	121.0	18		
71.0	41	96.0	42	122.0	3		
72.0	30	97.0	42	123.0	3		
73.0	39	98.0	43	124.0	21		

WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC., -65 DEG F, TPT-1011

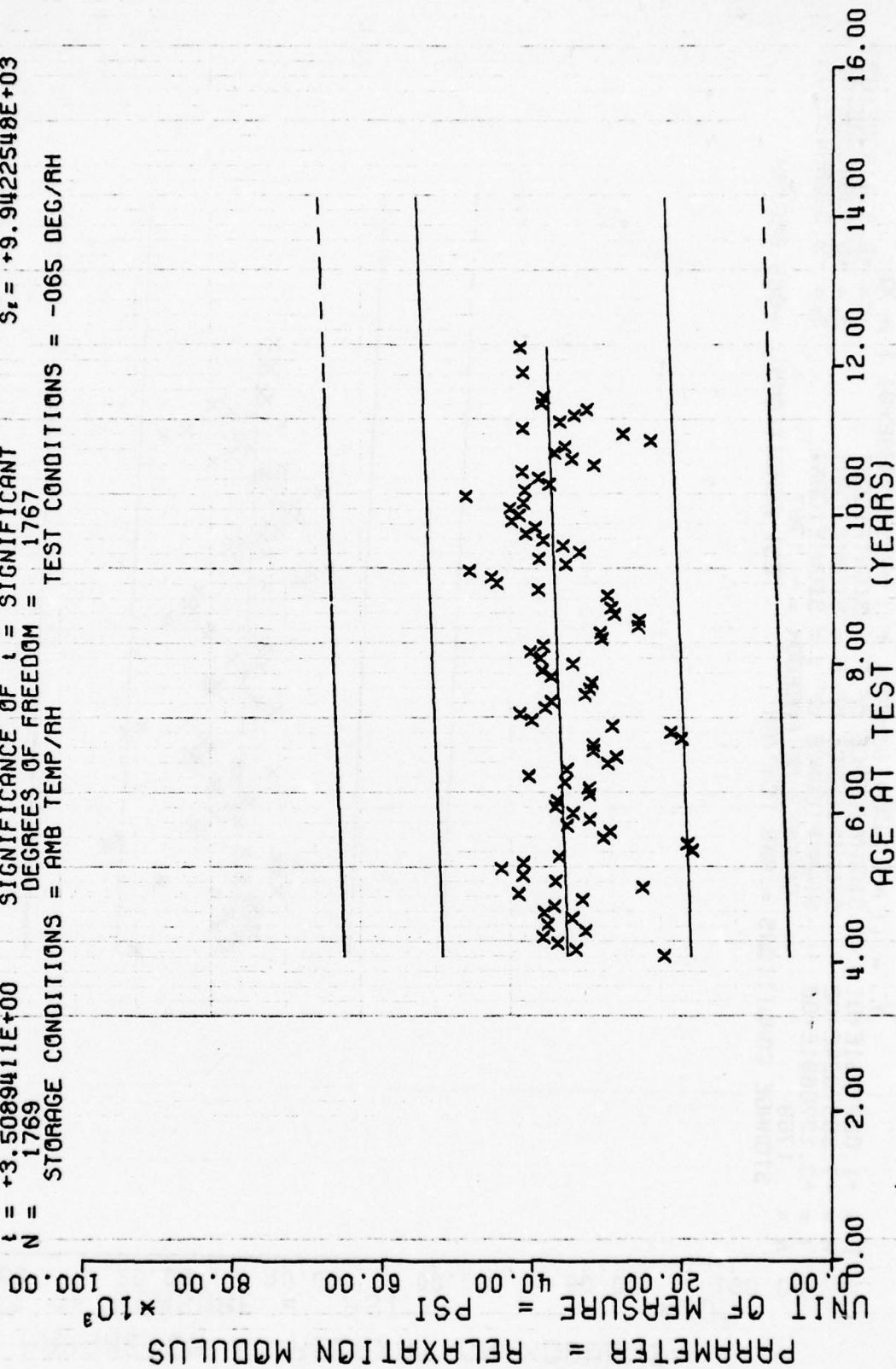
This sample size summary is applicable to figures 26 thru 29

$Y = ((+3.9606025E+04) + (+3.7481129E+01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 1767
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = -065 DEG AMB RH
 $\sigma_1 = +1.1267496E+04$
 $S_1 = +9.6713173E+00$
 $S_2 = +1.1223087E+04$



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC, -65 DEG F, TPH-1011

$Y = ((+3.3953446E+04) + (+3.0063135E+01) * X)$
 F = +1.2312667E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +8.3185943E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +3.5089411E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1769 DEGREES OF FREEDOM = 1767
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH



WING 6 STRESS RELAXATION MODULUS, 0.5% STRAIN, 50 SEC, -65 DEG F, TPH-1011

$Y = ((+3.1497468E+04) + (+2.5703969E+01) * X)$
 F = +1.0221251E+01 SIGNIFICANCE OF F = SIGNIFICANT $\alpha = +9.3541532E+03$
 R = +7.5837024E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_b = +8.0398539E+00$
 t = +3.1970691E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +9.3298542E+03$
 N = 1769 DEGREES OF FREEDOM = 1767
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH

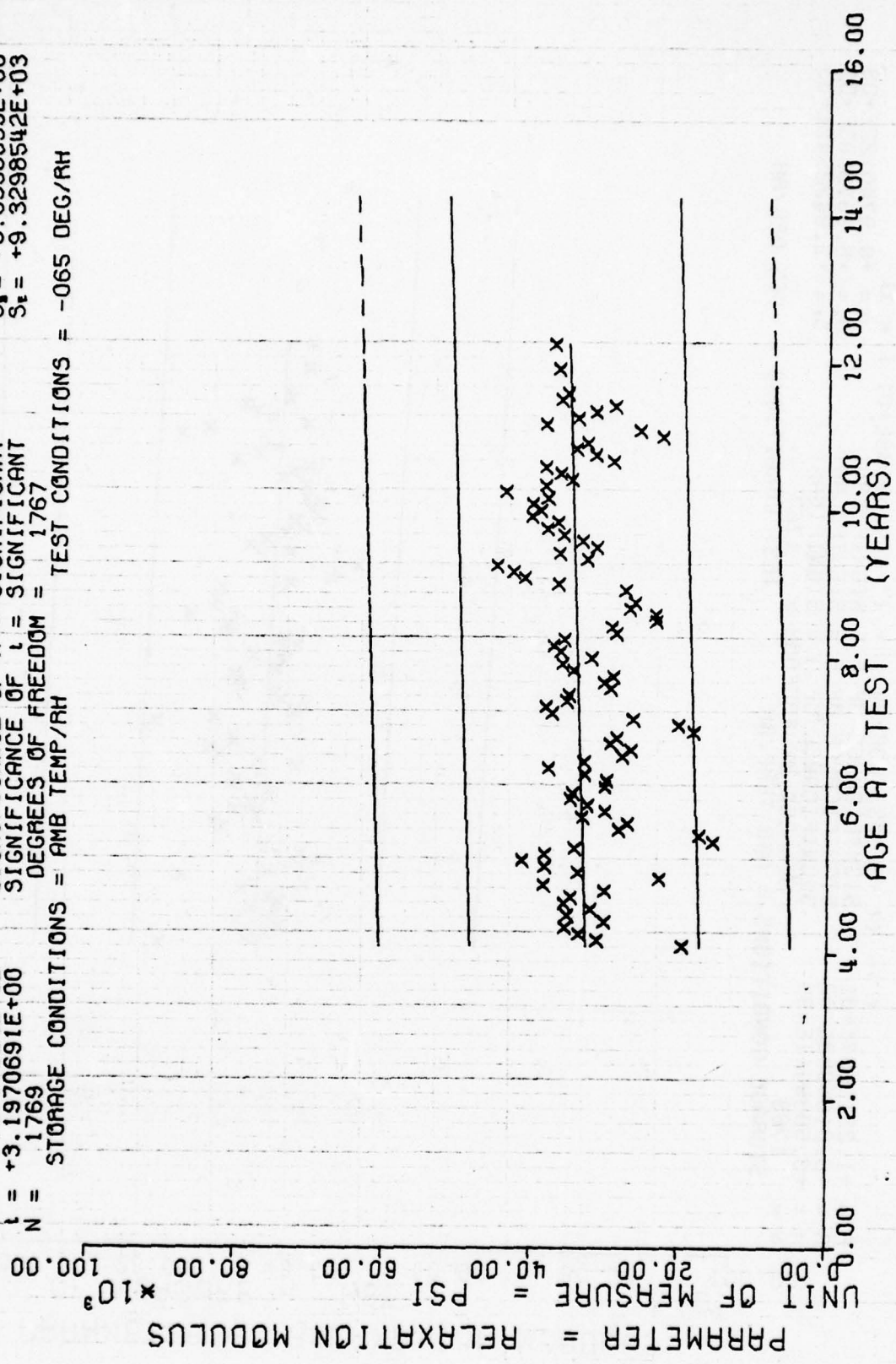
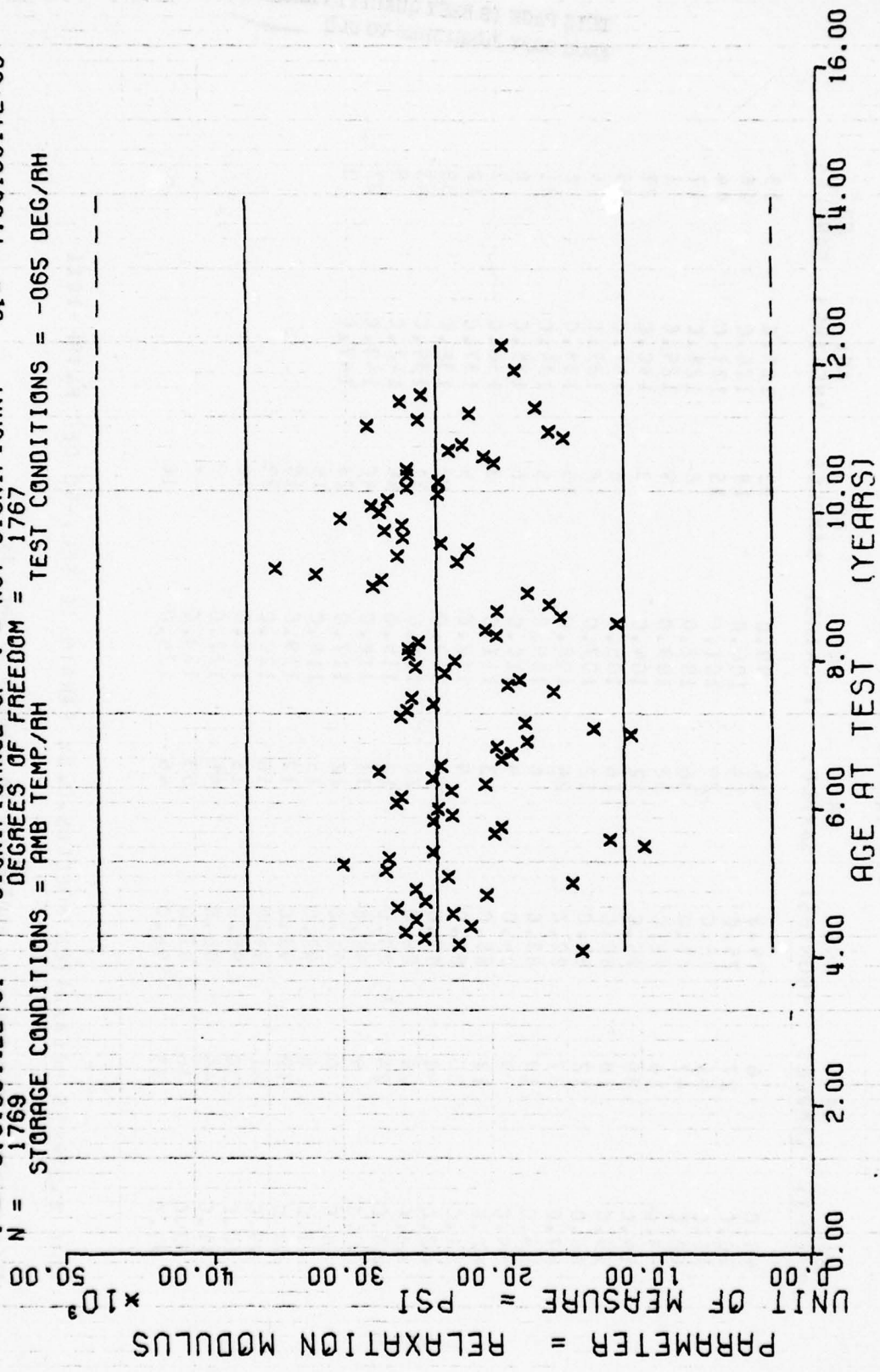


FIG 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 100 SEC, -65 DEG F, TPH-1011

F = +1.2343587E-01
 R = +8.3577093E-03
 I = +3.5133442E-01
 N = 1769
 STORAGE CONDITIONS = AMB TEMP/AH
 TEST CONDITIONS = -065 DEG/AH
 $Y = ((+2.5172696E+04) + (+2.2863689E+00) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF I = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 1767
 $\sigma_y = +7.5499594E+03$
 $S_e = +6.5076712E+00$
 $S_e = +7.5518317E+03$



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 1000 SEC, -65 DEG F, TPH-1011

Figure 29

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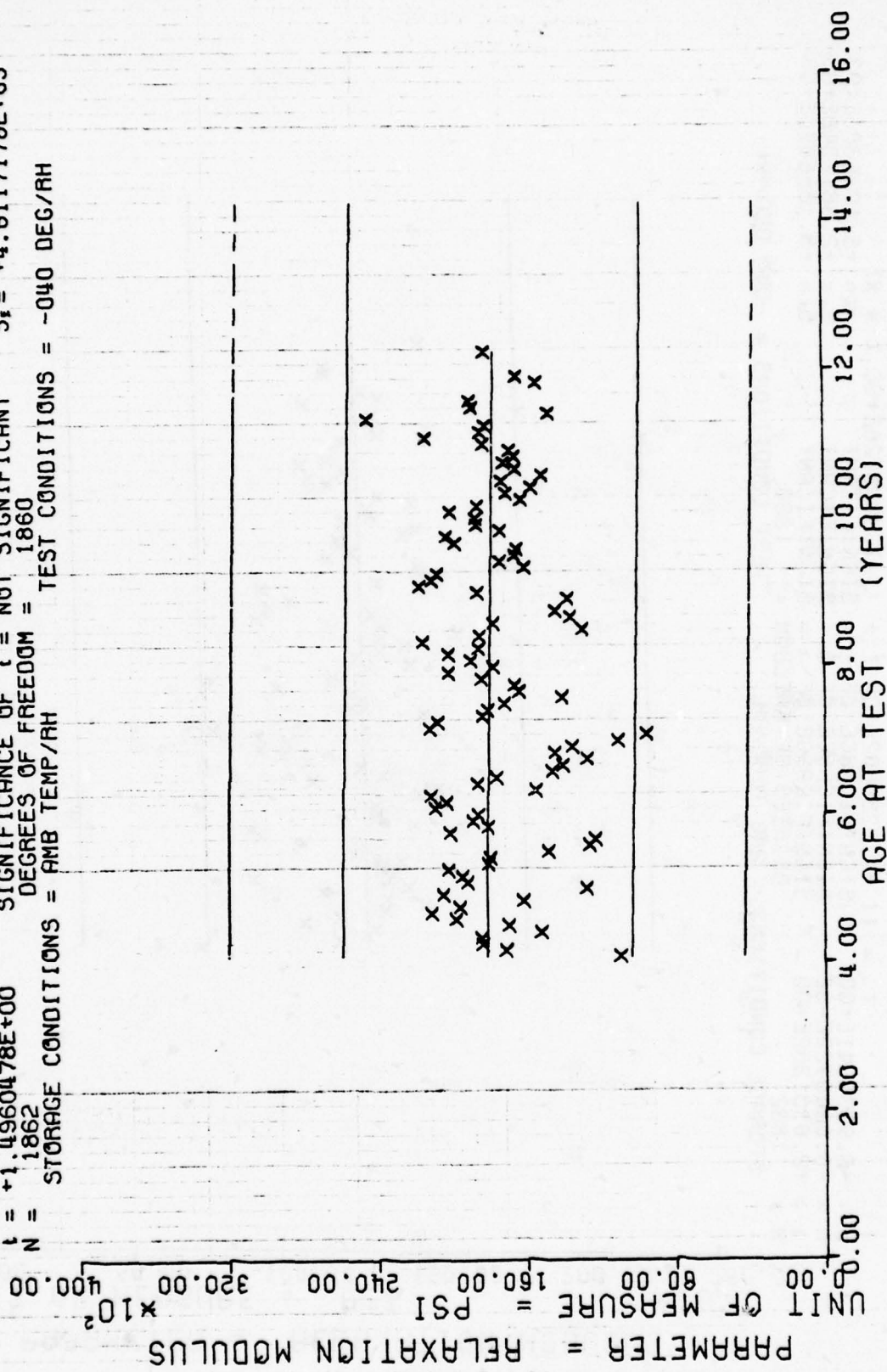
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.C	6	74.0	34	99.0	23	125.C	13
50.C	27	75.0	19	100.0	18	126.C	16
51.C	51	76.0	29	101.0	15	127.C	44
52.C	47	77.0	36	102.0	6	128.C	17
53.C	14	78.0	32	103.0	9	129.C	1
54.C	30	79.0	12	104.0	3	130.C	27
55.0	18	80.0	16	105.0	6	131.C	39
56.0	12	81.0	12	107.0	6	132.C	9
57.C	27	82.0	24	108.0	15	133.0	6
58.C	19	83.0	6	109.C	9	134.0	31
59.C	9	84.0	9	110.0	6	135.C	6
60.C	12	85.0	3	111.0	3	136.C	3
61.C	20	86.0	9	112.C	5	137.0	12
62.C	48	87.0	15	113.0	53	138.C	38
63.C	24	88.0	20	114.0	31	139.C	45
64.C	24	89.C	12	115.0	48	142.C	9
65.0	9	90.C	11	116.0	40	143.C	21
66.C	6	91.0	12	117.0	21	147.C	3
67.C	6	92.C	15	118.0	15		
68.0	12	93.C	12	119.C	15		
69.C	21	94.0	16	120.C	23		
70.C	30	95.0	15	121.0	18		
71.C	44	96.0	48	122.0	3		
72.C	36	97.0	53	123.0	5		
73.C	35	98.0	45	124.0	10		

WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 1C SEC, -40 DEG F, IPT-1011

This sample size summary is applicable to figures 30 thru 33

$Y = ((+1.846443E+04) + (-5.7582812E+00) * X)$
 $F = +2.2381591E+00$ SIGNIFICANCE OF F = NOT SIGNIFICANT $S_1 = +4.6132516E+03$
 $R = -3.4667927E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_2 = +3.8489953E+00$
 $L = +1.4960478E+00$ SIGNIFICANCE OF L = NOT SIGNIFICANT $S_3 = +4.6117178E+03$
 $N = 1862$ DEGREES OF FREEDOM = 1860
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC, -40 DEG F, TPH-1011

$Y = ((+1.3235602E+04) + (-7.0073726E+00) * X)$
 F = +6.9333641E+00 SIGNIFICANCE OF F = SIGNIFICANT $S_1 = +3.1936680E+03$
 R = -6.0940722E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_2 = +2.6612348E+00$
 I = +2.6331282E+00 SIGNIFICANCE OF I = SIGNIFICANT $S_3 = +3.1885890E+03$
 N = 1862 DEGREES OF FREEDOM = 1860
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH

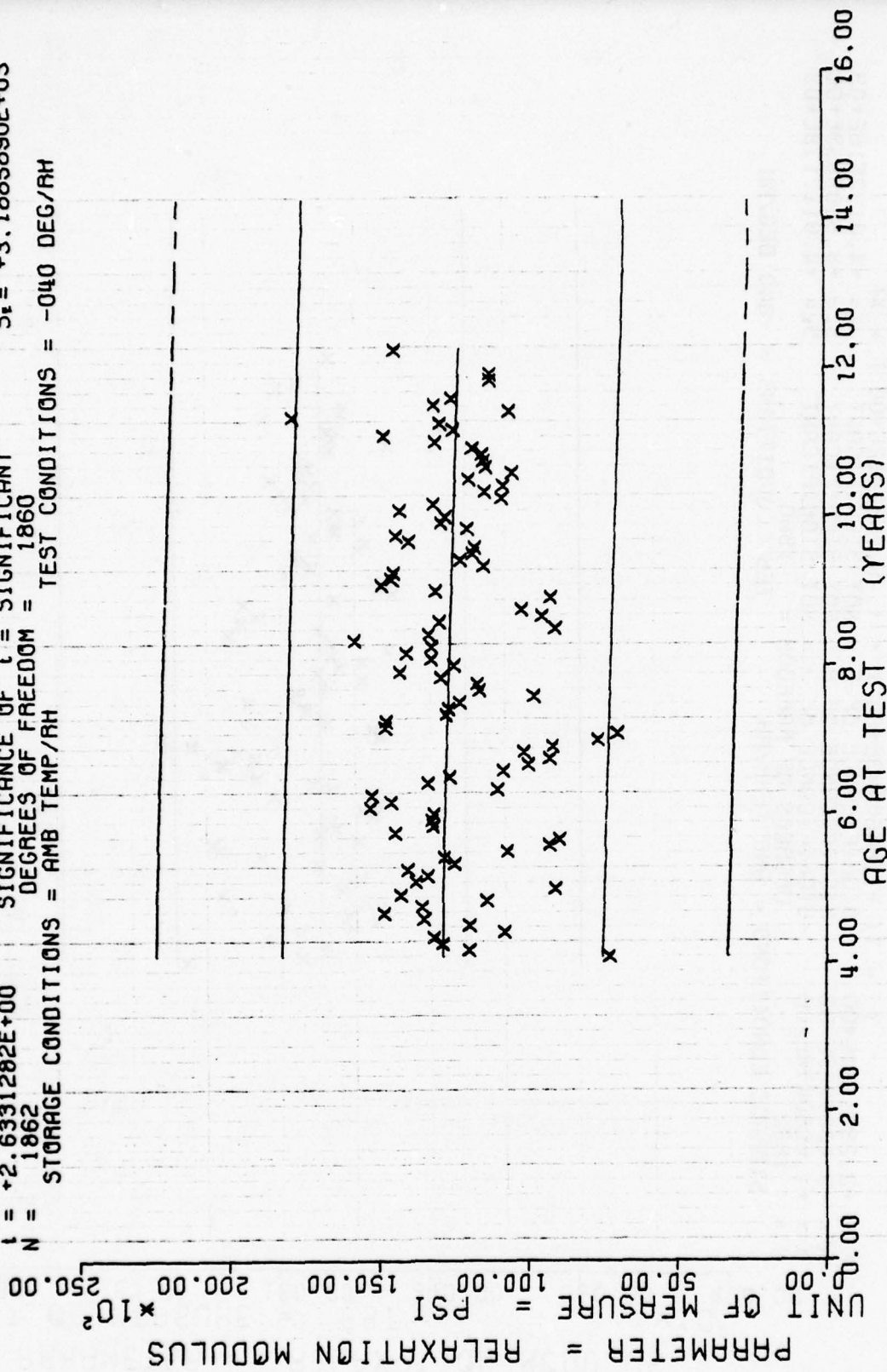
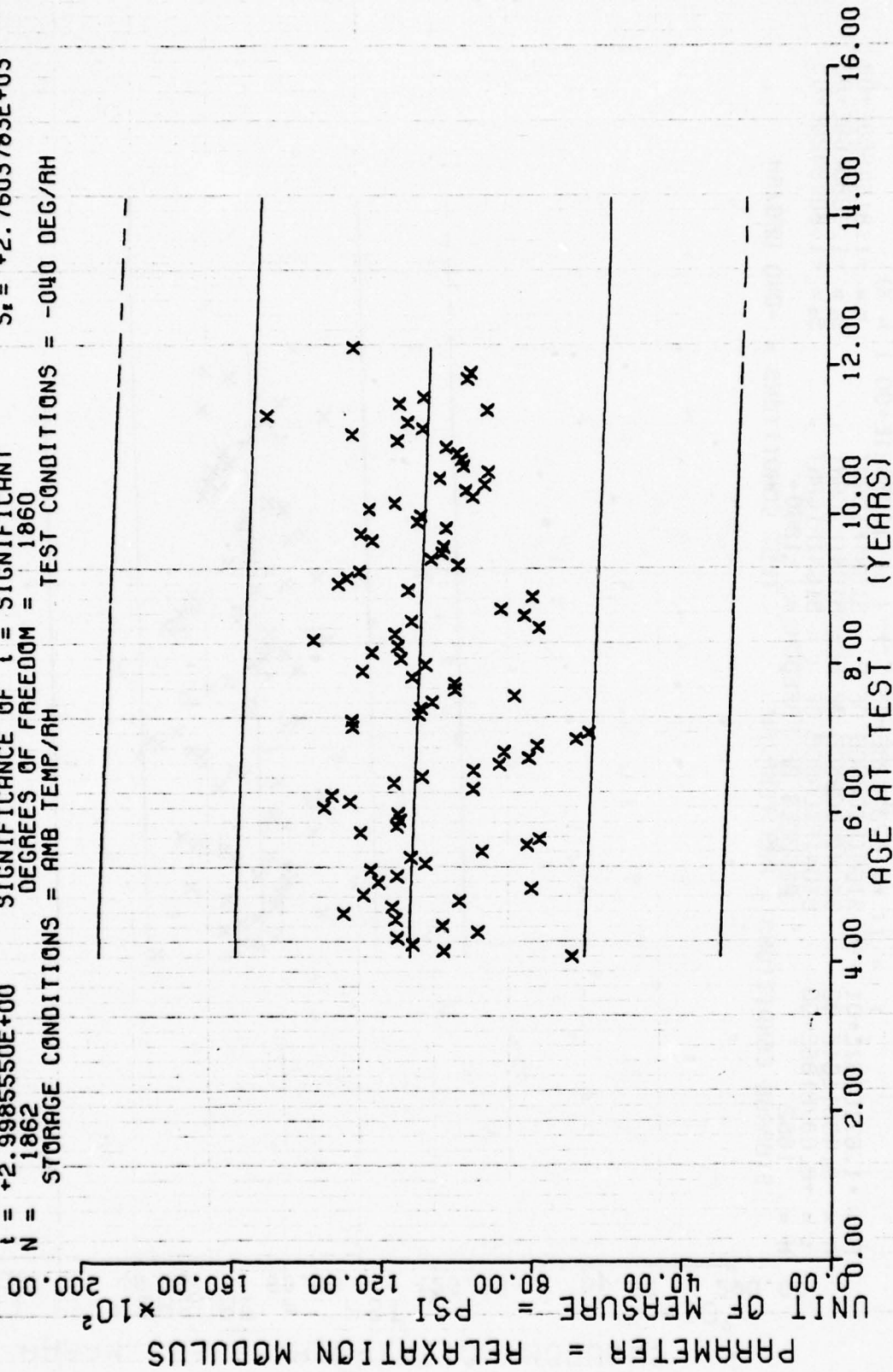


FIGURE 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 50 SEC., -40 DEG F, TPH-1011

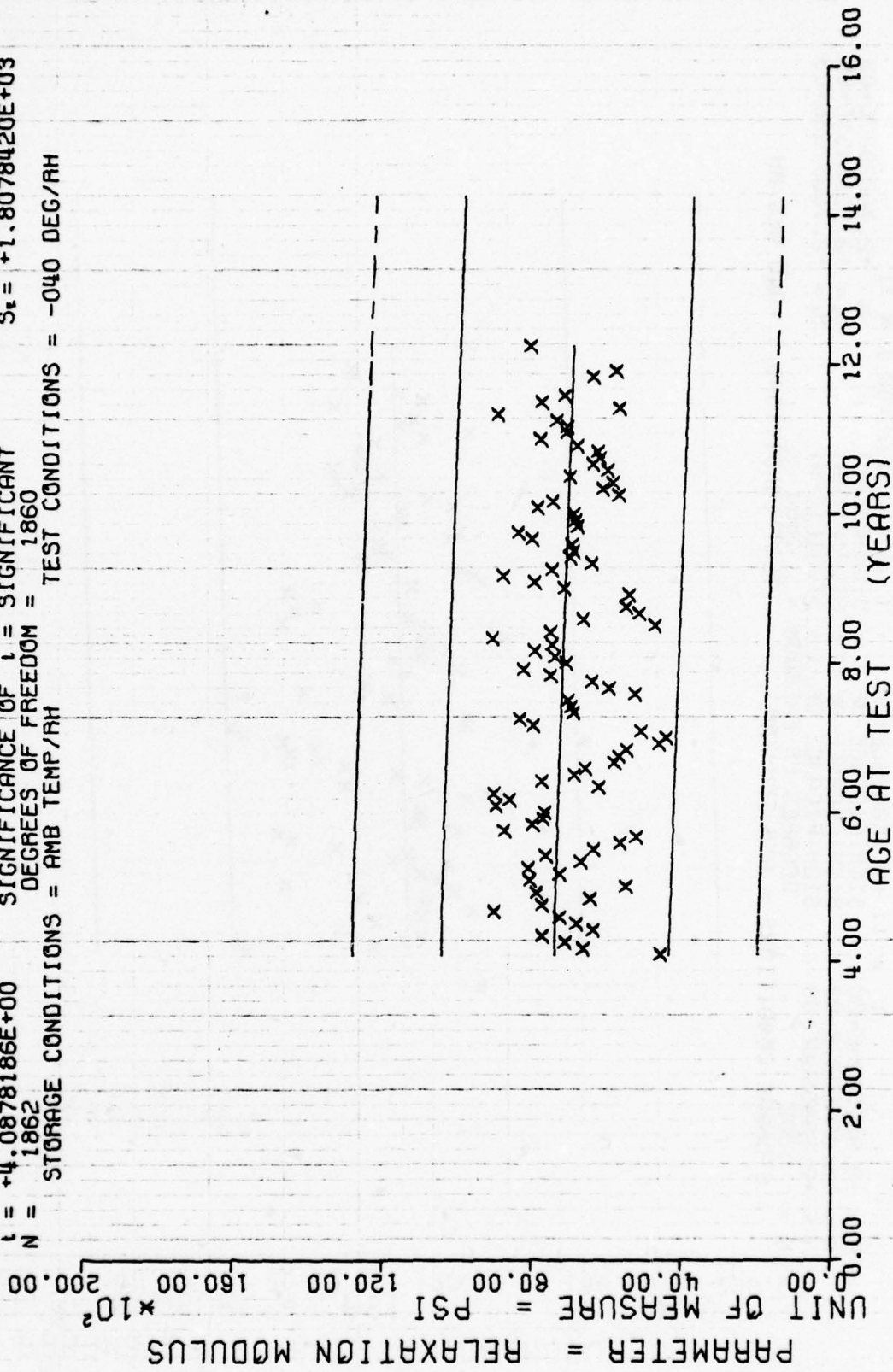
Figure 31

$Y = ((+1.1580896E+04) + (-6.9082064E+00) * X)$
 F = +8.9913323E+00 SIGNIFICANCE OF F = (-6.9082064E+00) * X
 R = -6.9359887E-02 SIGNIFICANT
 t = +2.9985550E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1862 DEGREES OF FREEDOM = 1860
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = -040 DEG/AH



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 100 SEC, -40 DEG F, TPFH-1011

$Y = ((+7.6787028E+03) + (-6.1678921E+00) * X)$
 F = +1.6710261E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = -9.4361101E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +4.0878186E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1862 DEGREES OF FREEDOM = 1860
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = -040 DEG/AH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 1000 SEC, -40 DEG F, TPH-1011

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.C	6	74.C	39	99.C	36	125.0	15
50.0	27	75.C	29	100.C	18	126.C	17
51.C	59	76.0	26	101.0	16	127.C	11
52.C	48	77.C	37	102.C	5	128.0	21
53.0	15	78.0	33	103.C	5	129.C	3
54.C	32	79.0	15	104.0	3	130.C	27
55.C	18	80.C	21	105.0	6	131.0	42
56.C	18	81.C	24	107.C	5	132.C	15
57.0	30	82.0	18	108.0	15	134.C	30
58.C	16	83.C	12	109.0	6	135.C	6
59.C	6	84.C	9	110.0	6	137.0	12
60.0	22	85.0	3	111.C	3	138.C	20
61.C	21	86.0	18	112.0	24	139.C	60
62.C	49	87.C	14	113.C	47	142.0	6
63.0	24	88.C	21	114.C	35	143.C	14
64.C	27	89.0	18	115.0	32	147.C	3
65.C	12	90.C	18	116.0	42		
66.C	9	91.C	15	117.0	21		
67.0	10	92.0	15	118.C	15		
68.C	9	93.C	15	119.0	27		
69.C	29	94.C	15	120.0	21		
70.0	24	95.0	23	121.C	18		
71.C	46	96.0	48	122.0	6		
72.C	42	97.C	45	123.0	6		
73.0	24	98.0	45	124.0	17		

WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 20 DEG F, TPT-1C11

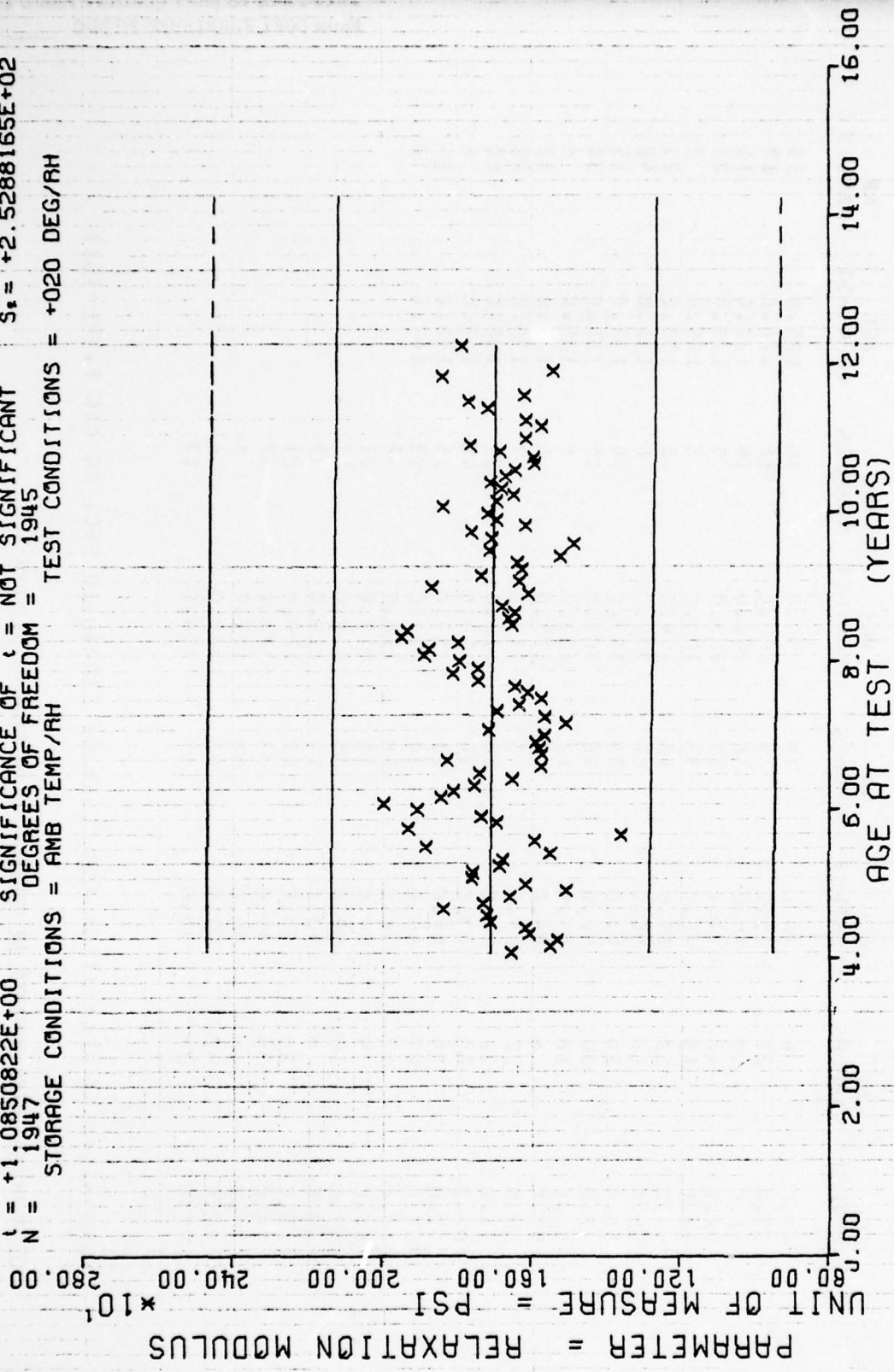
This sample size summary is applicable to figures 34 thru 37

Y = ((+1.7210419E+03) + (-2.2856097E-01) * X)
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 1945
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH

F = +1.1774035E+00
 R = -2.4596394E-02
 t = +1.0850822E+00
 N = 1947

* X)

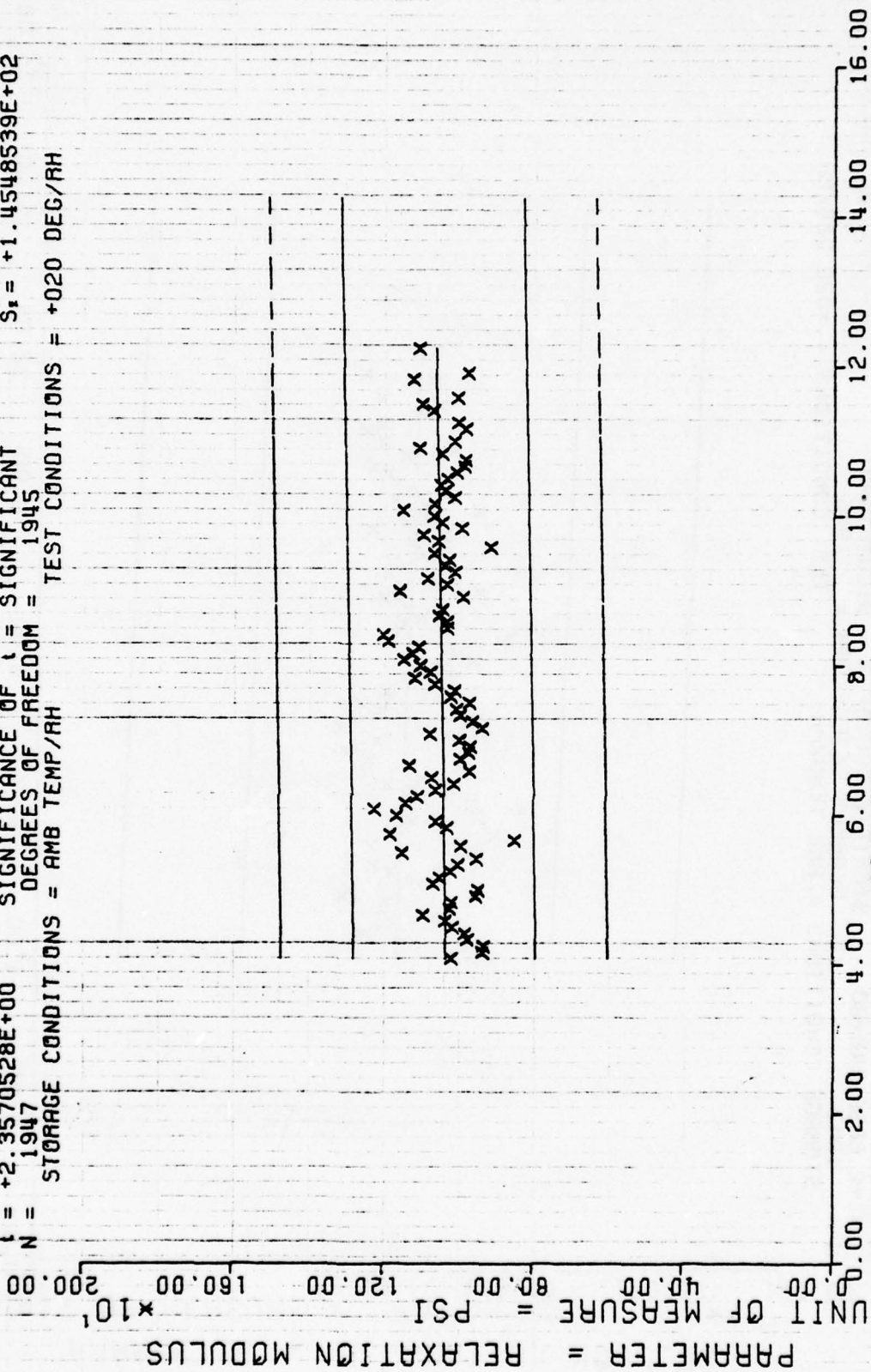
S_a = +2.5289317E+02
 S_b = +2.1063930E-01
 S_c = +2.5288165E+02



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 20 DEG F, TPH-1011

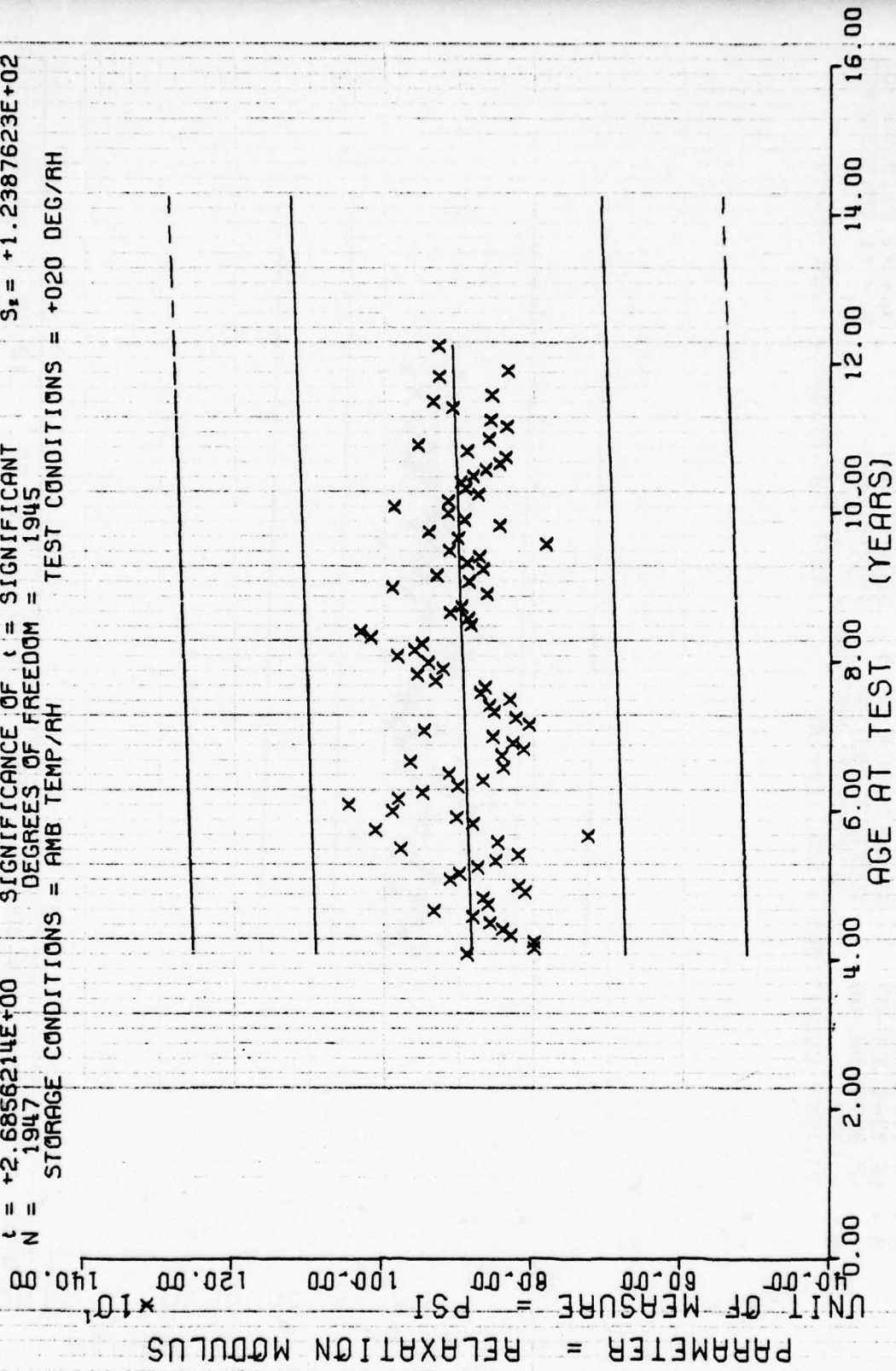
Figure 34

Y = ((+1.0202564E+03) + (+2.8563460E-01) * X)
 F = +5.5556981E+00 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_y = +1.4565558E+02$
 R = +5.3369132E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +1.2118294E-01$
 t = +2.3570528E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_b = +1.4548539E+02$
 N = 1947 DEGREES OF FREEDOM = 1945
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +020 DEG/AH



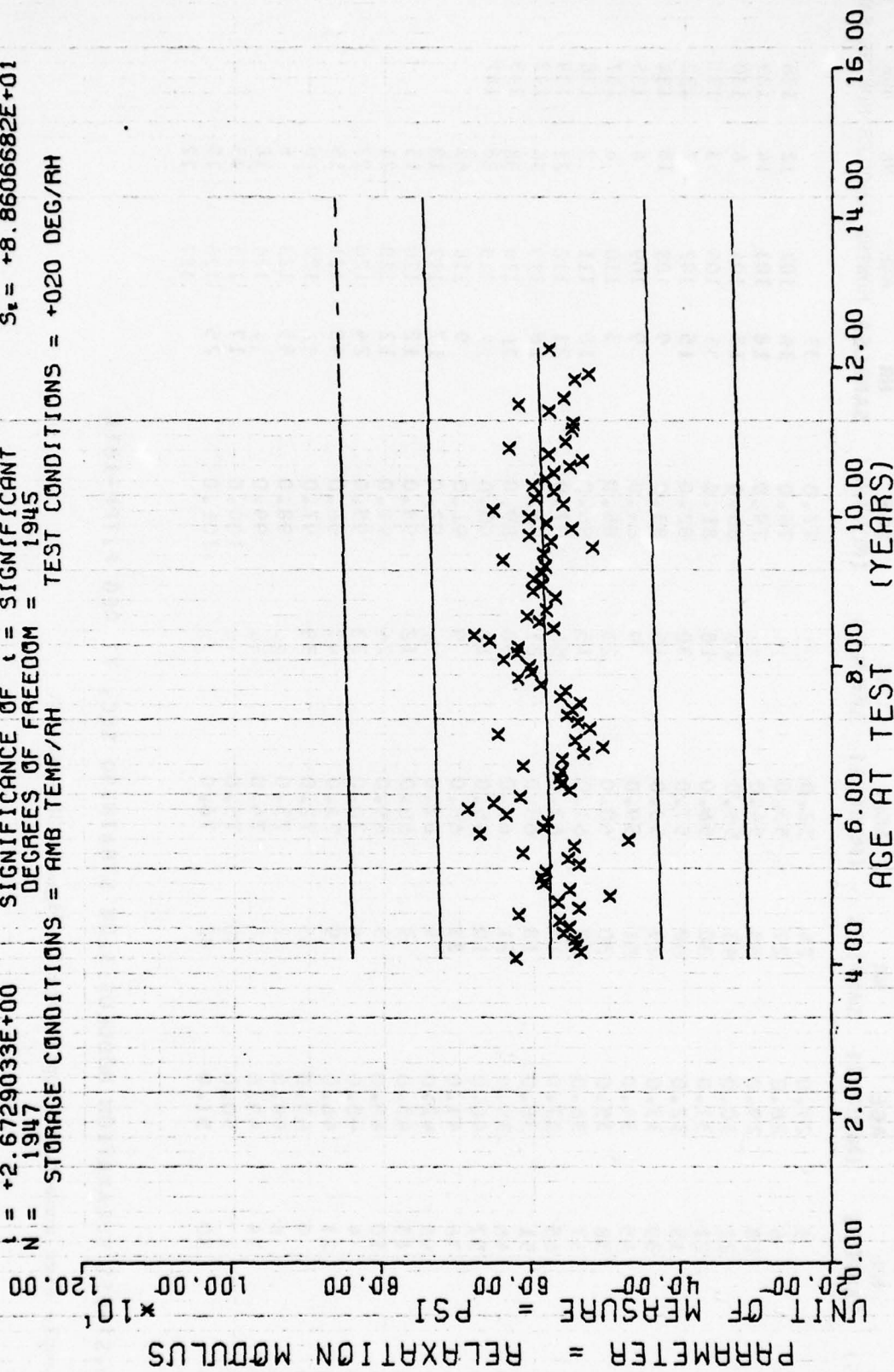
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 20 DEG F, TPH-1011

Y = ((+8.6681283E+02) + (+2.7711172E-01) * X)
 F = +7.2125627E+00 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +1.2407381E+02$
 R = +6.0782876E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_r = +1.0318346E-01$
 t = +2.6856214E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +1.2387623E+02$
 N = 1947 DEGREES OF FREEDOM = 1945
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 20 DEG F, TRH-1011

$Y = ((+5.6497105E+02) + (+1.9727489E-01) * X)$
 F = +7.1444122E+00 SIGNIFICANCE OF F = SIGNIFICANT $S_f = +8.8746457E+01$
 R = +6.0496086E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_R = +7.3805474E-02$
 t = +2.6729033E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +8.8606682E+01$
 N = 1947 DEGREES OF FREEDOM = 1945
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 20 DEG F, TRH-1011

Figure 37

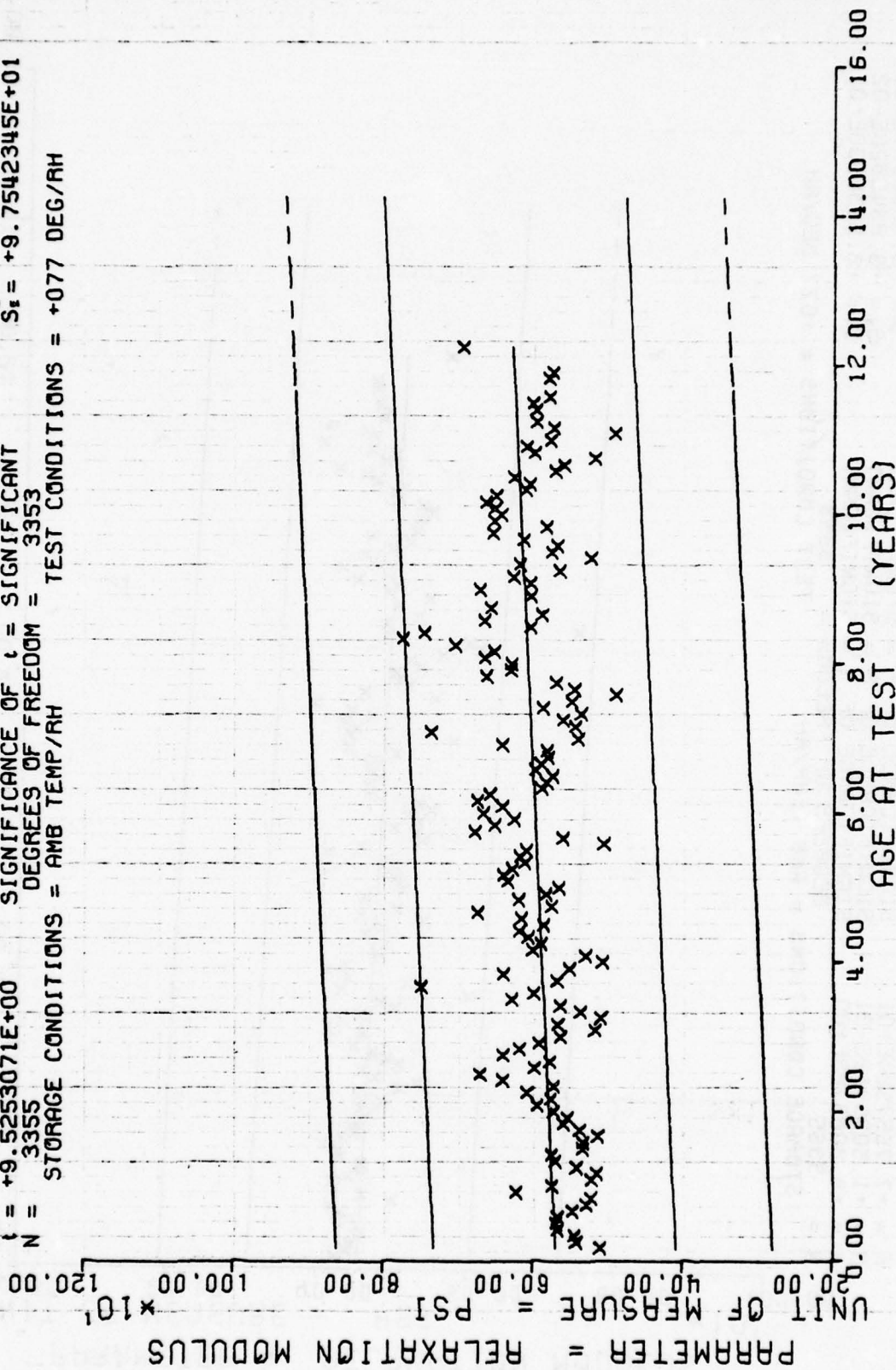
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
2.0	3	27.0	24	52.0	72	77.0	33	102	12	128	2				
3.0	6	28.0	27	53.0	15	78.0	36	103	14	129	3				
4.0	18	29.0	48	54.0	39	79.0	18	104	6	130	3				
5.0	22	30.0	43	55.0	16	80.0	15	105	3	131	3				
6.0	21	31.0	30	56.0	18	81.0	33	107	7	132	1				
7.0	35	32.0	60	57.0	30	82.0	15	108	18	134	2				
8.0	30	33.0	29	58.0	15	83.0	9	109	6	135	1				
9.0	45	34.0	51	59.0	9	84.0	9	110	6	137	1				
10.0	38	35.0	30	60.0	23	85.0	3	111	3	138	3				
11.0	37	36.0	52	61.0	15	86.0	18	112	21	139	4				
12.0	65	37.0	15	62.0	56	87.0	21	113	56	142	2				
13.0	51	38.0	18	63.0	21	88.0	18	114	38	143	1				
14.0	46	39.0	21	64.0	30	89.0	21	115	18	147	1				
15.0	57	40.0	18	65.0	12	90.0	27	116	62						
16.0	36	41.0	21	66.0	9	91.0	9	117	18						
17.0	46	42.0	9	67.0	6	92.0	17	118	15						
18.0	13	43.0	9	68.0	12	93.0	12	119	21						
19.0	10	44.0	3	69.0	24	94.0	12	120	27						
20.0	4	45.0	6	70.0	33	95.0	24	121	15						
21.0	27	46.0	9	71.0	47	96.0	48	122	6						
22.0	9	47.0	15	72.0	39	97.0	57	123	6						
23.0	6	48.0	12	73.0	24	98.0	45	124	18						
24.0	34	49.0	18	74.0	39	99.0	39	125	15						
25.0	27	50.0	30	75.0	30	100.0	17	126	19						
26.0	30	51.0	82	76.0	27	101.0	25	127	12						

WING 6.0 STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 77 DEG F, TPH-1011

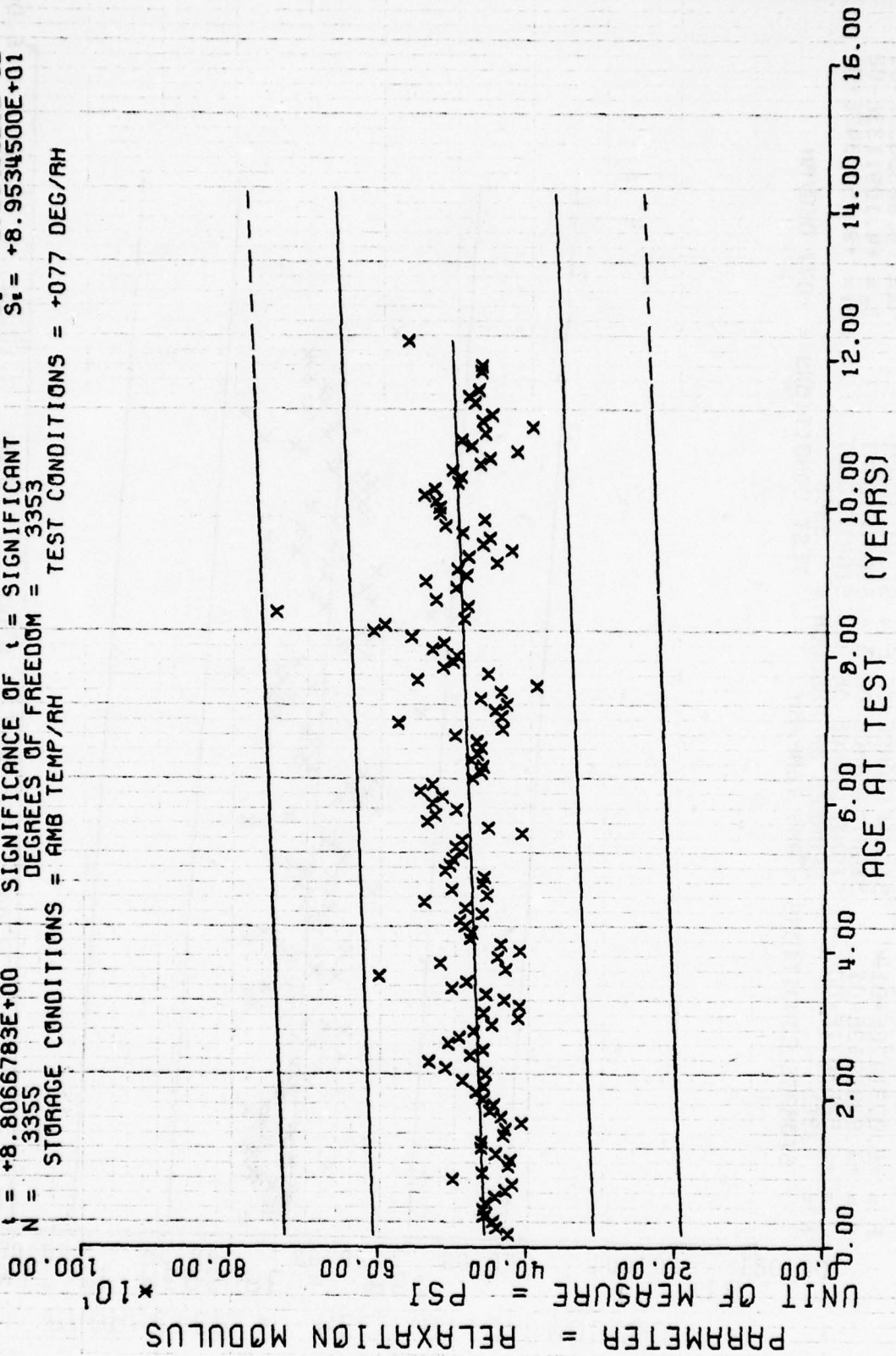
This sample size summary is applicable to figures 38 thru 41.

$Y = ((+5.7031073E+02) + (+3.9997844E-01) * X)$
 $F = +9.0731476E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +1.6231712E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +9.5253071E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 3355$ DEGREES OF FREEDOM = 3353
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +077 DEG/AH



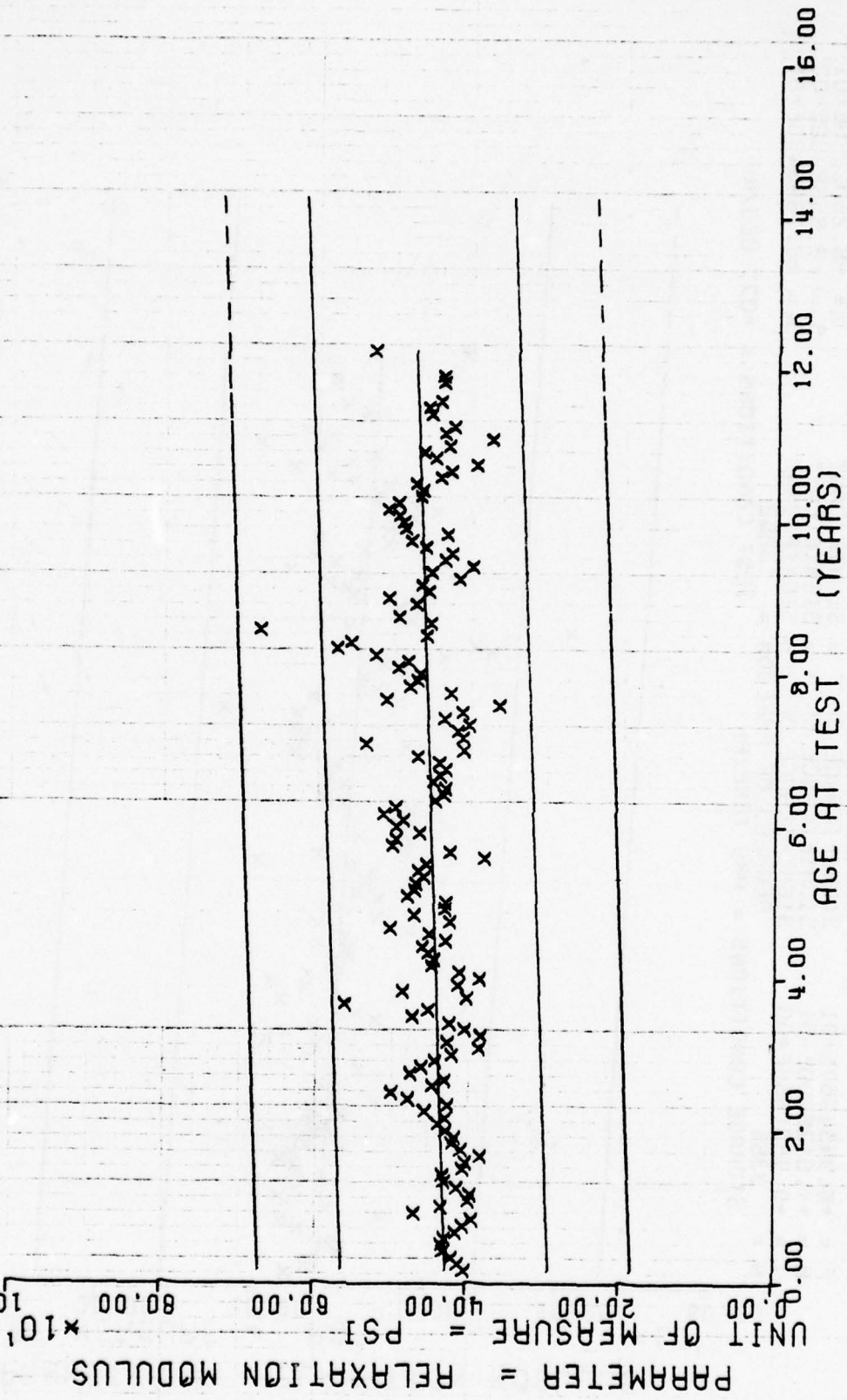
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 77 DEG F, TPH-1011

$Y = ((+4.5755940E+02) + (+3.3944308E-01) * X)$
 $F = +7.7557584E+01$ SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +9.0550581E+01$
 $R = +1.5035912E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +3.8543826E-02$
 $t = +8.8066783E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_t = +8.9534500E+01$
 $N = 3355$ DEGREES OF FREEDOM = 3353
 STORAGE CONDITIONS = AMB TEMP/RAH TEST CONDITIONS = +077 DEG/RAH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 77 DEG F, TPH-1011

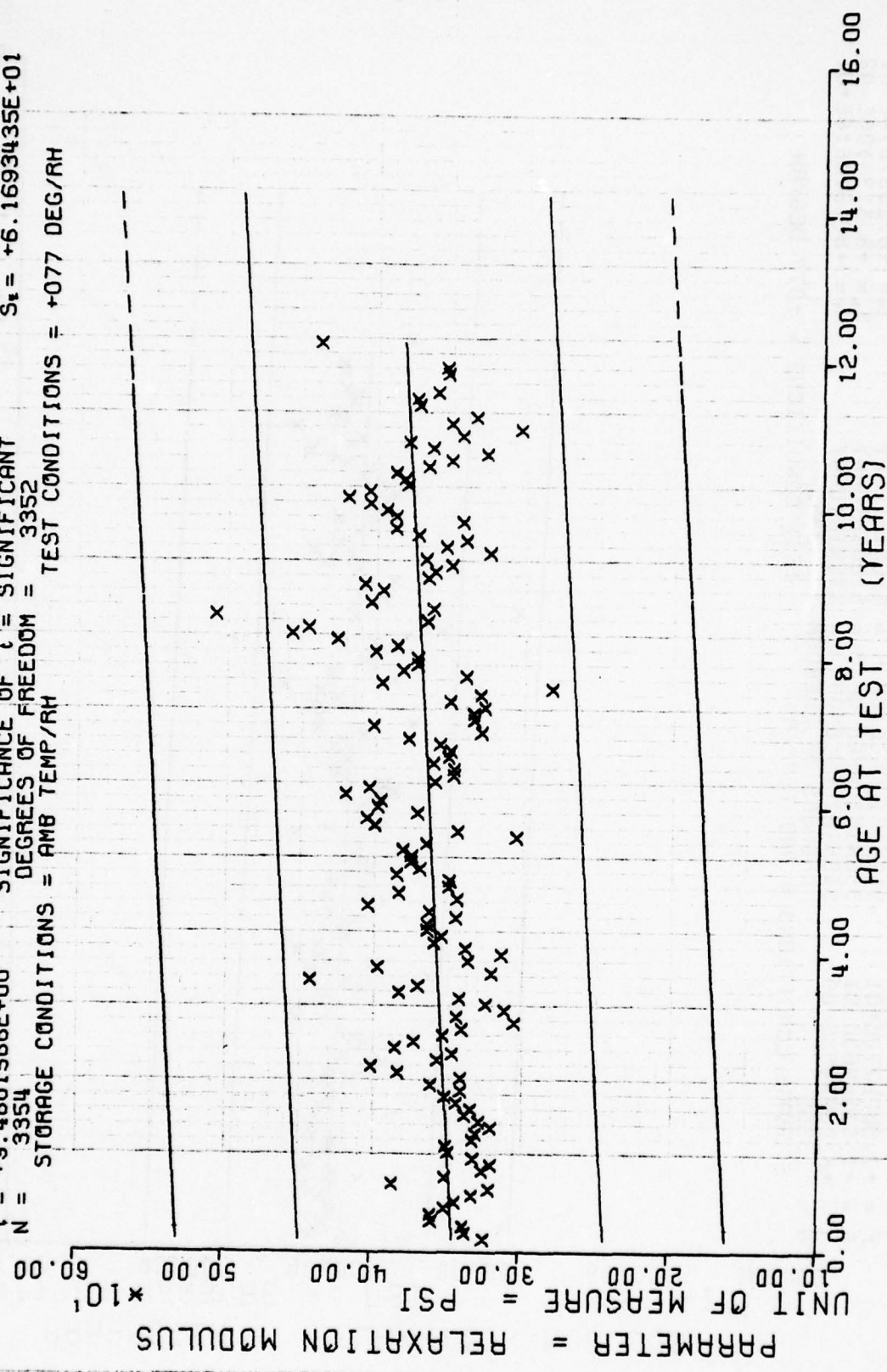
$Y = ((+4.2816926E+02) + (+3.1155004E-01) * X)$
 F = +7.8622772E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.5136463E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +8.8669483E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 3355 DEGREES OF FREEDOM = 3353
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +077 DEG/AH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 77 DEG F, TPFH-1011

Figure 40

$\gamma = ((+3.4534678E+02) + (+2.5125213E-01) * X)$
 $F = +8.9494564E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +1.6125930E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +9.4601566E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 3354$ DEGREES OF FREEDOM = 3352
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 77 DEG F, TPH-1011

Figure 41

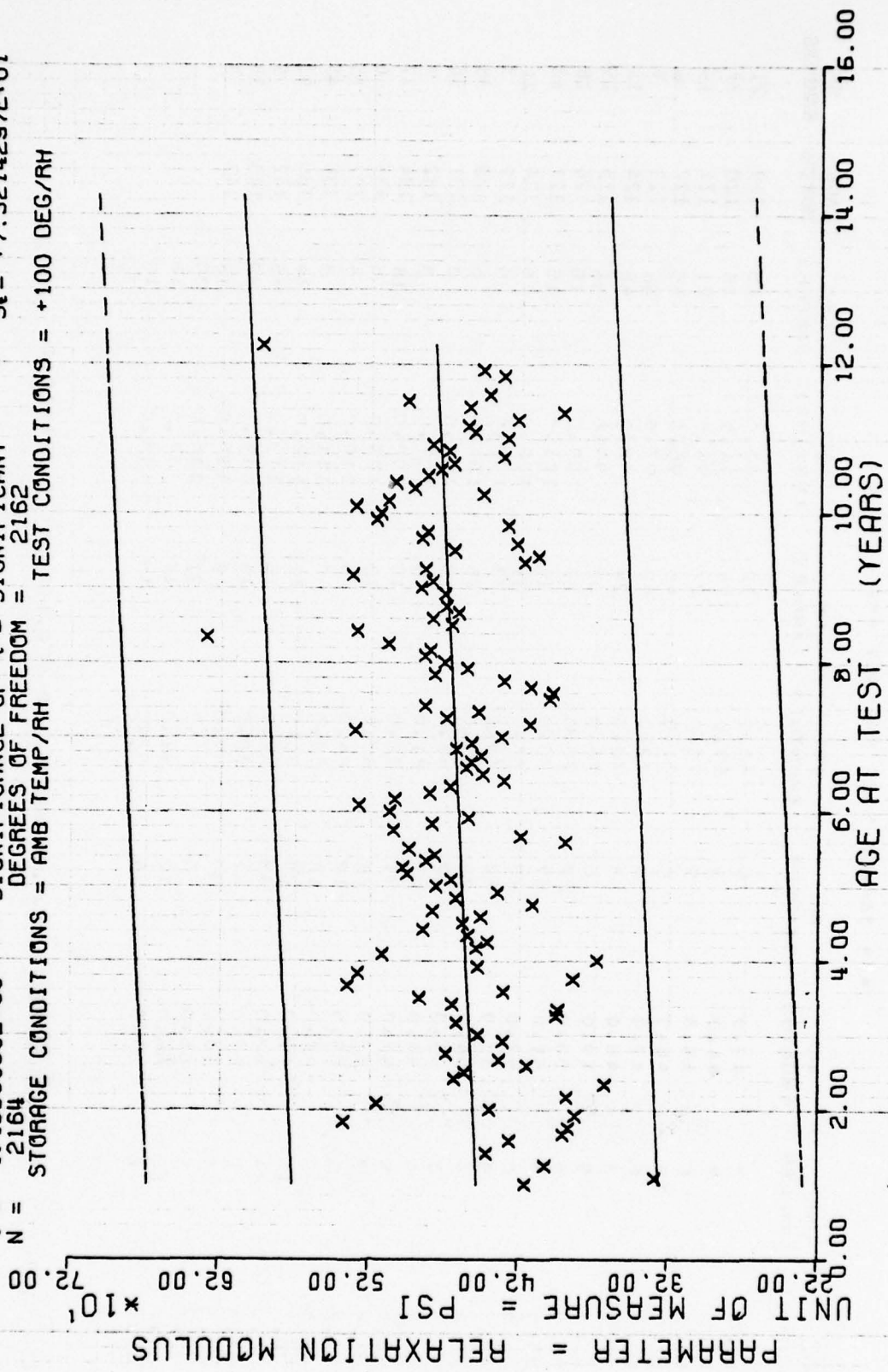
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	3	43.0	9	68.0	12	93.0	15
13.0	3	44.0	3	69.0	24	94.0	15
15.0	6	45.0	9	70.0	27	95.0	21
17.0	15	46.0	6	71.0	48	96.0	49
19.0	6	47.0	9	72.0	42	97.0	48
20.0	3	48.0	3	73.0	24	98.0	48
21.0	9	49.0	6	74.0	42	99.0	36
22.0	6	50.0	27	75.0	27	100.0	15
23.0	3	51.0	57	76.0	29	101.0	15
24.0	6	52.0	45	77.0	33	102.0	6
25.0	9	53.0	12	78.0	33	103.0	9
26.0	9	54.0	28	79.0	15	104.0	6
28.0	3	55.0	27	80.0	18	105.0	3
29.0	9	56.0	27	81.0	30	107.0	5
30.0	9	57.0	31	82.0	15	108.0	18
31.0	3	58.0	24	83.0	12	109.0	6
32.0	9	59.0	12	84.0	9	110.0	6
33.0	9	60.0	15	85.0	3	111.0	3
35.0	15	61.0	20	86.0	12	112.0	24
36.0	24	62.0	48	87.0	6	113.0	45
38.0	6	63.0	21	88.0	11	114.0	39
39.0	9	64.0	33	89.0	9	115.0	18
40.0	9	65.0	9	90.0	21	116.0	30
41.0	12	66.0	12	91.0	12	117.0	18
42.0	6	67.0	6	92.0	18	118.0	15

WING 5. STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 100 DFC F, TPH-1011

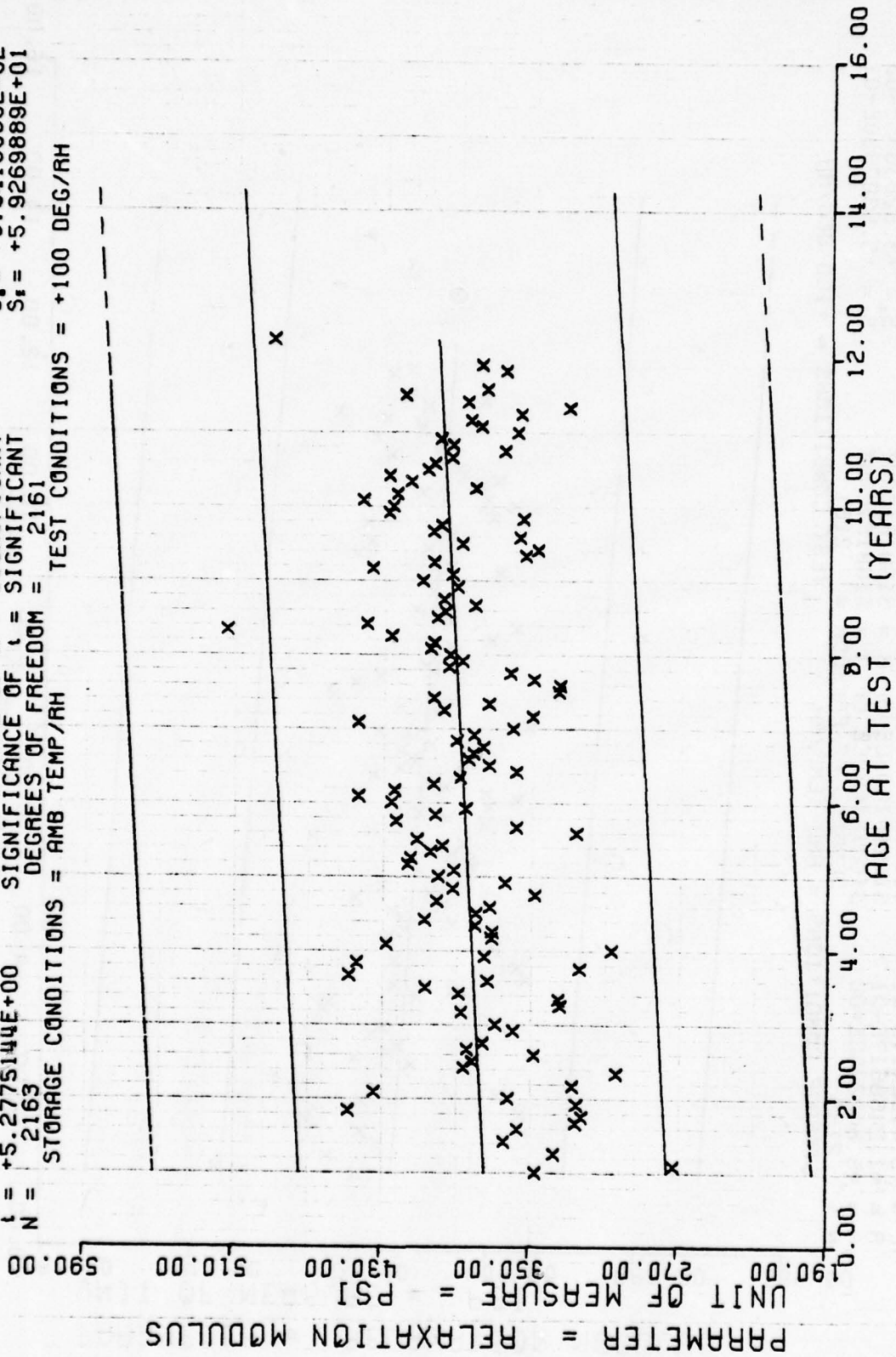
This sample size summary is applicable to figures 42 thru 45.

$Y = ((+4.4545160E+02) + (+2.1722867E-01) * X)$
 F = +1.9923689E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +9.5557571E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +4.4635960E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2164 DEGREES OF FREEDOM = 2162
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = +100 DEG/AM



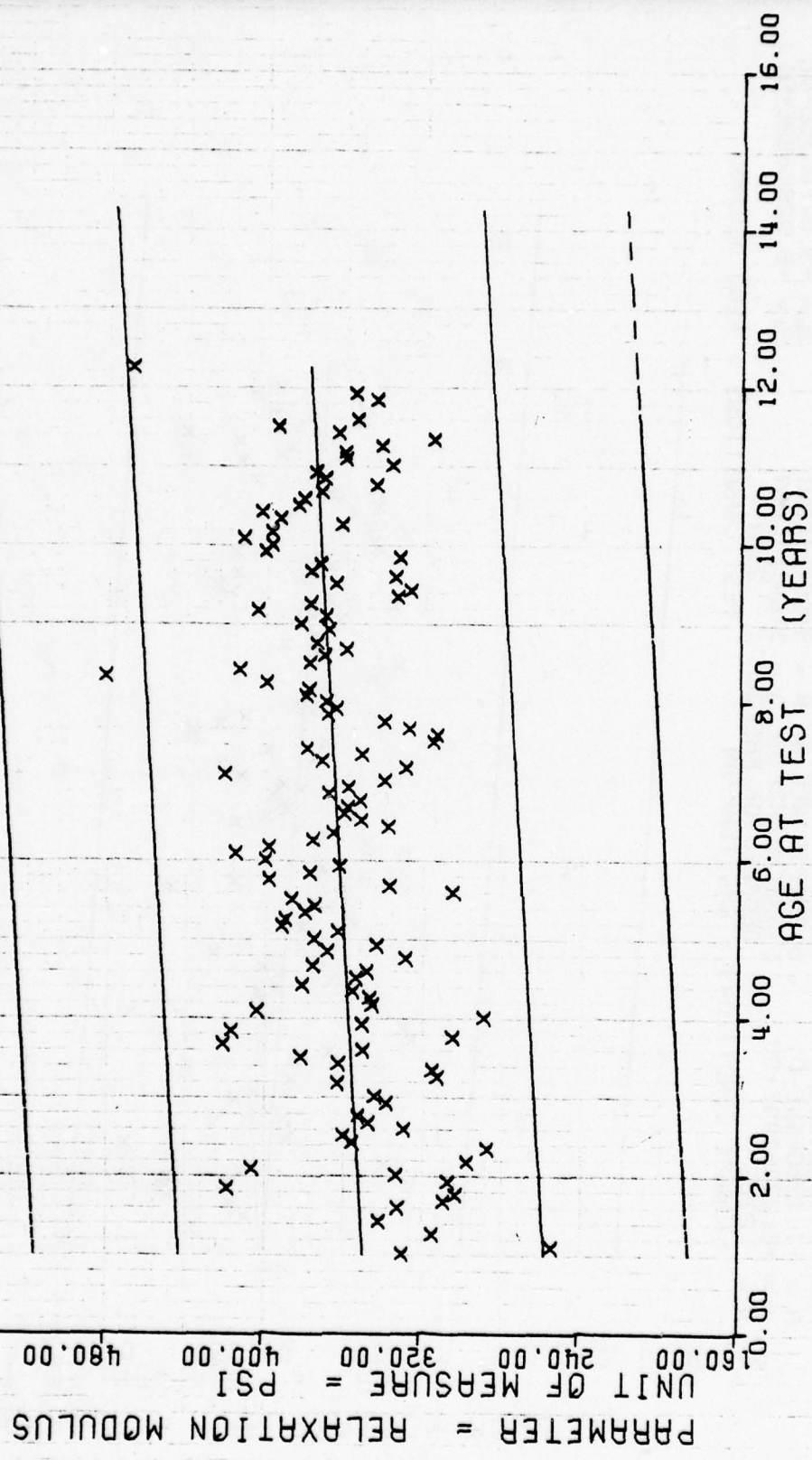
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 100 DEG F, TPH-1011

$Y = ((+3.7187248E+02) + (+2.0803189E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +5.9636820E+01$
 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +3.9418535E-02$
 SIGNIFICANCE OF λ = SIGNIFICANT $S_1 = +5.9269889E+01$
 DEGREES OF FREEDOM = 2161
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 100 DEG F, TPH-1011

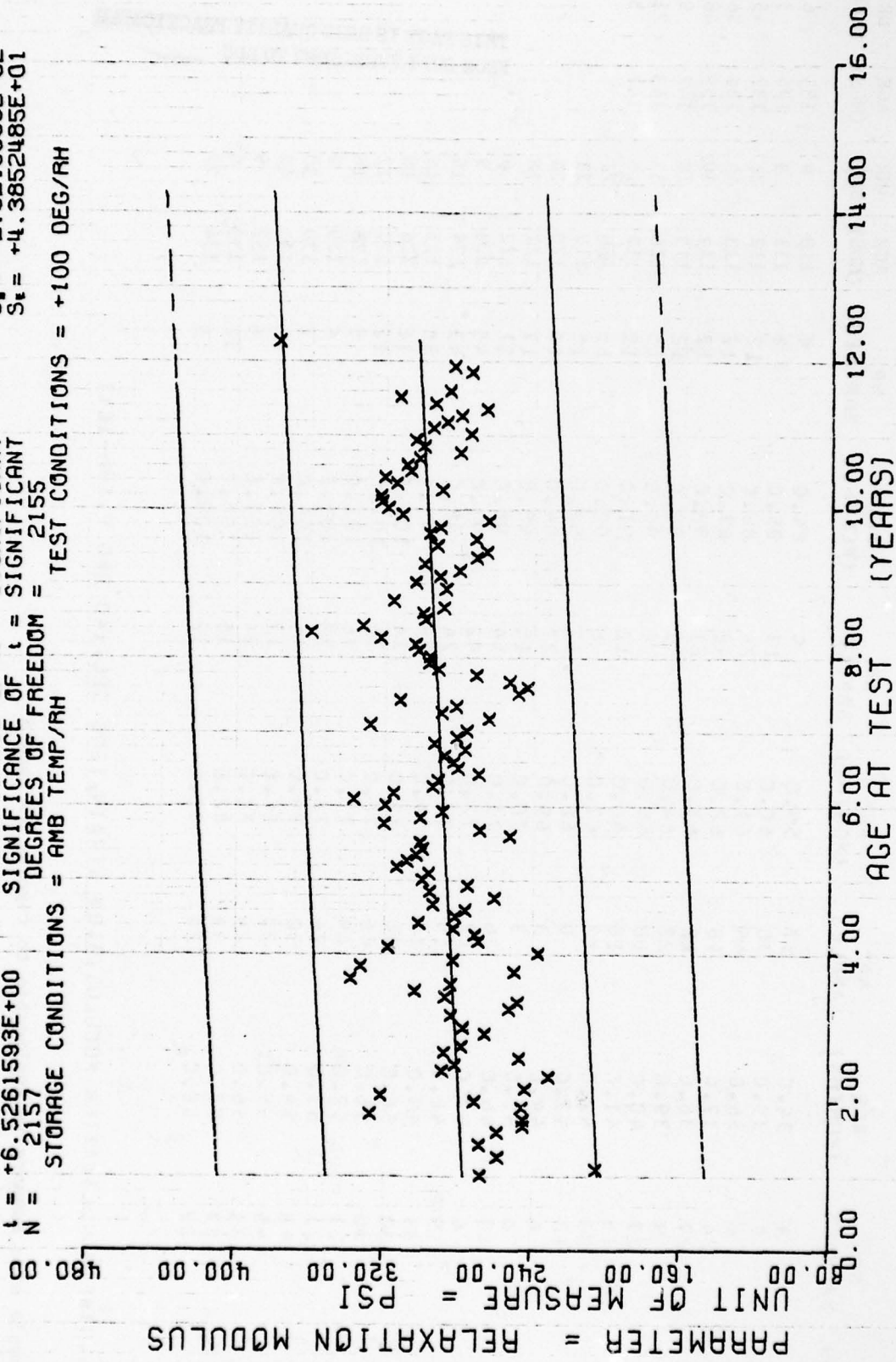
Y = ((+3.4720259E+02) + (+2.1489910E-01) * X)
 F = +3.4132411E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.2469617E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +5.8422950E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2163 DEGREES OF FREEDOM = 2161
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 100 DEG F, TPFH-1011

Figure 44

Y = ((+2.7491662E+02) + (+1.9062948E-01) * X)
 F = +4.2590755E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +4.4273437E+01$
 R = +1.3921443E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_p = +2.9210056E-02$
 t = +6.5261593E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +4.3852485E+01$
 N = 2157 DEGREES OF FREEDOM = 2155
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 100 DEG F, TPH-1011

Figure 45

*** SAMPLE SIZE SUMMARY ***

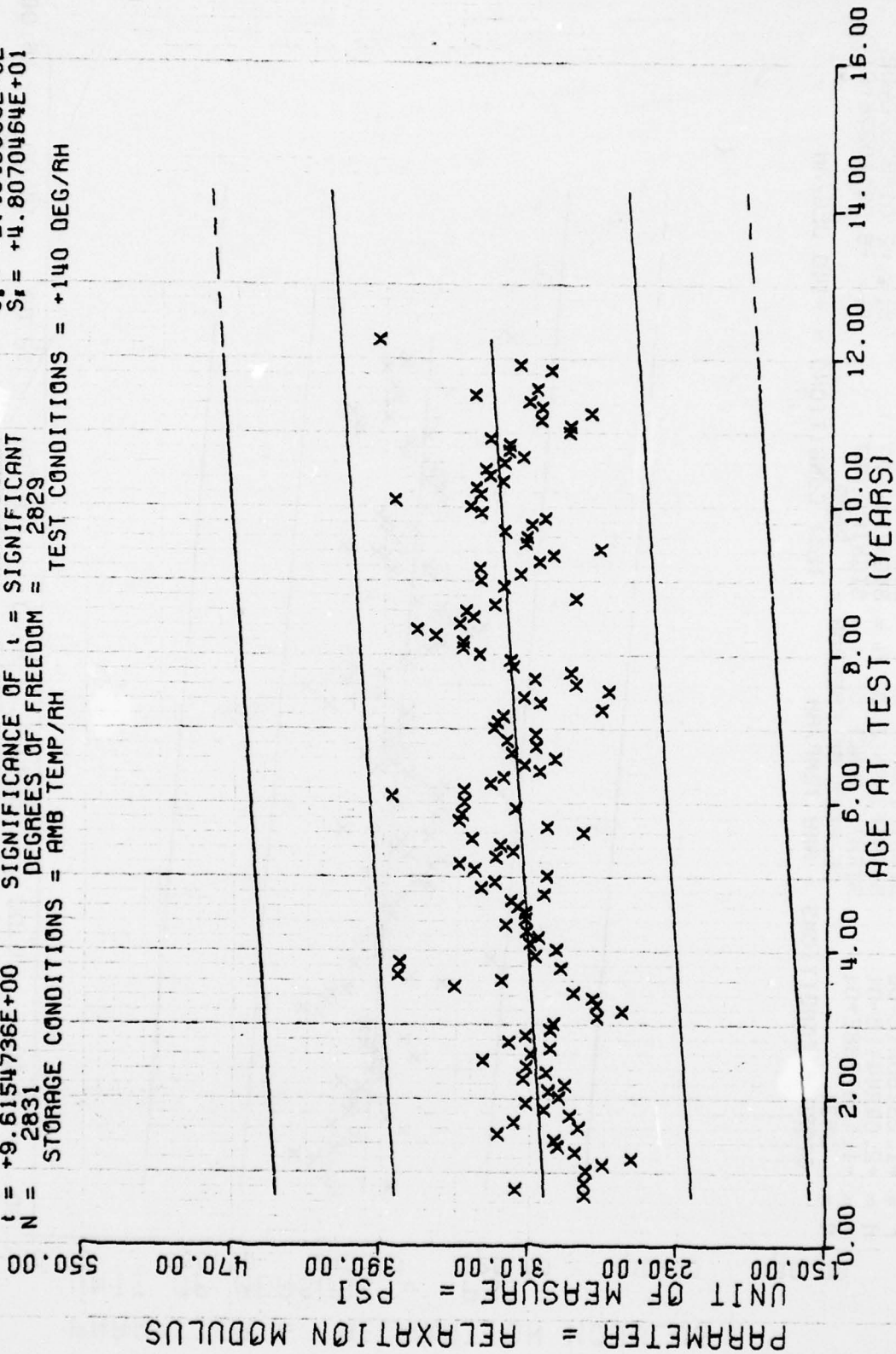
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
8.C	3	34.C	57	59.0	9	84.0	9	110	9	135	6		
9.C	9	35.C	30	60.0	17	85.0	3	111	3	136	3		
10.C	6	36.0	45	61.0	24	86.0	12	112	21	137	15		
12.C	24	37.0	18	62.0	48	87.0	12	113	45	138	36		
13.C	27	38.C	12	63.0	21	88.0	12	114	39	139	48		
14.C	9	39.0	27	64.0	33	89.0	12	115	15	142	9		
15.C	27	40.0	18	65.0	9	90.0	15	116	33	143	21		
16.C	15	41.C	18	66.0	12	91.0	15	117	18	147	3		
17.0	39	42.0	12	67.0	6	92.0	15	118	21				
18.0	10	43.0	9	68.0	12	93.0	15	119	21				
19.C	6	44.C	3	69.0	27	94.0	18	120	24				
20.C	6	45.C	3	70.0	15	95.0	17	121	18				
21.0	18	46.0	6	71.0	54	96.0	51	122	6				
22.C	6	47.0	12	72.0	42	97.0	45	123	9				
23.C	9	48.C	15	73.0	24	98.0	43	124	15				
24.C	33	49.0	15	74.0	38	99.0	36	125	15				
25.C	30	50.C	36	75.0	24	100.0	18	126	18				
26.C	30	51.C	66	76.0	36	101.0	12	127	12				
27.0	21	52.0	69	77.0	36	102.0	5	128	18				
28.C	27	53.0	24	78.0	33	103.0	5	129	2				
29.C	48	54.C	30	79.0	14	104.0	2	130	30				
30.C	45	55.0	27	80.0	17	105.0	3	131	42				
31.C	33	56.0	24	81.0	24	107.0	6	132	9				
32.C	57	57.0	33	82.0	15	108.0	18	133	6				
33.C	27	58.0	24	83.0	12	109.0	6	134	27				

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WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 140 DEG F, TPH-1C11

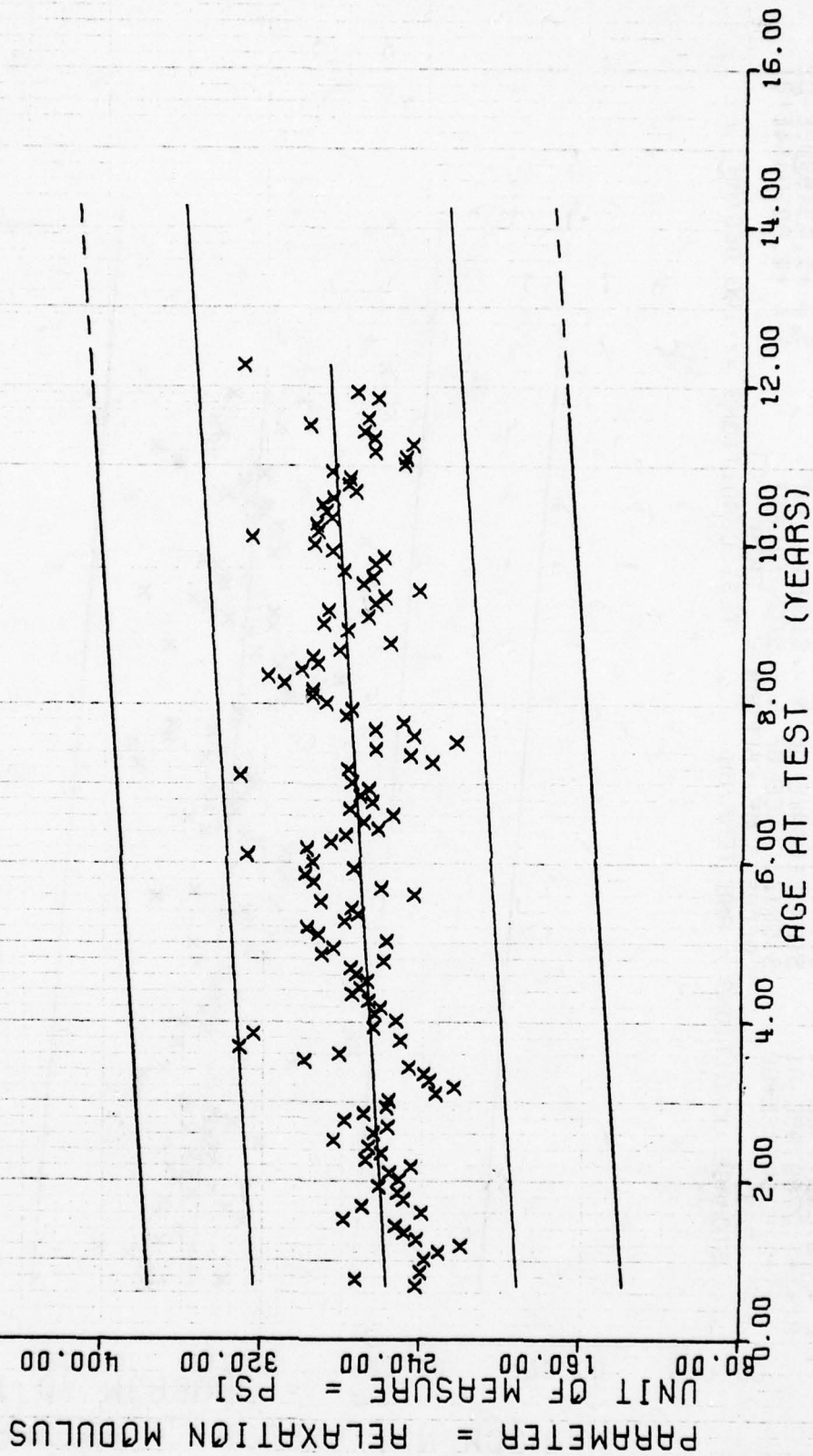
This sample size summary is applicable to figures 46 thru 49

$Y = ((+2.9996746E+02) + (+2.3412621E-01) * X)$
 F = +9.2457332E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_1 = +4.8841037E+01$
 R = +1.7789793E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +2.4348900E-02$
 t = +9.6154736E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +4.8070464E+01$
 N = 2831 DEGREES OF FREEDOM = 2829
 STORAGE CONDITIONS = AMB TEMP/4H TEST CONDITIONS = +140 DEG/4H



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 140 DEG F, TPH-1011

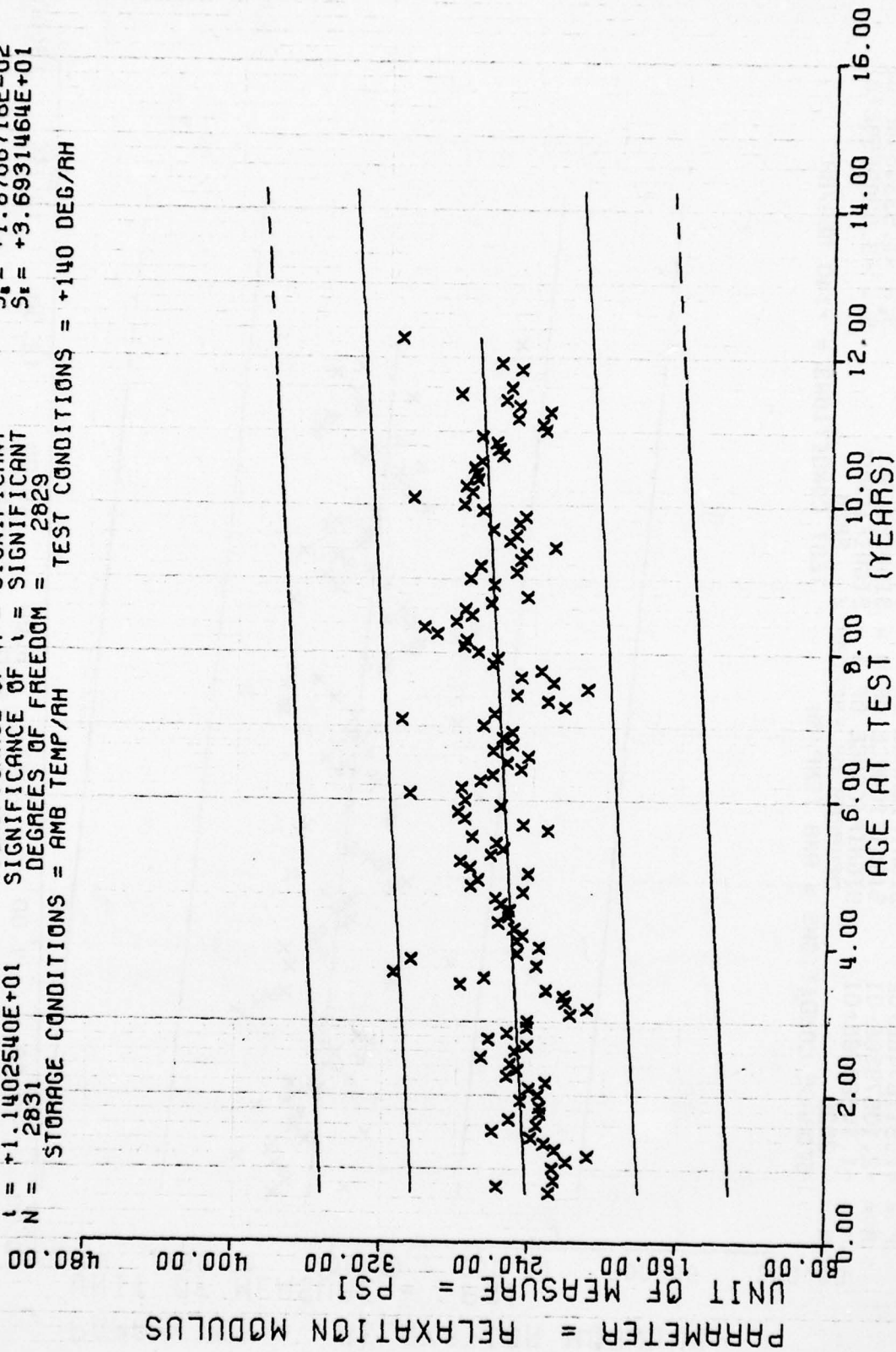
$Y = ((+2.5576379E+02) + (+2.2378101E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2829
 N = 2831
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = +140 DEG/RH
 $\sigma = +4.0661129E+01$
 $S_e = +2.0165287E-02$
 $S_t = +3.9811027E+01$



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 140 DEG F, TPFH-1011

Figure 47

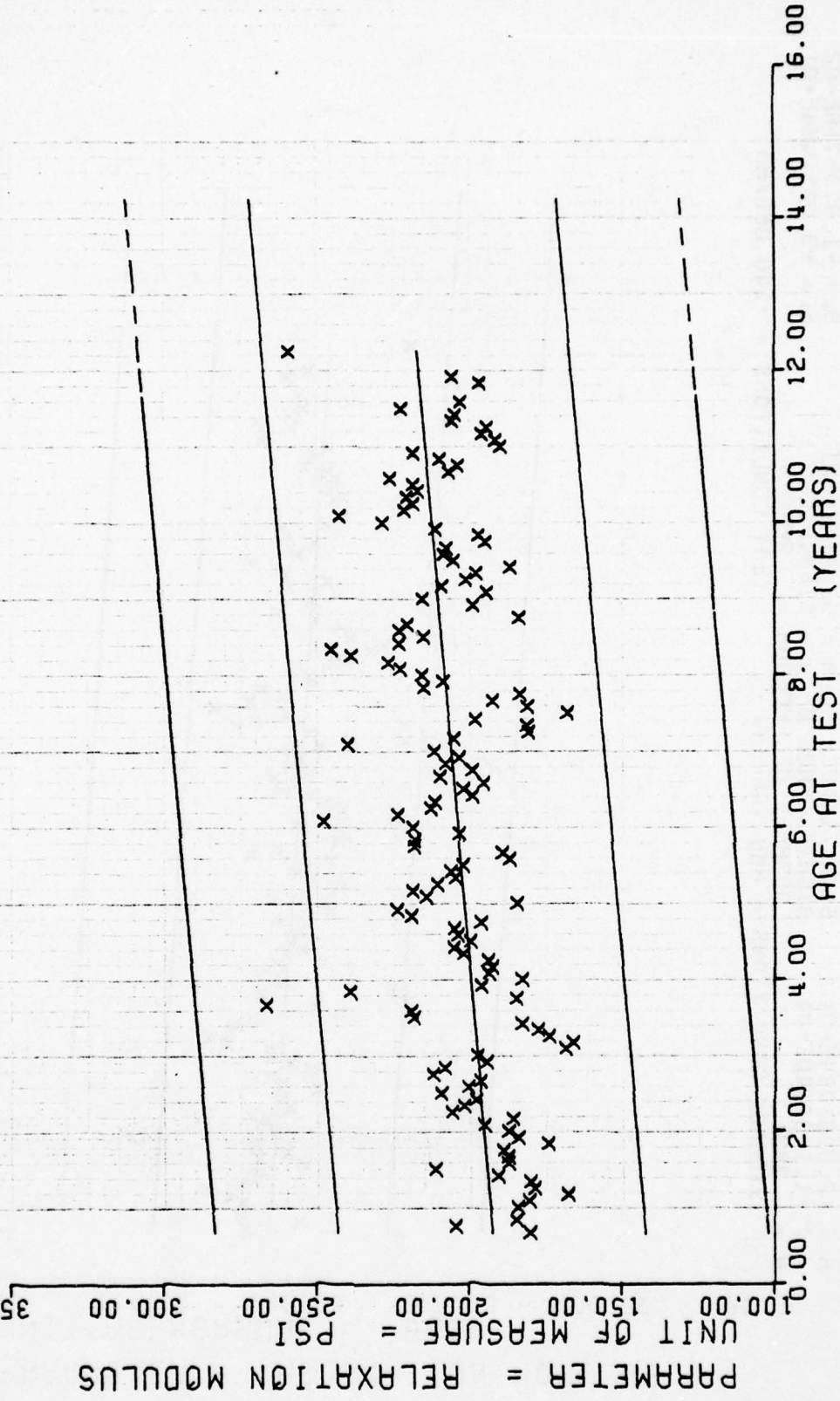
$Y = ((+2.3999026E+02) + (+2.1330409E-01) * X)$
 F = +1.3001793E+02 SIGNIFICANCE OF F = SIGNIFICANT $S_f = +3.7763923E+01$
 R = +2.0961764E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_r = +1.8706716E-02$
 t = +1.1402540E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +3.6931464E+01$
 N = 2831 DEGREES OF FREEDOM = 2829
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +140 DEG/AH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 140 DEG F, TPH-1011

$Y = ((+1.9119137E+02) + (+1.7585422E-01) * X)$
 F = +1.3116746E+02 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +3.0989447E+01$
 R = +2.1067936E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +1.5354644E-02$
 t = +1.1452836E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +3.0299258E+01$
 N = 2826 DEGREES OF FREEDOM = 2824

STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +140 DEG/AH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 140 DEG F, TPH-1011

Figure 49

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
8.C	3	34.C	51	59.C	5	84.C	9	110	6	135	6
9.0	9	35.0	27	60.C	15	85.C	3	111	3	136	3
10.C	6	36.0	51	61.0	24	86.C	15	112	24	137	15
12.C	24	37.C	18	62.C	46	87.C	15	113	48	138	54
13.C	24	38.C	12	63.C	21	88.C	27	114	36	139	44
14.C	12	39.0	27	64.0	30	89.C	21	115	12	142	8
15.C	24	40.C	18	65.0	12	90.0	30	116	33	143	27
16.C	18	41.C	18	66.C	12	91.0	15	117	18	143	27
17.C	33	42.0	12	67.C	6	92.C	15	118	14	147	3
18.C	18	43.C	9	68.0	12	93.C	15	119	15		
19.C	9	44.0	3	69.C	16	94.C	17	120	23		
20.C	6	45.0	6	70.0	20	95.C	18	121	9		
21.C	18	46.C	3	71.0	30	96.C	51	123	6		
22.C	9	47.C	15	72.0	48	97.C	48	124	9		
23.0	9	48.0	15	73.C	27	98.C	48	125	15		
24.C	30	49.C	15	74.0	36	99.C	36	126	15		
25.C	35	50.C	36	75.0	27	100.0	17	127	18		
26.0	24	51.0	57	76.C	35	101.C	12	128	12		
27.C	24	52.0	68	77.0	27	102.C	6	129	15		
28.C	26	53.C	24	78.C	39	103.C	9	130	6		
29.C	50	54.0	33	79.C	15	104.0	3	131	24		
30.C	42	55.0	27	80.C	18	105.C	6	132	42		
31.C	33	56.C	24	81.0	27	107.C	6	133	12		
32.C	54	57.C	36	82.C	15	108.C	21	134	6		
33.C	30	58.0	24	83.0	15	109.C	6	122	15		

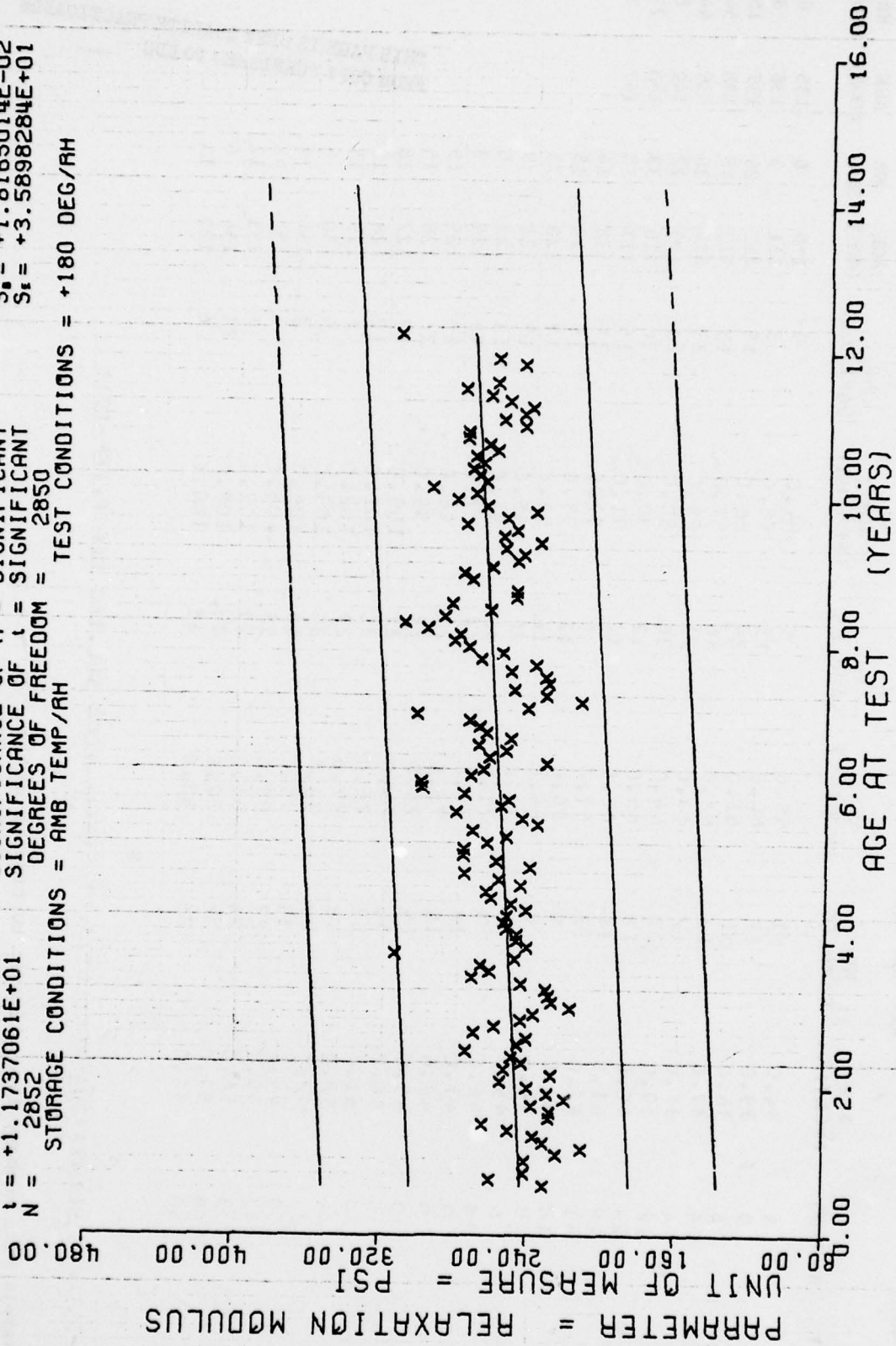
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WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, ICC SEC, 180 DEG F, TPT-IC11

This sample size summary is applicable to figures 50 thru 53

$Y = ((+2.4197625E+02) + (+2.1320390E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2850
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +180 DEG/AH
 $G_1 = +3.6749196E+01$
 $S_0 = +1.8165014E-02$
 $S_1 = +3.5898284E+01$

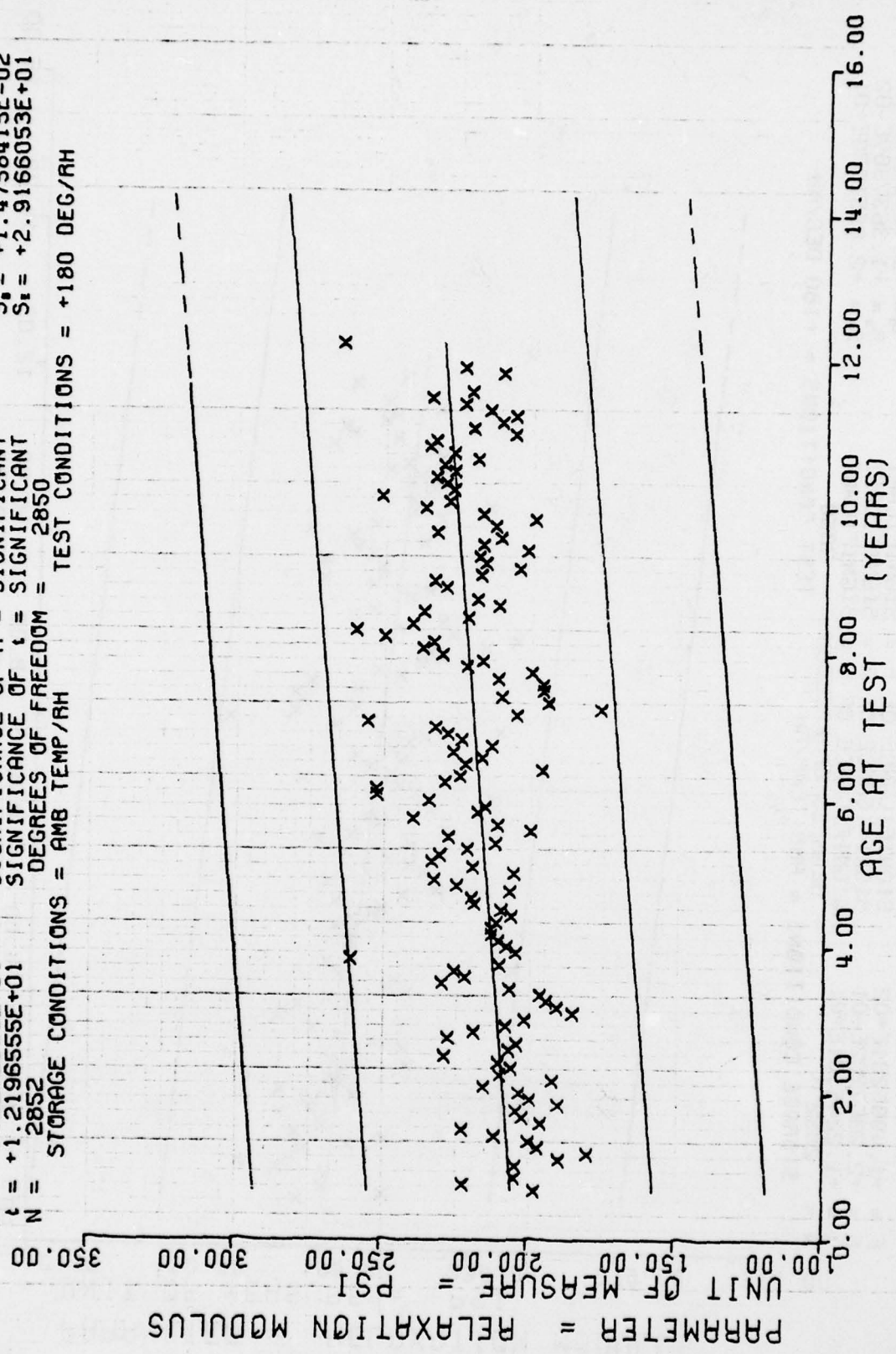
F = +1.3775862E+02
 R = +2.1472699E-01
 t = +1.1737061E+01
 N = 2852



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 180 DEG F, TPH-1011

Figure 50

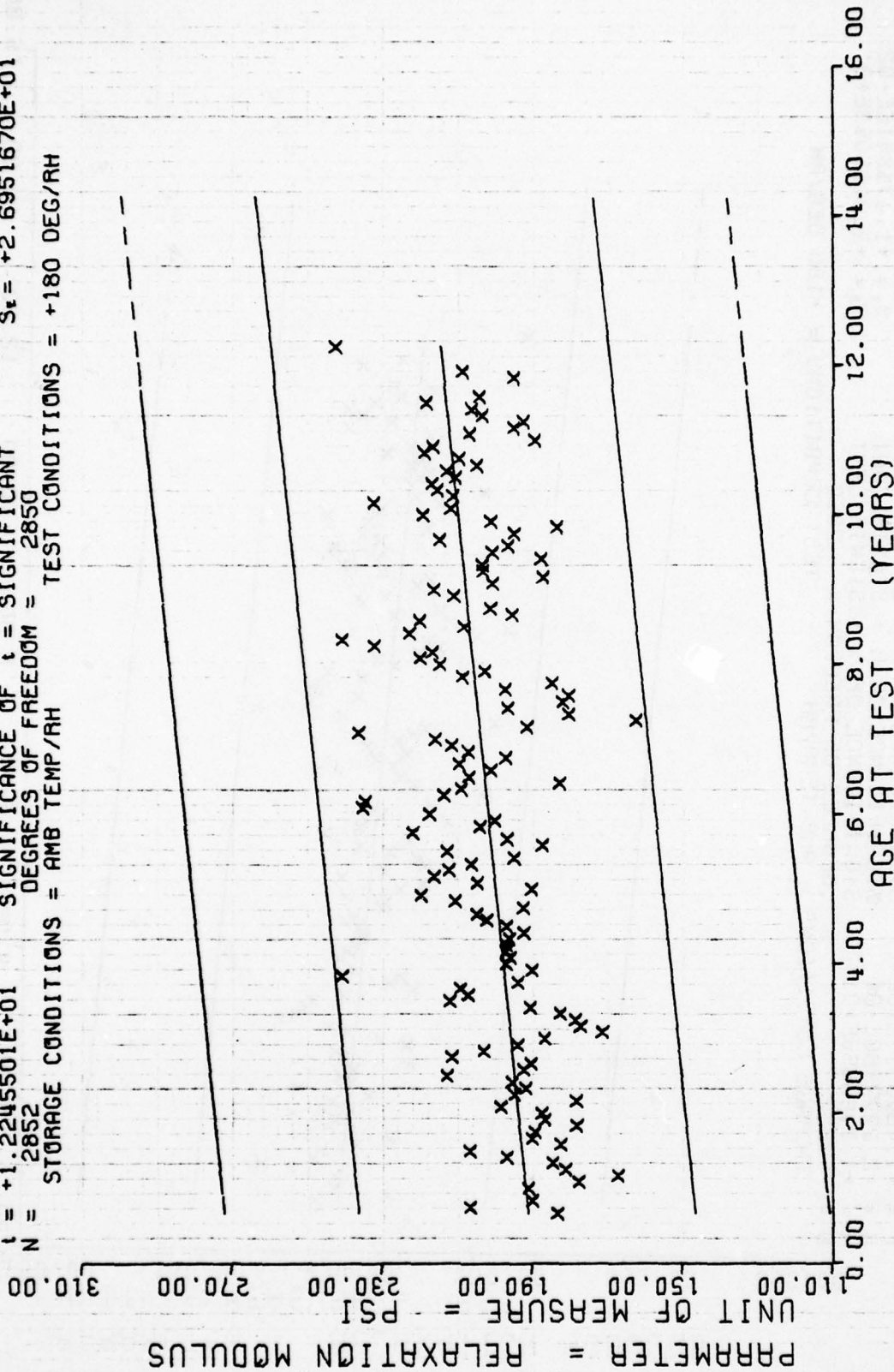
$Y = ((+2.0435185E+02) + (+1.8000183E-01) * X)$
 F = +1.4875597E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = +2.2272380E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +1.2196555E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2852 DEGREES OF FREEDOM = 2850
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +180 DEG/AH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 180 DEG F, TPH-1011

Figure 51

$Y = ((+1.9000371E+02) + (+1.6700302E-01) * X)$
 F = +1.4995231E+02 SIGNIFICANCE OF F = SIGNIFICANT $S_x = +2.7646760E+01$
 R = +2.2357302E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_y = +1.3637907E-02$
 t = +1.2245501E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +2.6951670E+01$
 N = 2852 DEGREES OF FREEDOM = 2850
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 180 DEG F, TPH-101

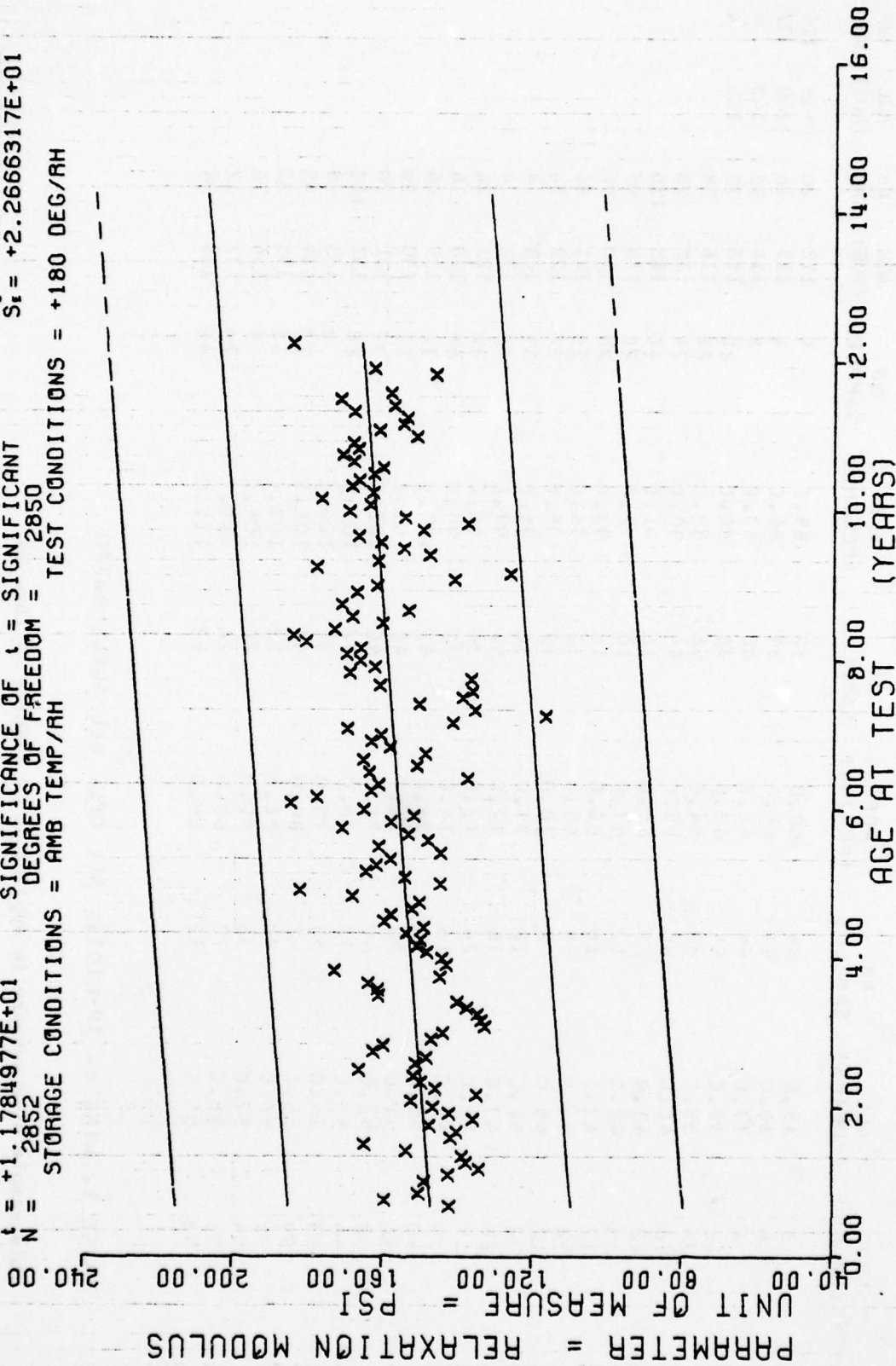
Figure 52

$F = +1.3888570E+02$
 $R = +2.1556294E-01$
 $t = +1.1784977E+01$
 $N = 2852$

$Y = ((+1.4632884E+02) + (+1.3516734E-01) * X)$

SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2850

STORAGE CONDITIONS = AMB TEMP/180
 TEST CONDITIONS = +180 DEG/RH



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 180 DEG F, TPH-1011

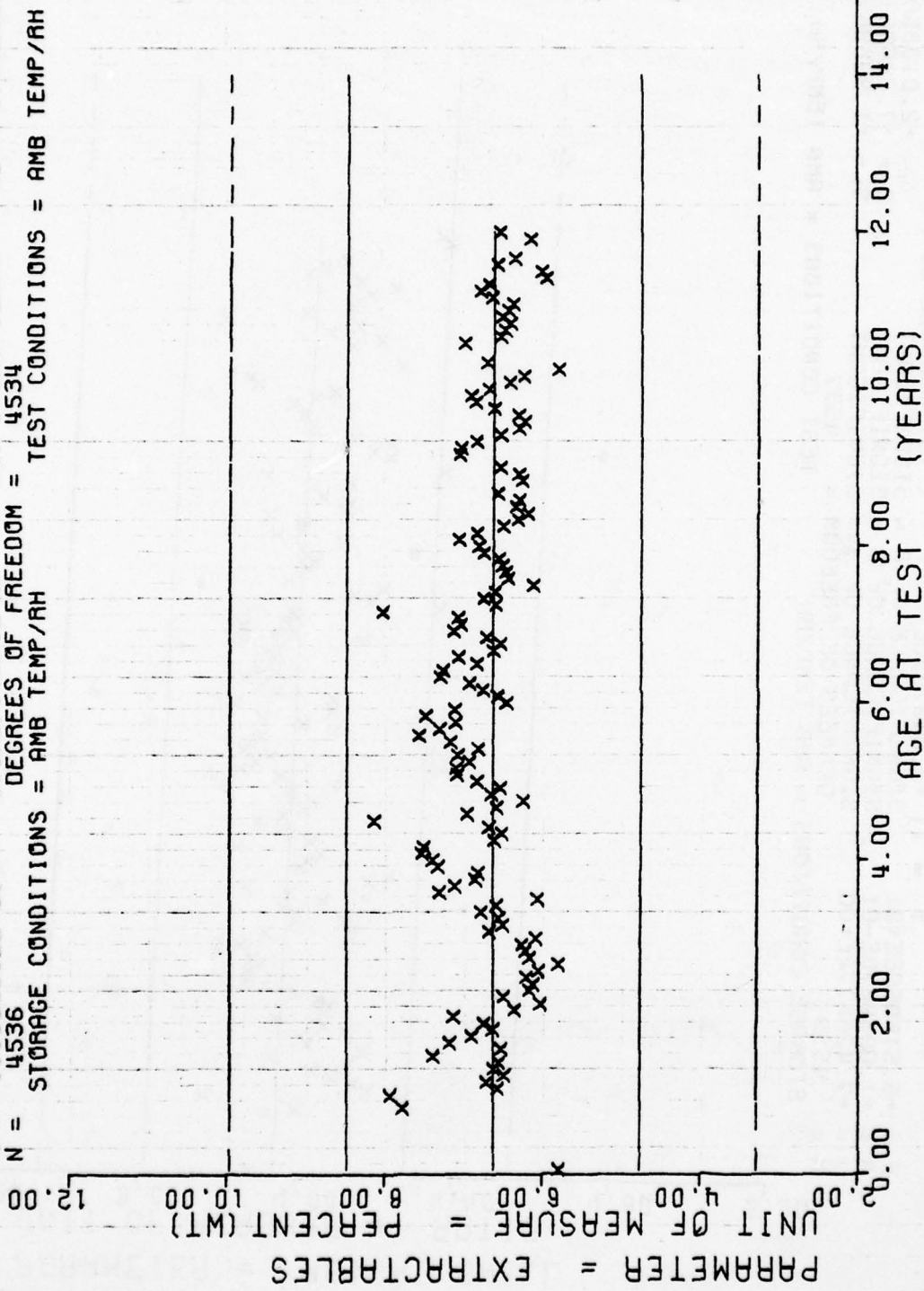
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.C	3	35.0	64	60.0	32	85.C	5	112	20	139	114	112	20	139	114
10.C	4	36.C	44	61.C	31	86.C	4	113	16	140	27	113	16	140	27
12.C	4	37.C	48	62.0	40	87.C	8	114	76	143	4	114	76	143	4
13.C	12	38.C	44	63.0	36	88.C	20	115	72	144	4	115	72	144	4
14.C	24	39.C	32	64.0	56	89.0	28	116	58			116	58		
15.0	16	40.C	40	65.0	44	90.0	24	117	28			117	28		
16.C	12	41.0	28	66.0	16	91.C	40	118	116			118	116		
17.C	28	42.0	12	67.0	16	92.0	20	119	95			119	95		
18.C	32	43.C	16	68.C	16	93.0	20	120	96			120	96		
19.C	52	44.0	4	69.0	12	94.C	28	121	64			121	64		
20.C	12	45.C	8	70.0	12	95.C	28	122	56			122	56		
21.C	32	46.C	12	71.0	36	96.C	31	123	4			123	4		
22.0	28	47.0	16	72.0	52	97.C	40	124	4			124	4		
23.C	24	48.C	24	73.0	36	98.C	32	127	24			127	24		
24.C	8	49.C	16	74.0	72	99.0	68	128	16			128	16		
25.0	40	50.0	8	75.0	52	100.C	76	129	44			129	44		
26.0	56	51.0	20	76.0	40	101.C	52	130	20			130	20		
27.C	32	52.0	60	77.0	40	102.0	32	131	70			131	70		
28.C	44	53.0	72	78.C	42	103.C	28	132	112			132	112		
29.C	43	54.0	38	79.0	38	104.C	8	133	75			133	75		
30.C	44	55.C	42	80.0	46	106.C	12	134	48			134	48		
31.C	72	56.C	70	81.0	23	107.C	12	135	32			135	32		
32.0	64	57.0	36	82.0	20	108.C	4	136	16			136	16		
33.C	52	58.C	70	83.0	24	110.C	24	137	12			137	12		
34.C	48	59.C	32	84.0	12	111.0	48	138	34			138	34		

STAGE 1, WING 6, TP-H1011, SCL GFL, GEL SWELL RATIO

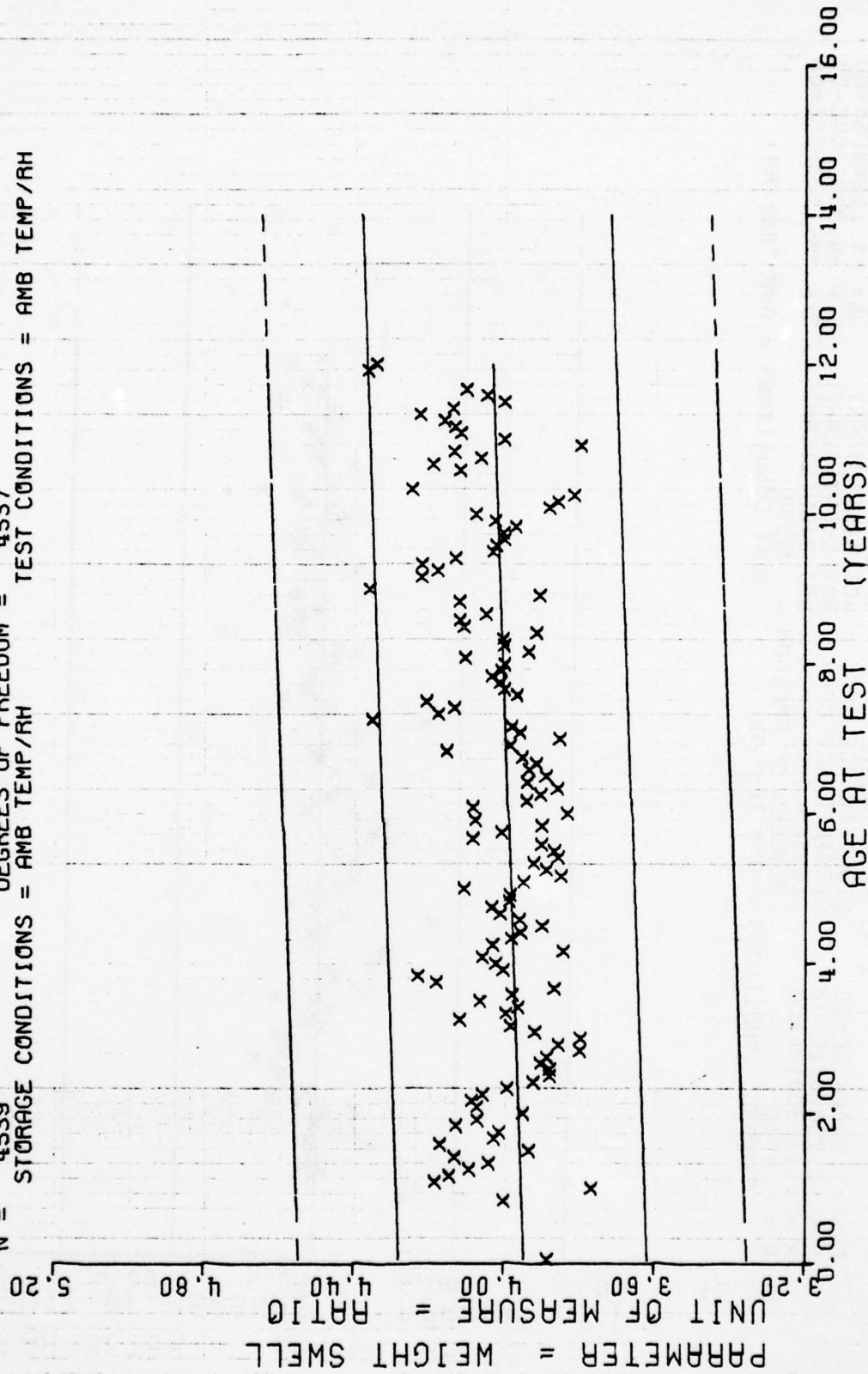
This sample size summary is applicable to figures 54 thru 56

$Y = ((+6.6414452E+00) + (-5.1276212E-04) * X)$
 F = +1.3996812E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_f = +1.1124425E+00$
 R = -1.7567371E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_e = +4.3341244E-04$
 t = +1.1830812E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_r = +1.1123935E+00$
 N = 4536 DEGREES OF FREEDOM = 4534



STAGE 1, WING 6 TP-H1011, SOL GEL, PERCENT EXTRACTABLES

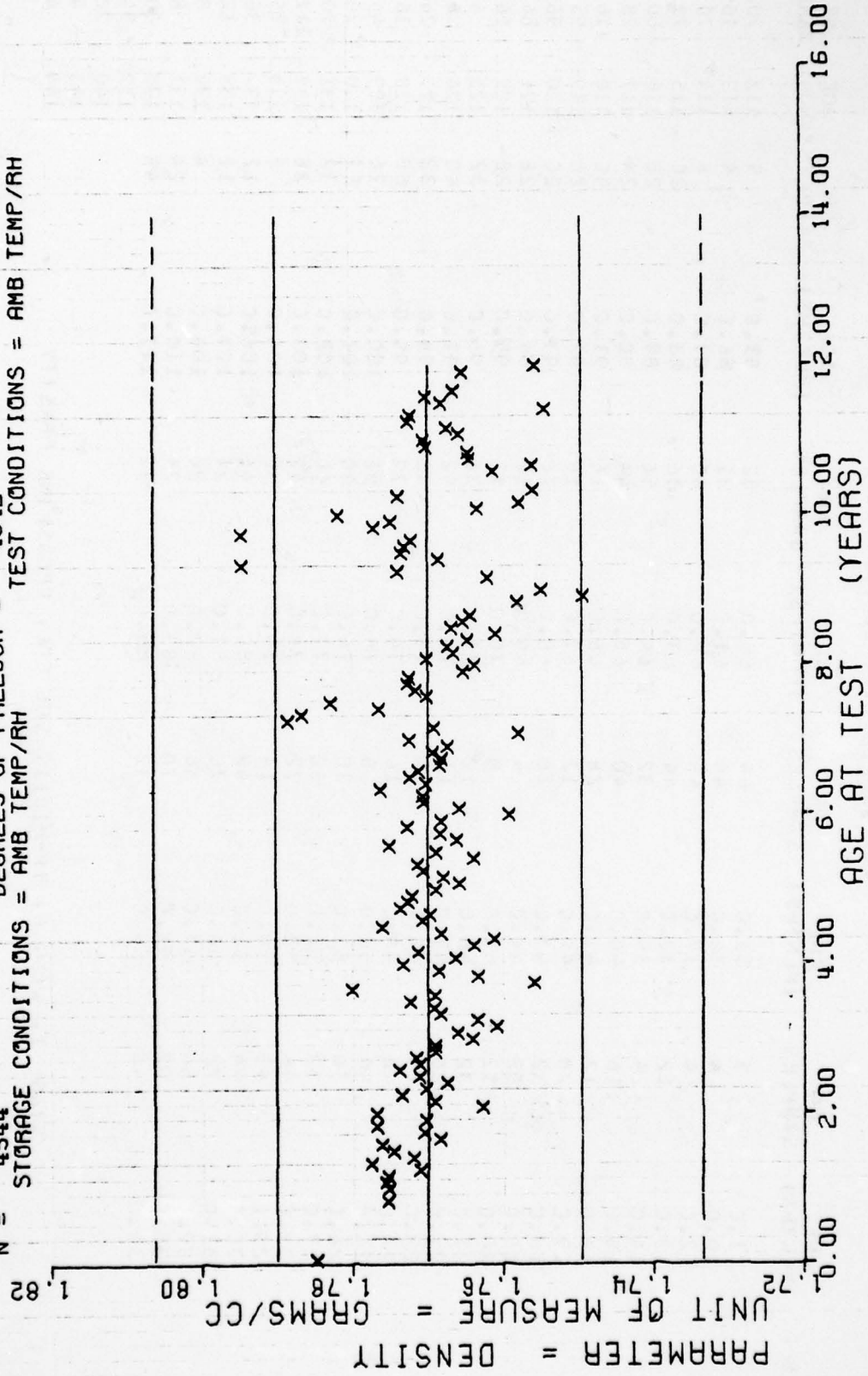
$Y = ((+3.9497930E+00) + (+5.7832852E-04) * X)$
 F = +5.5158506E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +2.0108581E-01$
 R = +1.0959678E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +7.7869675E-05$
 t = +7.4268772E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +1.9989652E-01$
 N = 4539 DEGREES OF FREEDOM = 4537
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 6, TP-H1011, SOL GEL, GEL SWELL RATIO

Figure 55

$Y = ((+1.7699814E+00) + (-4.3488019E-06) * X)$
 F = +8.4803424E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_1 = +1.2125541E-02$
 R = -1.3662890E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_0 = +4.7224017E-06$
 t = +9.2088774E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_e = +1.2125744E-02$
 N = 4544 DEGREES OF FREEDOM = 4542
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 6, TP-H1011, SOL GEL, DENSITY

AD-A057 428

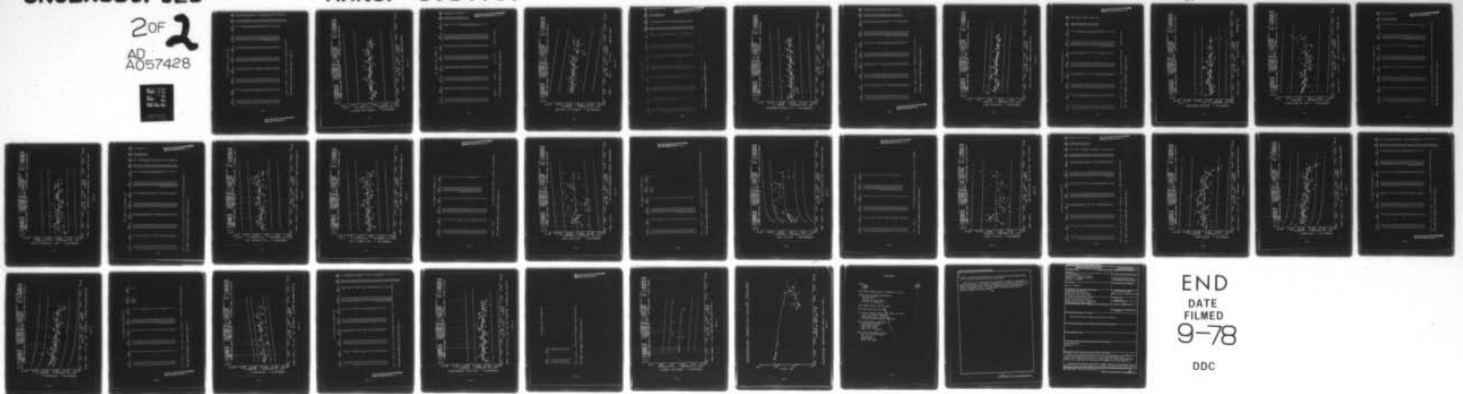
OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE I. PHASE E,--ETC(U)
JUN 78 J A THOMPSON
MANCP-396(78)

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*** SAMPLE SIZE SUMMARY ***

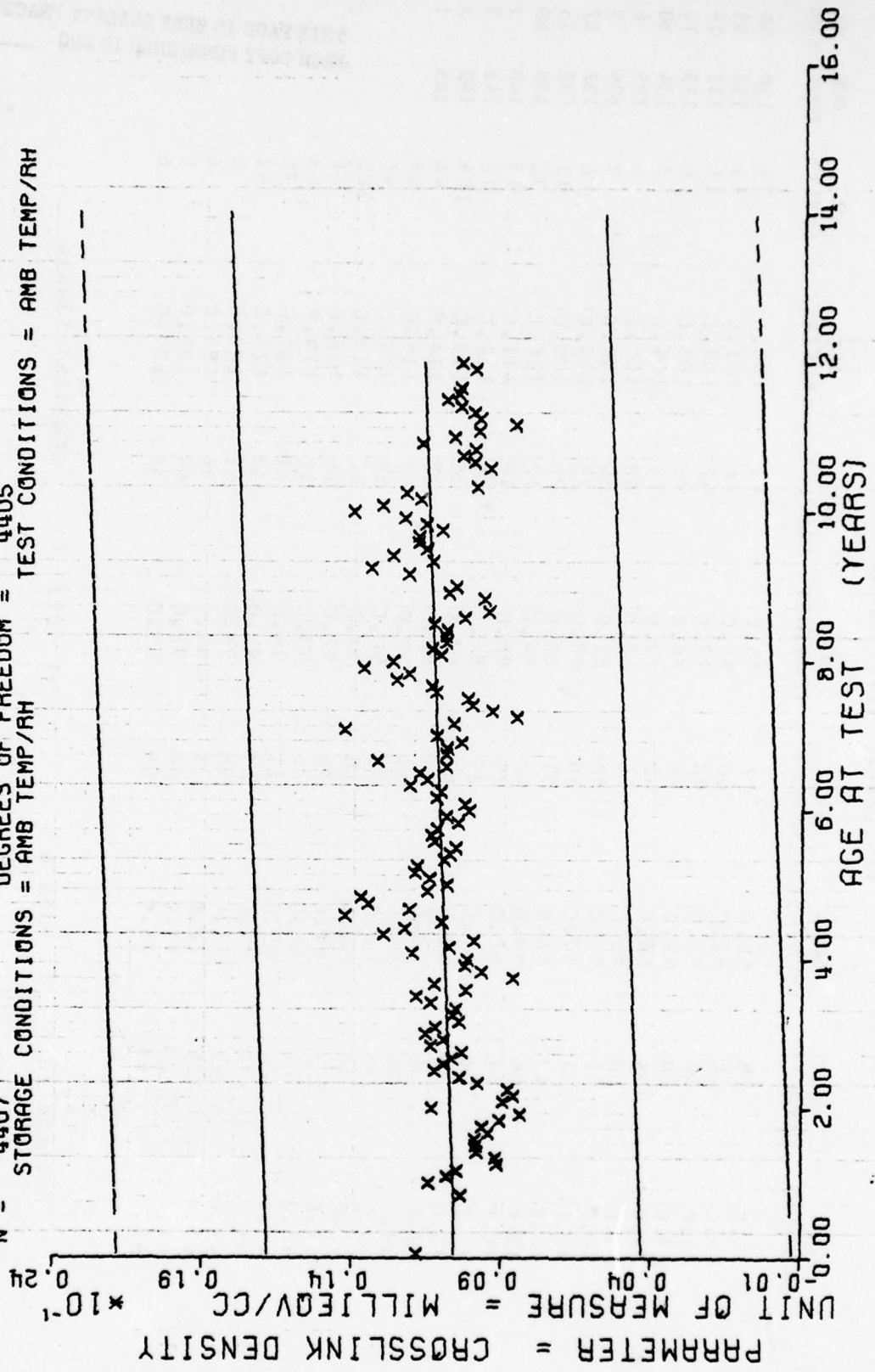
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	3	35.0	64	60.0	32	85.0	9	112	20		
10.0	4	36.0	44	61.0	32	86.0	4	113	16		
12.0	4	37.0	48	62.0	40	87.0	8	114	76		
13.0	12	38.0	44	63.0	36	88.0	20	115	72		
14.0	24	39.0	32	64.0	56	89.0	28	116	60		
15.0	16	40.0	40	65.0	44	90.0	24	117	28		
16.0	12	41.0	28	66.0	16	91.0	40	118	116		
17.0	28	42.0	12	67.0	16	92.0	20	119	95		
18.0	32	43.0	16	68.0	16	93.0	20	120	96		
19.0	52	44.0	4	69.0	12	94.0	28	121	64		
20.0	12	45.0	8	70.0	12	95.0	28	122	56		
21.0	32	46.0	12	71.0	36	96.0	32	123	4		
22.0	28	47.0	16	72.0	52	97.0	40	124	4		
23.0	24	48.0	24	73.0	36	98.0	32	127	24		
24.0	8	49.0	16	74.0	72	99.0	68	128	16		
25.0	40	50.0	8	75.0	52	100.0	76	129	44		
26.0	56	51.0	20	76.0	40	101.0	52	130	20		
27.0	32	52.0	60	77.0	40	102.0	32	131	70		
28.0	44	53.0	72	78.0	42	103.0	28	132	112		
29.0	43	54.0	14	79.0	38	104.0	8	133	75		
30.0	44	55.0	42	80.0	46	106.0	12	134	36		
31.0	72	56.0	70	81.0	24	107.0	12	135	12		
32.0	64	57.0	36	82.0	20	108.0	4	136	8		
33.0	52	58.0	70	83.0	24	110.0	24	137	8		
34.0	48	59.0	32	84.0	12	111.0	48	138	30		
								139	54		
								140	22		
								143	4		
								144	4		

STAGE 1, WING 6, IP-H1011, SCL GEL, CRCSLINK DENSITY

This sample size summary is applicable to figure 57

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$Y = ((+1.0560424E-02) + (+8.0927375E-06) * X)$
 F = +2.8505635E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +8.0184741E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +5.3390669E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 4407 DEGREES OF FREEDOM = 4405
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 6, TP-H1011, SOL GEL, CROSSLINK DENSITY

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
24.C	19	50.0	17	75.0	48	100.0	36	130	54
25.C	64	51.C	60	76.C	46	101.C	18	131	93
25.0	22	52.0	90	77.C	42	102.C	11	132	18
27.C	29	53.C	72	78.0	72	103.C	6	133	12
28.C	34	54.C	42	79.0	17	104.0	3	134	30
29.C	59	55.C	28	80.C	48	105.C	3	135	6
30.C	31	56.0	62	81.0	35	106.C	2	136	9
31.C	51	57.C	69	82.0	23	107.0	6	137	27
32.C	67	58.0	51	83.C	25	109.0	33	138	75
33.C	56	59.0	22	84.0	16	110.C	30	139	60
34.C	61	60.C	20	85.0	18	111.C	17	140	9
35.C	36	61.C	27	86.C	24	112.C	22	141	3
36.0	26	62.0	63	87.0	30	113.C	104	142	3
37.C	34	63.C	58	88.0	23	114.C	44	145	3
38.C	26	64.C	65	89.0	43	115.0	48		
39.0	33	65.0	22	90.C	54	116.C	45		
40.C	30	66.0	10	91.0	30	117.C	101		
41.C	9	67.C	36	92.0	26	118.C	28		
42.C	21	68.0	26	93.C	16	119.0	63		
43.C	24	69.0	11	94.C	31	120.C	75		
44.C	10	70.C	17	95.0	33	121.0	42		
46.C	13	71.C	28	96.C	41	122.0	6		
47.0	15	72.0	21	97.C	86	125.C	6		
48.C	19	73.C	66	98.0	67	126.C	6		
49.C	43	74.C	54	99.0	38	129.0	6		

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STAGE 1 WING 6 TP-T 1011 CCNSTANT STRAIN

This sample size summary is applicable to figure 58

$Y = ((+2.6480863E+01) + (-2.3701098E-02) * X)$
 F = +3.5061230E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = -2.8480029E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +1.8724644E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 3974 DEGREES OF FREEDOM = 3972
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

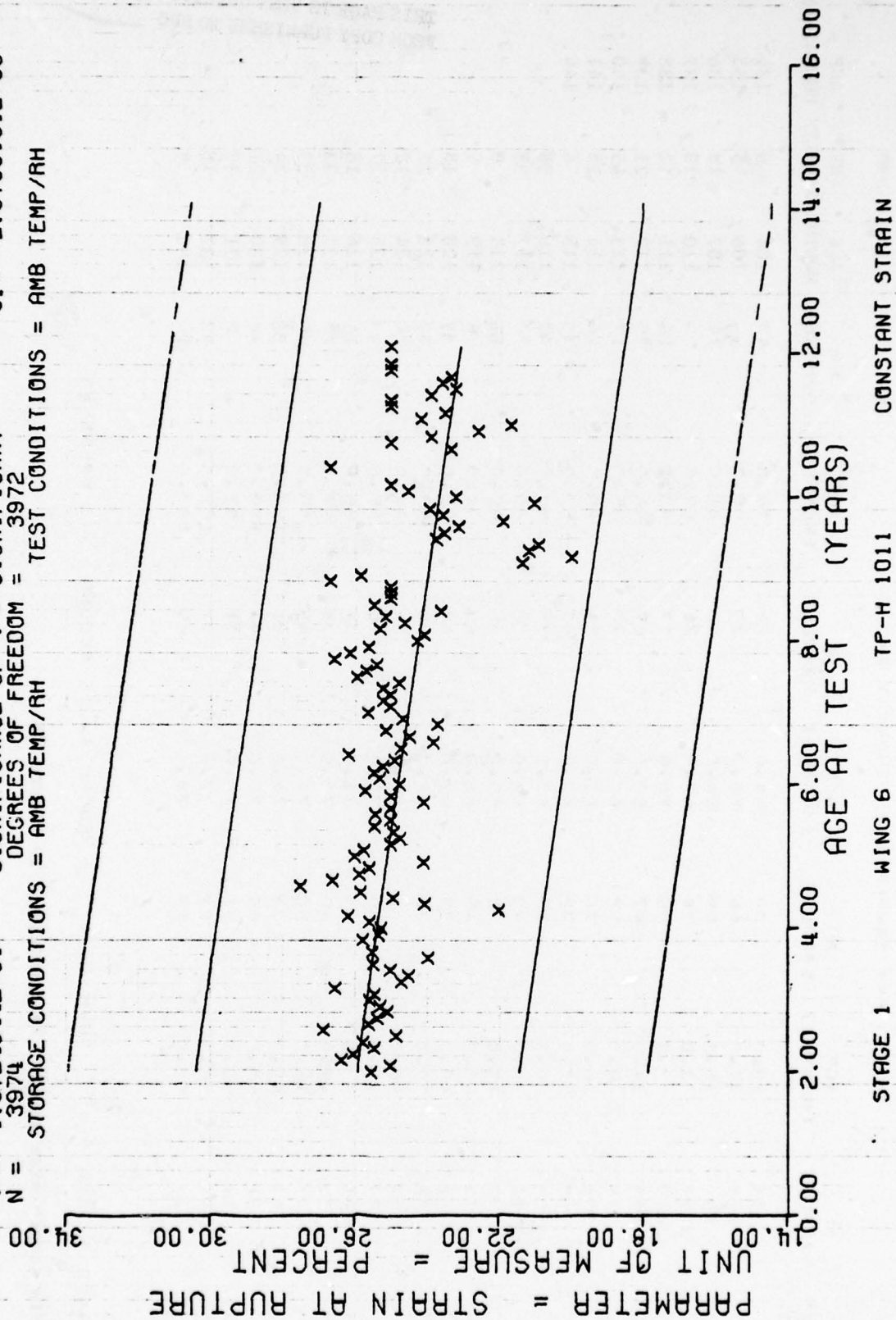


Figure 58

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NI SAMPLES	AGE (MONTHS)	NO SAMPLES	AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
4.0	76	29.0	70	54.0	54	79.0	43	104	6
5.0	108	30.0	66	55.0	77	80.0	57	106	5
6.0	120	31.0	59	56.0	48	81.0	72	107	18
7.0	117	32.0	70	57.0	71	82.0	59	110	18
8.0	117	33.0	59	58.0	57	83.0	14	111	12
9.0	125	34.0	47	59.0	67	84.0	35	112	21
10.0	114	35.0	52	60.0	70	85.0	17	113	45
11.0	124	36.0	76	61.0	51	86.0	46	114	15
12.0	63	37.0	32	62.0	60	87.0	30	115	6
13.0	123	38.0	57	63.0	78	88.0	47	116	33
14.0	110	39.0	40	64.0	58	89.0	20	117	33
15.0	132	40.0	32	65.0	56	90.0	64	118	6
16.0	114	41.0	45	66.0	45	91.0	25	119	9
17.0	136	42.0	33	67.0	48	92.0	37	120	18
18.0	108	43.0	31	68.0	24	93.0	32	123	21
19.0	52	44.0	3	69.0	46	94.0	29	124	12
20.0	27	45.0	25	70.0	110	95.0	53	125	27
21.0	50	46.0	63	71.0	37	96.0	14	126	18
22.0	33	47.0	40	72.0	75	97.0	70	127	33
23.0	75	48.0	50	73.0	45	98.0	55	128	33
24.0	57	49.0	28	74.0	51	99.0	58	129	24
25.0	76	50.0	40	75.0	64	100.0	42	130	21
26.0	74	51.0	61	76.0	71	101.0	8	131	32
27.0	42	52.0	62	77.0	72	102.0	12	132	18
28.0	74	53.0	24	78.0	69	103.0	10	133	9

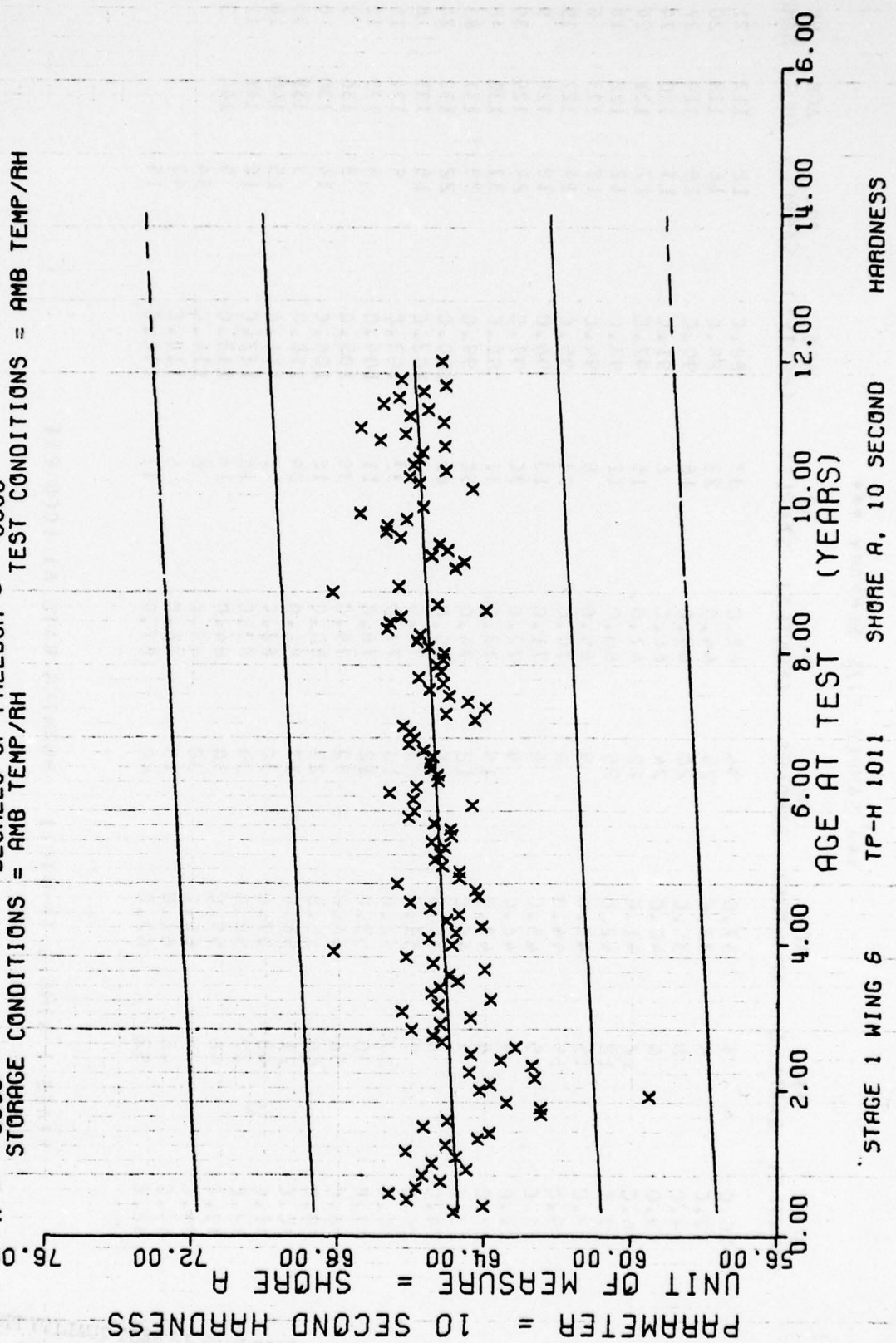
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STAGE 1 WING 5 TP-H 1311 SHORE A, 10 SECOND ADDRESS

This sample size summary is applicable to figure 59

$Y = ((+6.4688319E+01) + (+9.1945893E-03) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 N = 6858 DEGREES OF FREEDOM = 6856
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

F = +1.3858691E+02
 R = +1.4076026E-01
 t = +1.1772294E+01
 N = 6858



STAGE 1 WING 6 TP-H 1011 SHORE A, 10 SECOND HARDNESS

Figure 59

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MCNTHS)	NR SAMPLES	AGE (MOS)	NR SAMP
10.C	3	37.0	36	63.C	33	88.C	12	117	21
12.C	6	38.0	23	64.0	23	85.C	16	118	20
14.C	6	35.C	20	65.0	16	90.0	28	119	27
15.C	6	40.C	24	66.C	6	91.C	17	120	74
16.C	12	41.C	12	67.0	15	92.C	17	121	24
17.C	12	42.C	25	68.0	12	93.0	12	122	18
18.C	15	43.0	9	69.C	5	94.C	11	123	6
19.C	15	44.0	6	70.C	21	95.C	14	127	19
20.C	15	45.C	6	71.0	13	96.0	18	128	9
21.C	9	46.0	9	72.C	30	97.C	24	129	39
22.C	6	47.0	15	73.0	32	98.C	37	130	48
23.C	3	49.C	12	74.0	50	99.C	33	131	83
24.C	6	50.C	15	75.0	62	100.C	22	132	24
25.C	9	51.0	3	76.C	42	102.C	15	133	8
26.C	17	52.C	13	77.0	33	103.C	5	134	15
27.C	30	53.C	12	78.C	11	104.0	4	135	12
28.0	36	54.0	32	79.C	39	105.C	3	136	9
29.C	46	55.0	27	80.C	18	106.C	14	138	6
30.C	21	56.0	17	81.0	24	110.0	3	139	35
31.C	48	57.C	30	82.C	15	111.C	15	140	18
32.C	37	58.0	39	83.0	15	112.C	12	141	12
33.C	46	59.C	30	84.0	14	113.C	9	144	3
34.C	38	60.C	38	85.C	6	114.0	54		
35.C	46	61.0	15	86.0	5	115.C	47		
36.C	52	62.C	40	87.0	12	116.C	19		

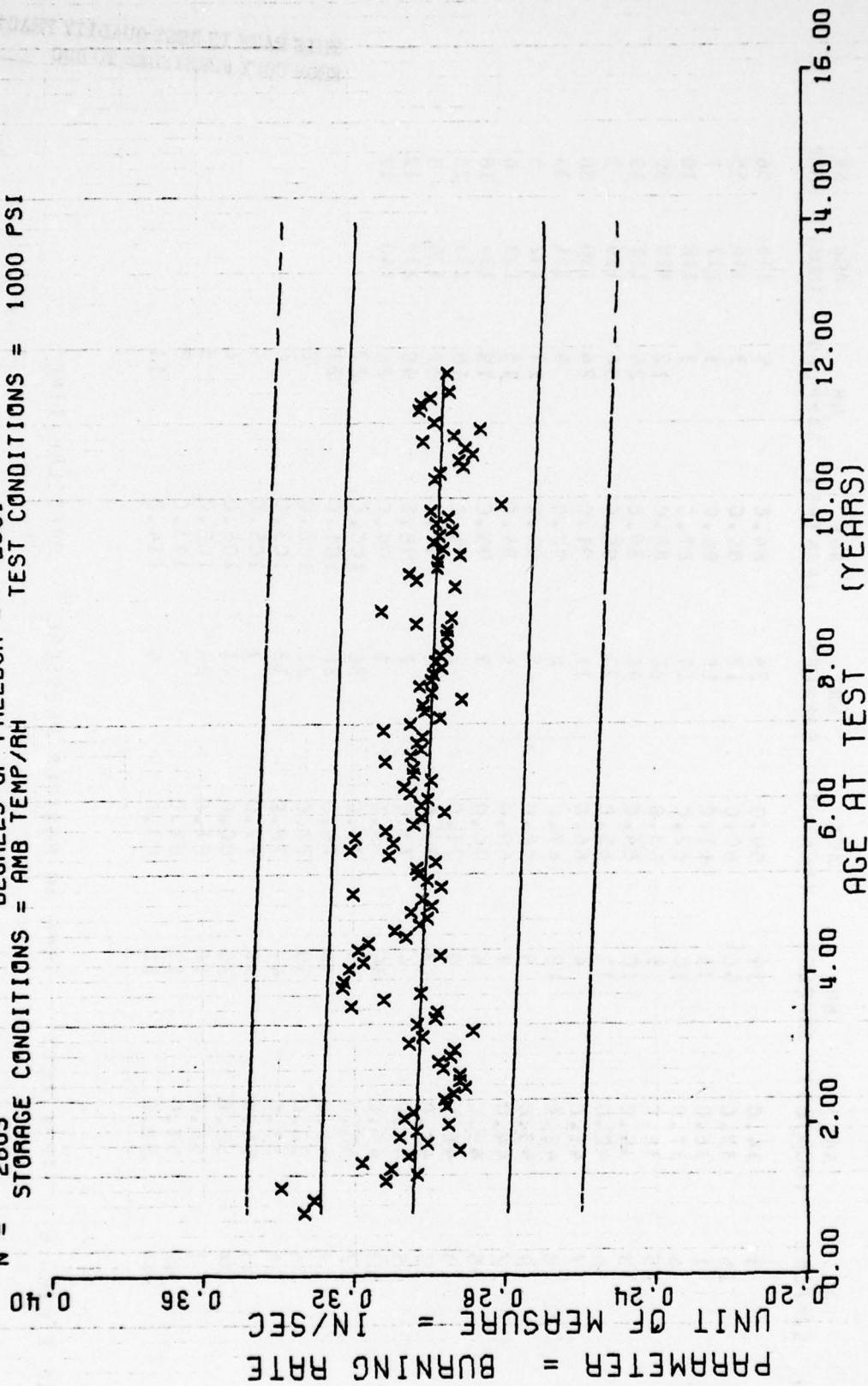
STAGE I WING 6 TP-H1C11 BURNING RATE AT ICCO PSI

This sample size summary is applicable to figure 60

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$Y = ((+3.0499257E-01) + (-7.4027421E-05) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2603 DEGREES OF FREEDOM = 2601
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 1000 PSI

$\sigma_1 = +1.5029487E-02$
 $S_0 = +7.9820081E-06$
 $S_t = +1.4789823E-02$



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*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
8.C	3	34.0	39	59.0	24	84.C	5	115	56
10.C	15	35.C	50	60.0	13	85.0	3	116	55
11.C	1	36.0	39	61.0	10	86.C	3	117	7
12.C	6	37.0	10	62.C	17	87.C	3	118	10
13.C	15	38.C	5	63.0	20	88.0	12	120	39
14.C	13	39.C	10	64.C	40	89.C	24	121	12
15.C	16	40.0	11	65.0	27	90.C	36	129	3
16.C	17	41.C	4	66.0	18	91.C	24	130	36
17.C	18	42.C	12	67.0	8	92.0	9	131	33
18.C	19	43.0	4	68.C	5	93.C	17	132	5
19.C	22	44.0	7	69.0	4	94.C	15	133	6
20.C	35	45.C	4	70.0	7	95.C	19	134	18
21.C	13	46.C	9	71.C	2	96.C	18	135	25
22.C	13	47.0	13	72.0	6	97.C	28	136	3
23.C	15	48.0	4	73.0	2	98.0	40	139	12
24.C	13	49.C	30	74.C	1	99.C	26	140	12
25.C	22	50.0	13	75.C	30	100.C	23		
26.C	27	51.0	38	76.0	26	101.C	21		
27.C	36	52.C	39	77.0	22	102.C	8		
28.C	38	53.0	47	78.C	13	103.C	6		
29.C	43	54.0	37	79.0	7	105.C	5		
30.C	24	55.C	25	80.C	21	106.0	6		
31.C	51	56.0	18	81.C	24	108.C	3		
32.C	42	57.0	19	82.C	7	113.C	3		
33.C	54	58.C	16	83.0	5	114.0	11		

STAGE I WING 6 TP-T 1C11 TIME TO MAXIMUM PRESSURE PRESSURE TIME

This sample size summary is applicable to figures 61 and 62

$Y = ((+3.5983647E+03) + (-1.4161747E-01) * X)$
 F = +5.9373170E+00 SIGNIFICANCE OF F = SIGNIFICANT
 R = -5.2441499E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +2.4366610E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2155 DEGREES OF FREEDOM = 2153
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 500 PSI INT PRES

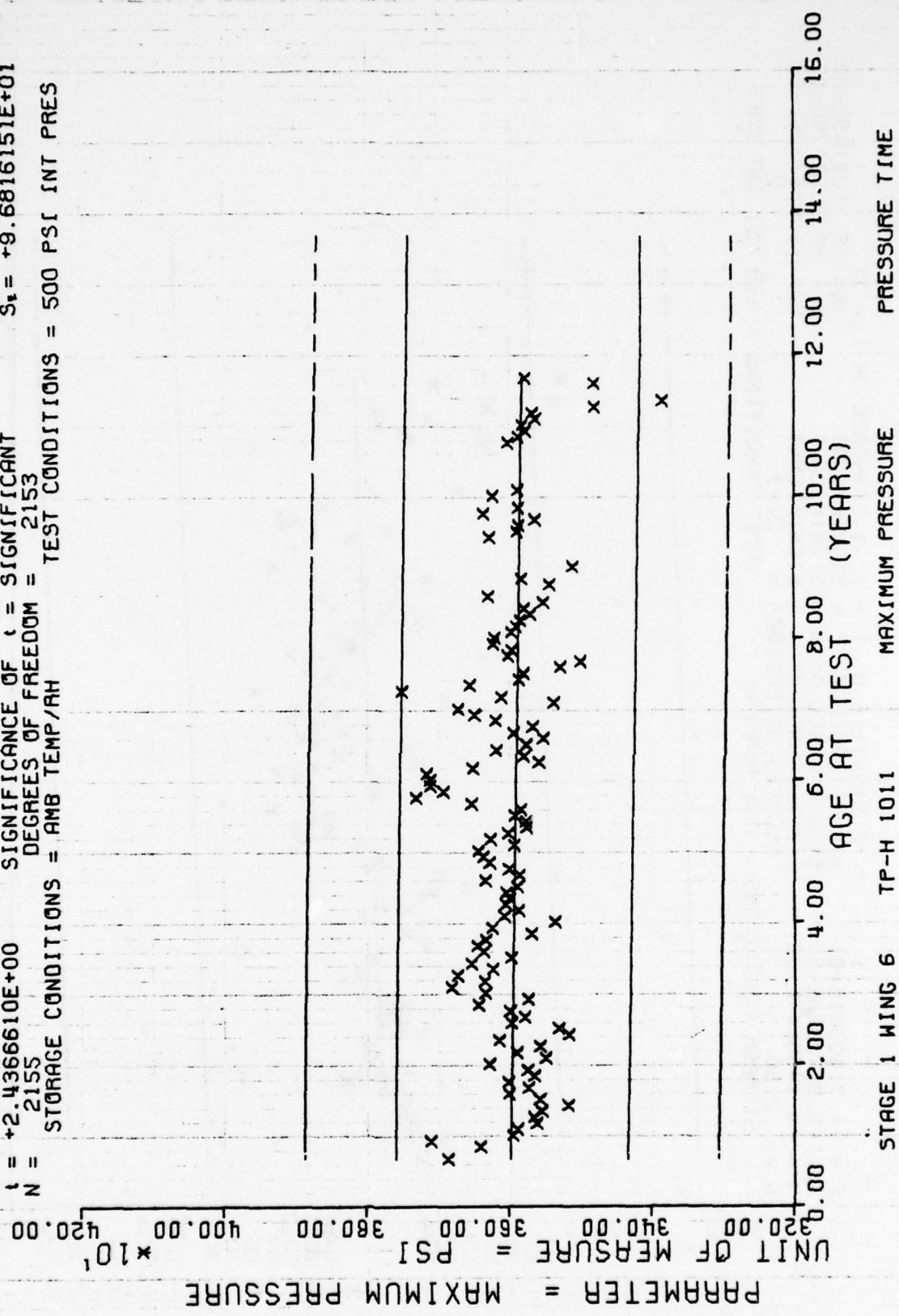


Figure 61

$Y = ((+6.9144111E-01) + (-1.4635562E-04) * X)$
 F = +1.7140301E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = -8.8872076E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +4.1400847E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2155 DEGREES OF FREEDOM = 2153
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 500 PSI INT PRES

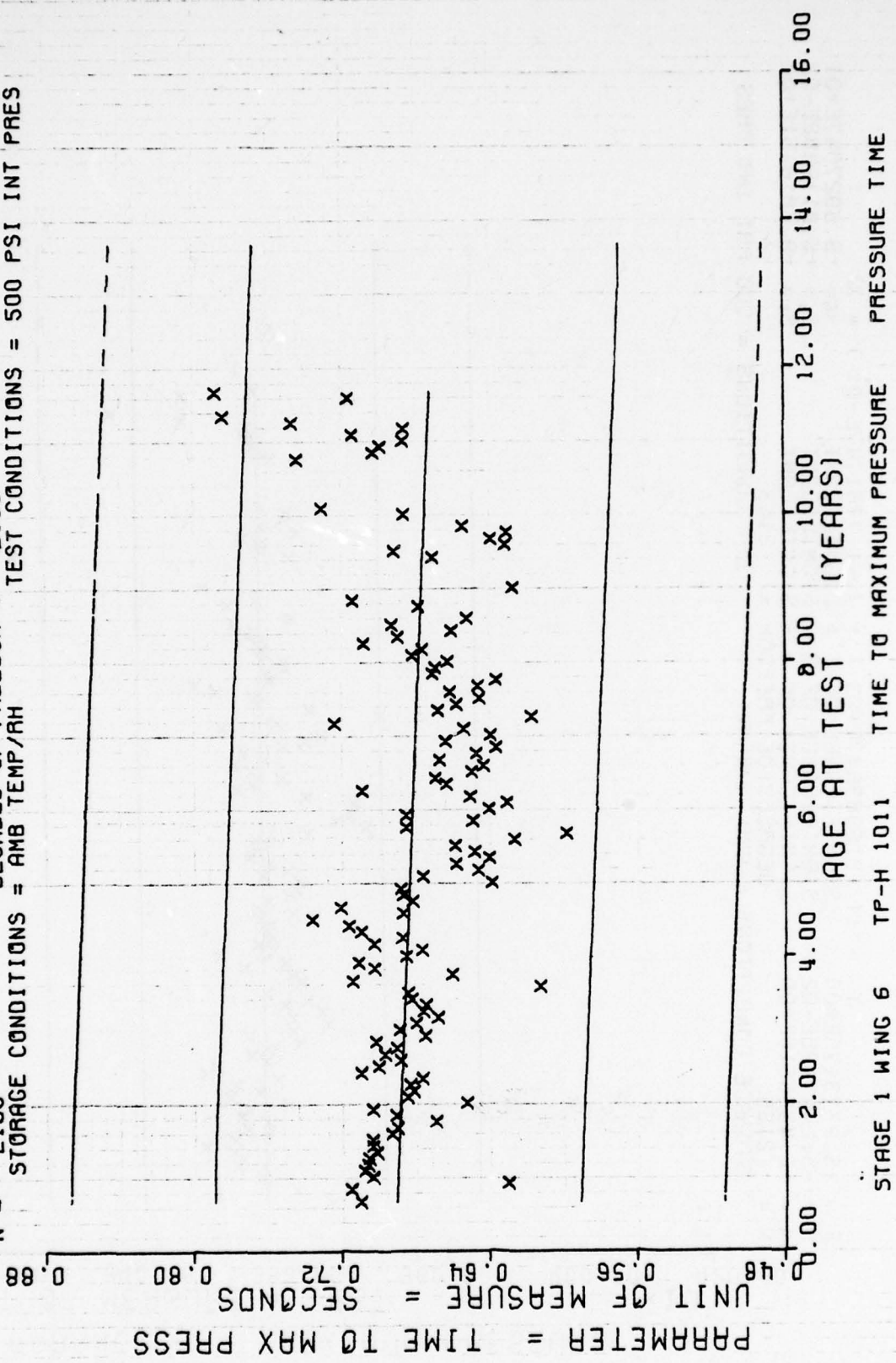


Figure 62

*** SAMPLE SIZE SUMMARY ***

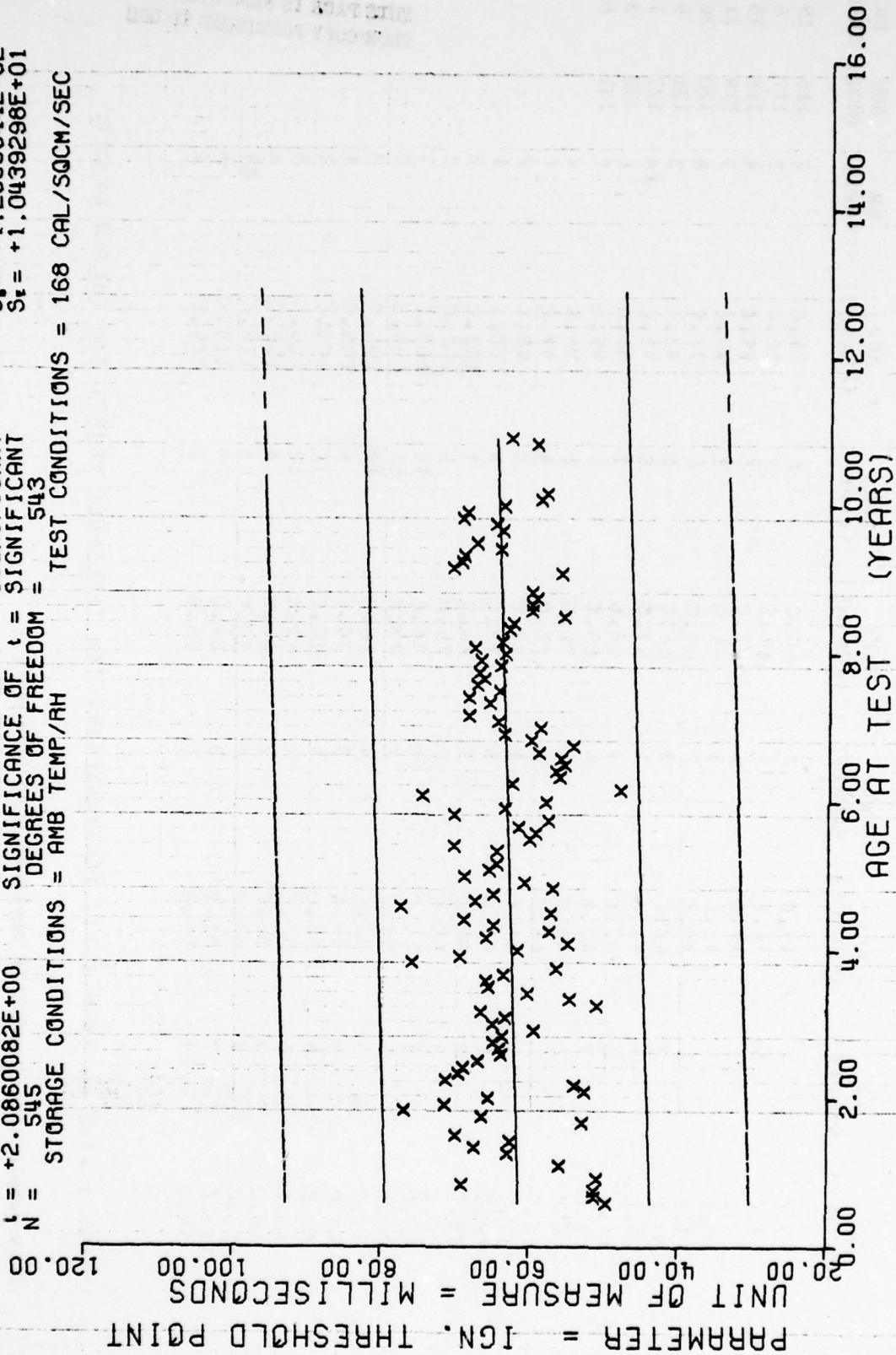
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MCNTHS)	NR SAMPLES	AGE (MOS)	NR SAMP
7.C	7	35.C	2	60.0	6	86.0	2	116	19
8.C	6	36.C	14	61.C	3	88.C	3	117	6
9.0	3	37.0	6	62.C	5	89.C	4	118	15
10.C	5	38.C	3	64.0	8	90.C	7	119	21
11.C	1	39.C	2	65.0	5	91.C	8	120	26
13.C	2	40.C	3	66.0	6	92.C	3	121	9
15.C	3	41.0	3	67.0	9	93.C	14	122	1
16.C	2	42.C	3	68.0	3	94.0	6	130	3
17.C	3	43.0	4	69.C	5	95.0	5	131	6
18.C	2	44.0	3	70.0	6	96.C	2		
20.C	2	45.0	2	71.0	4	97.0	6		
21.C	2	46.C	1	72.0	3	98.C	2		
22.0	1	47.0	5	73.0	4	100.C	1		
23.C	6	48.0	5	74.0	1	101.C	2		
24.C	3	49.C	2	75.0	3	102.C	3		
25.0	3	50.0	4	76.C	10	103.C	1		
26.0	1	51.0	2	77.0	10	104.C	2		
27.C	3	52.C	4	78.0	12	105.0	3		
28.0	3	53.C	3	79.C	4	105.0	1		
29.C	6	54.0	4	80.C	10	109.C	1		
30.C	6	55.0	2	81.0	12	110.0	3		
31.C	7	56.C	2	82.C	4	111.0	6		
32.C	7	57.0	2	83.C	6	112.C	11		
33.C	7	58.C	3	84.0	4	113.C	4		
34.C	11	59.C	6	85.0	2	114.C	2		

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STAGE I WING 6, TP-H 1011, IGNITABILITY, IGN THRESHOLD PCINT, 168 CAL/SQ CM/SEC

This sample size summary is applicable to figure 63

$Y = ((+6.1387015E+01) + (+2.6979481E-02) * X)$
 F = +4.3514306E+00 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +1.0471406E+01$
 R = +8.9162636E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +1.2933544E-02$
 t = +2.0860082E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +1.0439296E+01$
 N = 545 DEGREES OF FREEDOM = 543
 STORAGE CONDITIONS = AMB TEMP/4H TEST CONDITIONS = 168 CAL/SQCM/SEC



STAGE 1 WING 6, TP-H 1011, IGNITABILITY, IGN THRESHOLD POINT, 168 CAL/SQ CM/SEC

Figure 63

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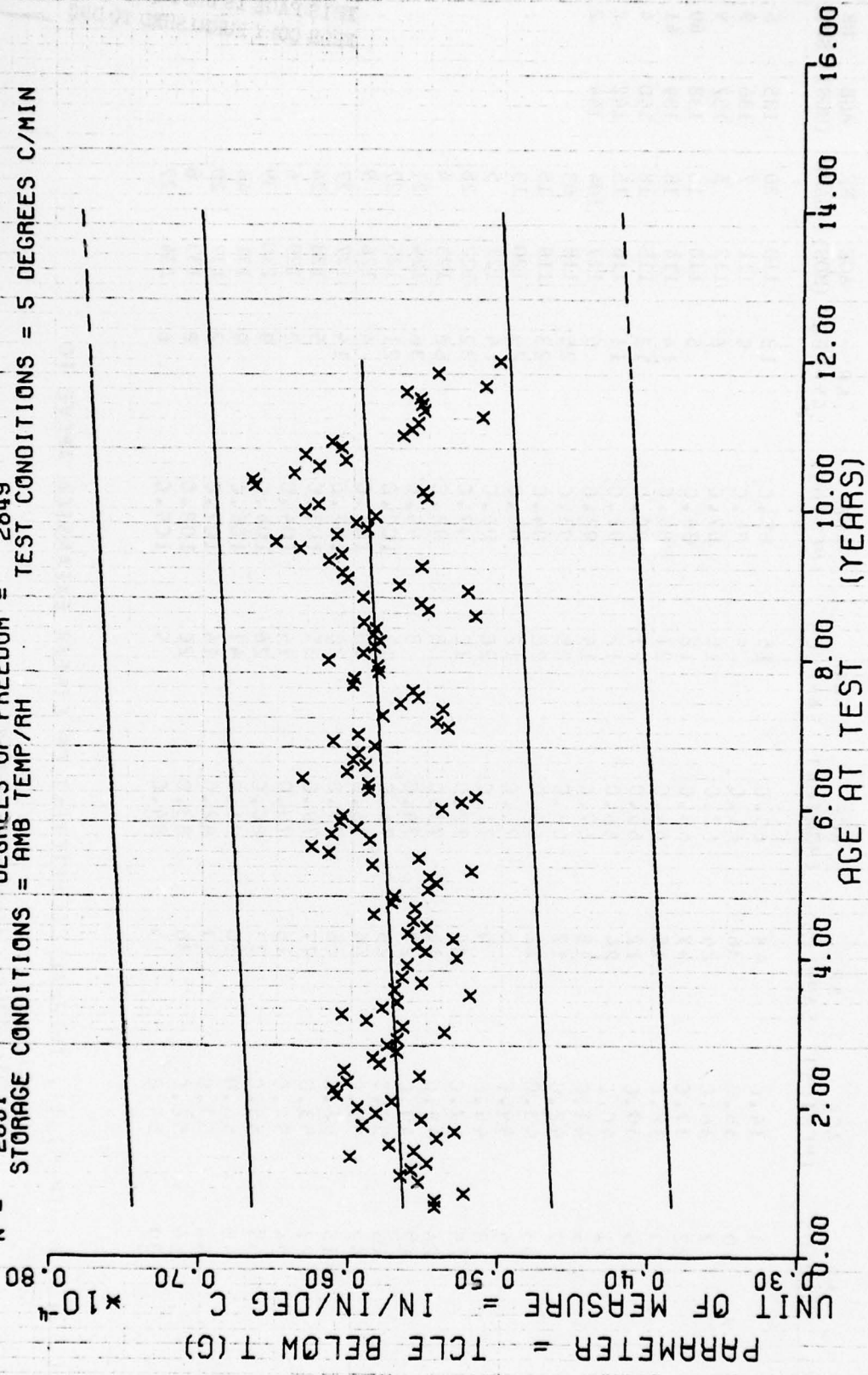
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
8.C	3	34.C	48	60.C	15	85.C	13	110	20	135	8
9.C	10	35.0	36	61.C	9	86.C	9	111	7	136	9
10.C	7	36.C	24	62.0	15	87.C	6	112	5	137	9
12.C	22	37.C	47	63.0	12	88.0	5	113	16	138	60
13.0	29	38.C	15	64.C	21	89.C	14	114	18	139	41
14.C	15	39.C	12	65.0	21	90.C	13	115	18	140	4
15.C	21	40.C	24	66.0	12	91.0	11	116	15	142	2
15.0	24	41.C	18	67.0	14	92.0	5	117	104	144	2
17.C	9	42.0	12	68.C	25	93.C	25	118	63		
18.C	33	43.0	12	69.0	26	94.C	23	119	15		
19.C	4	44.C	6	70.C	12	95.0	29	120	13		
20.C	8	45.0	9	71.C	20	96.C	14	121	5		
21.C	25	47.0	32	72.0	10	97.C	32	122	28		
22.C	24	48.C	11	73.0	8	98.0	68	123	4		
23.C	12	49.0	27	74.0	3	99.C	36	124	21		
24.C	18	50.0	25	75.0	13	100.C	21	125	27		
25.C	42	51.C	64	76.0	19	101.0	4	126	9		
25.0	15	52.0	66	77.C	20	102.0	14	127	27		
27.C	27	53.0	77	78.C	35	103.C	5	128	24		
28.C	24	54.0	15	79.0	14	104.C	3	129	6		
29.C	39	55.C	33	80.C	26	105.0	9	130	39		
30.C	42	56.0	30	81.C	41	106.C	9	131	44		
31.C	48	57.C	27	82.0	14	107.C	2	132	20		
32.C	54	58.C	36	83.0	20	108.0	8	133	8		
33.0	39	59.C	15	84.C	5	109.C	6	134	27		

STAGE 1, WING 6, TP-HIC11, THERMAL COEFFICIENT OF LINEAR EXPANSION ABOVE TG

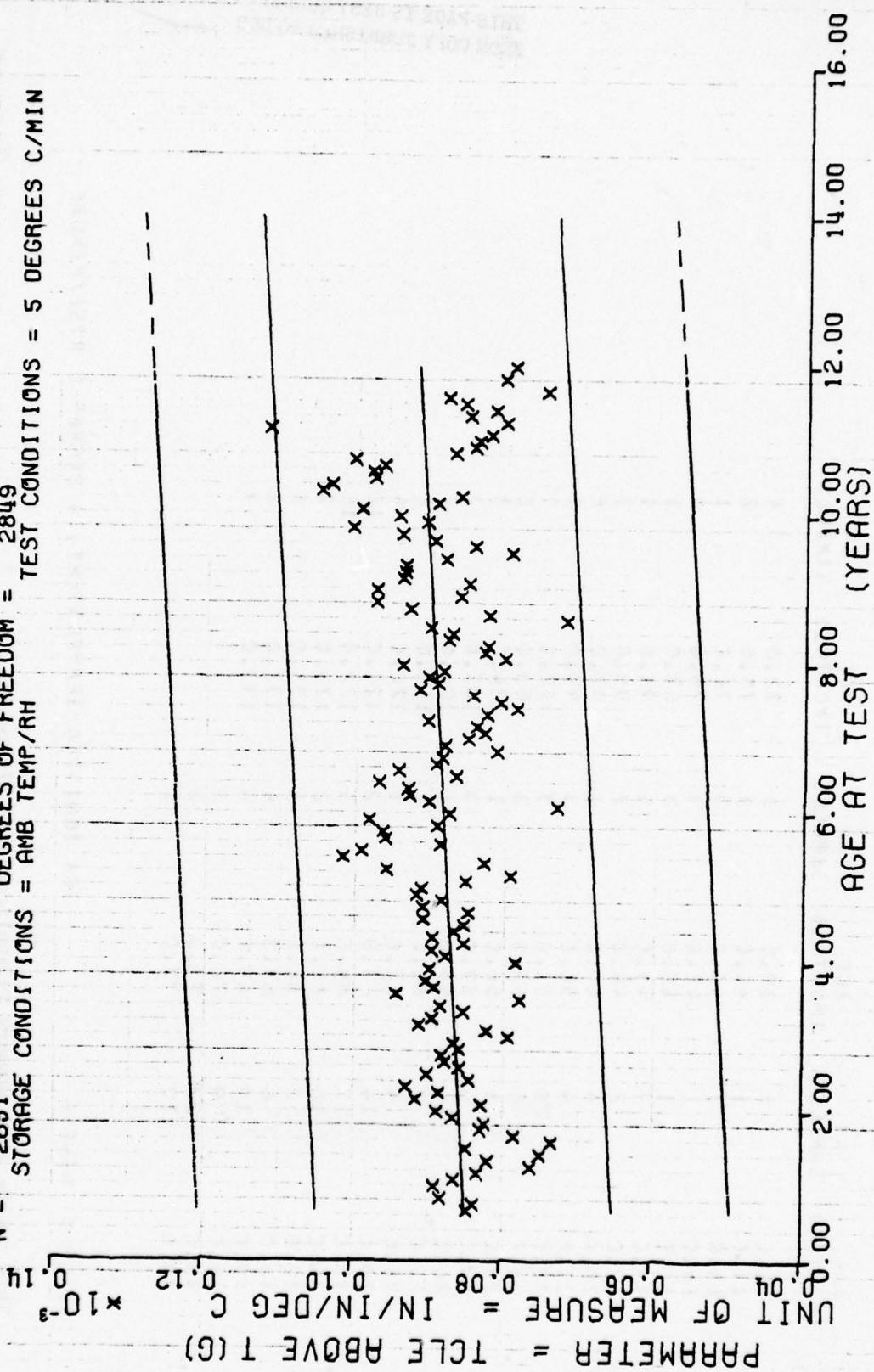
This sample size summary is applicable to figures 64 and 65

$Y = ((+5.6250688E-05) + (+2.3128001E-08) * X)$
 F = +6.2447050E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +6.0862057E-06$
 R = +1.4645409E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_b = +2.9267265E-09$
 t = +7.9023446E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +6.0216375E-06$
 N = 2851 DEGREES OF FREEDOM = 2849
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 5 DEGREES C/MIN



STAGE 1, WING 6, TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

F = +8.2702919E+01
 R = +1.6795790E-01
 t = +9.0941145E+00
 N = 2851
 STORAGE CONDITIONS = AMB TEMP/AH
 TEST CONDITIONS = 5 DEGREES C/MIN
 Y = ((+8.4489664E-05) + (+5.2488106E-08) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2849
 $\sigma_f = +1.2043993E-05$
 $S_b = +5.7716565E-09$
 $S_t = +1.1874981E-05$



STAGE 1, WING 6, TP-H1011, THERMAL COEFFICIENT OF LINEAR EXPANSION ABOVE TG

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.C	3	39.0	3	73.0	4
11.C	1	40.C	3	75.0	2
13.C	1	41.C	3	76.C	1
15.C	1	42.0	3	79.C	6
16.C	1	45.C	3	87.0	1
18.C	7	47.C	1	91.C	1
19.C	2	48.0	2	95.0	2
20.C	4	49.0	1	97.0	6
21.C	4	50.C	3	99.0	3
22.C	20	51.C	3	102.0	2
23.C	4	53.0	3	103.0	6
24.C	4	56.C	1	104.0	3
25.C	6	57.0	3	105.0	2
26.C	14	59.0	1	106.0	2
27.C	2	61.C	1	110.0	2
28.C	4	62.C	1	120.C	4
29.C	14	63.0	2	121.C	10
30.C	12	64.C	3	122.0	16
31.C	10	65.C	2	123.C	2
32.C	2	66.C	1	131.C	4
33.C	6	67.0	4	132.0	8
34.C	10	69.C	4	133.C	3
35.C	9	70.C	1		
36.C	22	71.0	2		
37.C	12	72.0	1		

STAGE I WING 6 TGA IGNITION TEMPERATURE, 9 DEGREE C RISE/MINUTE

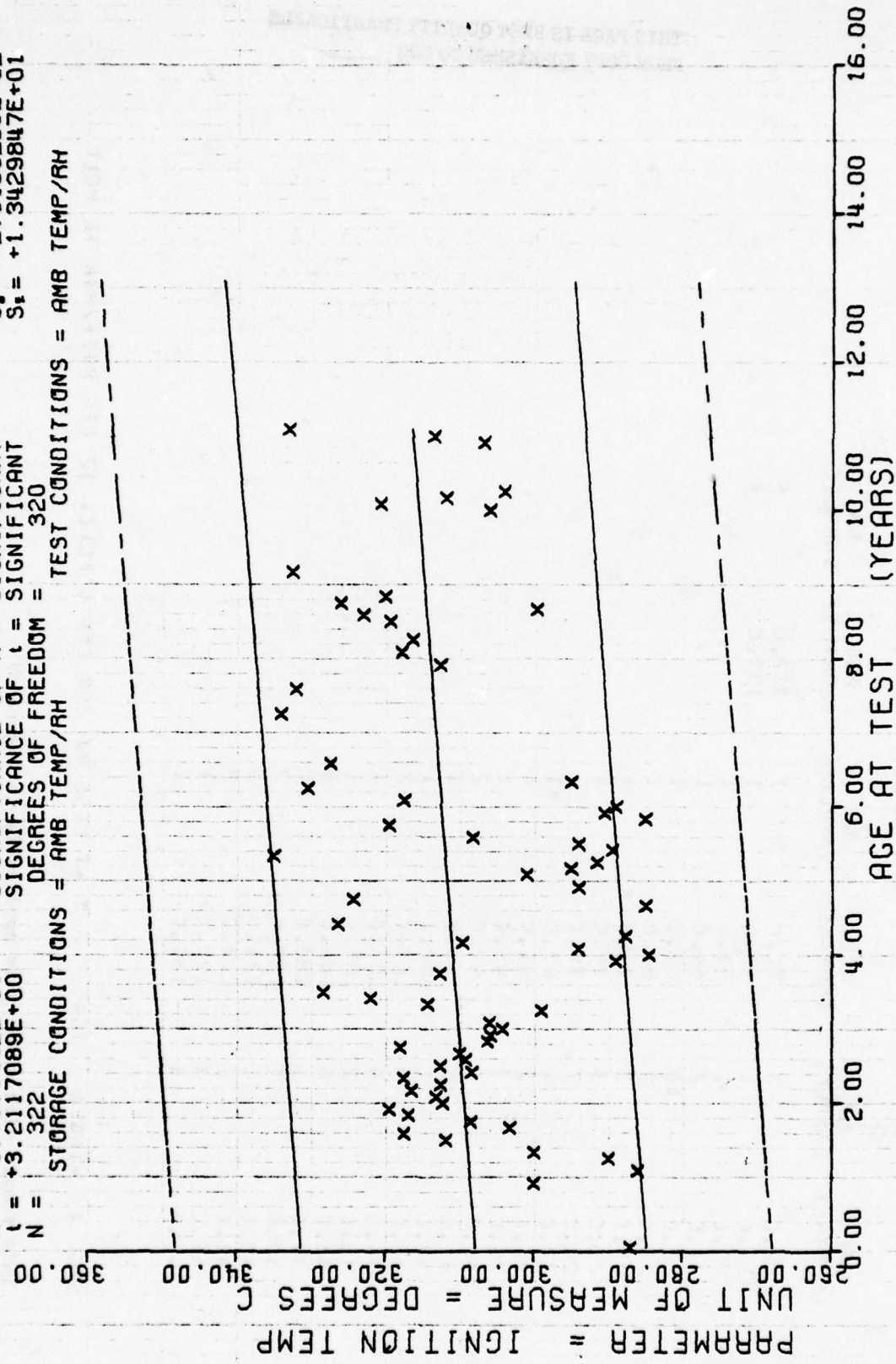
This sample size summary is applicable to figure 66

F = +1.0315074E+01
 R = +1.7671442E-01
 t = +3.2117089E+00
 N = 322

Y = ((+3.0797055E+02) + (+6.4652611E-02) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 320

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

G = +1.3623313E+01
 S_p = +2.0130283E-02
 S_t = +1.3429847E+01



STAGE I WING 6
 TGA IGNITION TEMPERATURE, 9 DEGREE C RISE/MINUTE

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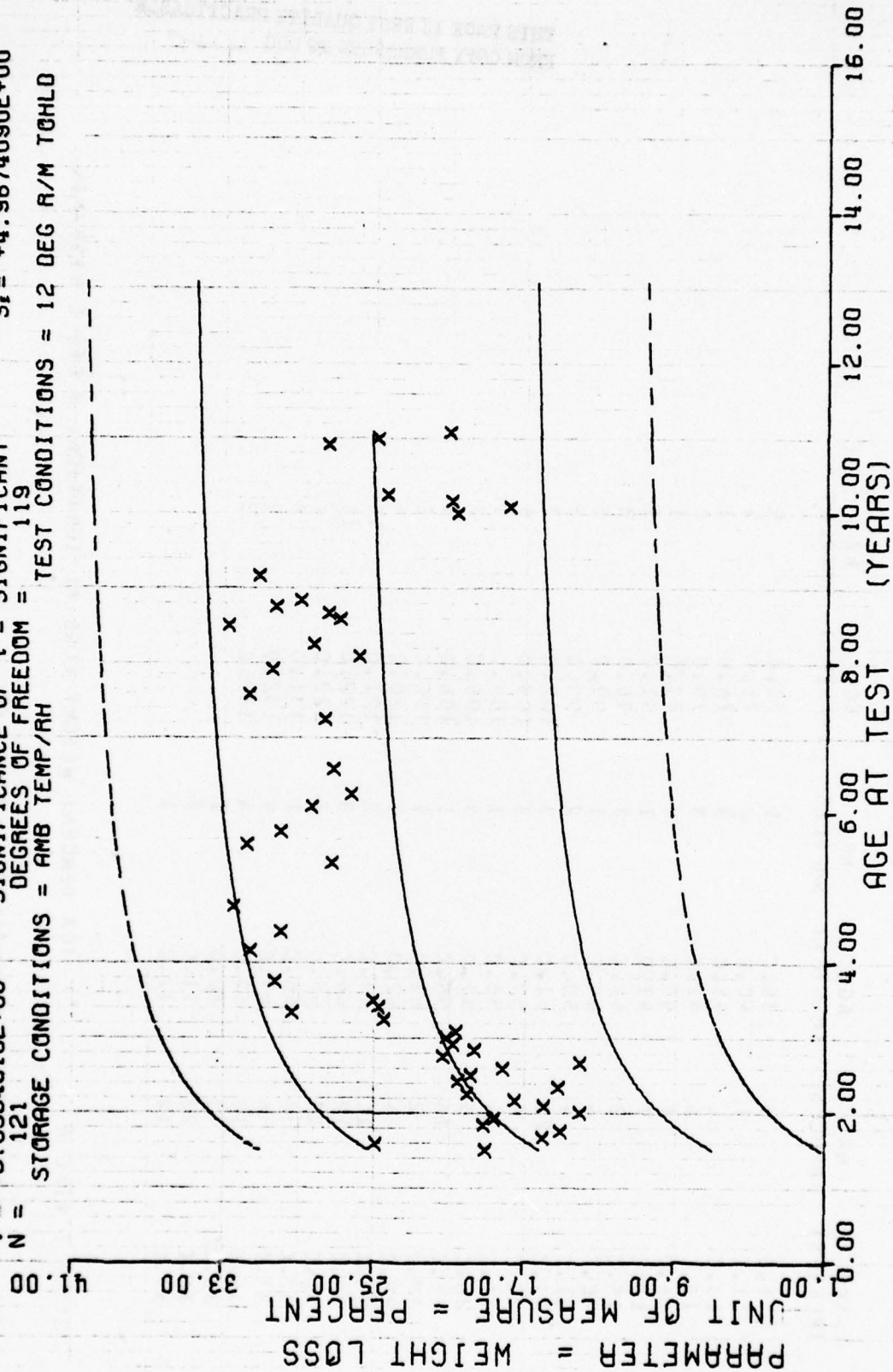
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
18.C	3	50.C	1	132.C	4
19.C	1	53.0	1	133.C	2
20.C	1	57.C	1		
21.C	2	64.C	1		
22.C	10	67.0	1		
23.C	2	69.0	1		
24.C	2	73.C	1		
25.C	3	75.C	1		
26.C	7	79.C	2		
27.C	1	87.0	1		
28.C	2	91.0	1		
29.C	7	95.C	1		
30.0	6	97.0	2		
31.C	5	99.0	1		
32.C	1	102.C	1		
33.C	3	103.C	2		
34.0	4	104.0	1		
35.C	2	105.0	1		
36.C	6	106.C	1		
37.C	1	110.C	1		
39.0	1	120.C	2		
40.C	1	121.0	5		
41.C	1	122.C	8		
42.C	1	123.C	1		
45.0	1	131.C	2		

SAGE I WING 6 TGA 7 WT LCSS AT 250 DEG C HOLD, 1? DEG RISE/MIN TO HOLD 67-68

This sample size summary is applicable to figure 67

$Y = ((+2.6615207E+01) + (-1.8902122E+02) / X)$
 F = +3.6463374E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +5.6539679E+00$
 R = -4.8429890E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_b = +3.1302723E+01$
 t = +6.0384910E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +4.9674090E+00$
 N = 121 DEGREES OF FREEDOM = 119
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG R/M TOHLD



SAGE 1 WING 6 TGA % WT LOSS AT 250 DEG C HOLD, 12 DEG RISE/MIN TO HOLD

Figure 67

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*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.C	3	39.C	1	73.0	4
11.C	1	40.C	2	75.0	2
13.C	1	41.C	3	76.0	1
15.C	1	42.C	3	79.0	6
16.0	1	45.0	2	87.0	1
18.C	7	47.0	1	91.0	1
19.C	2	48.0	2	95.0	3
20.C	4	49.C	1	97.0	5
21.0	4	50.0	2	99.0	2
22.C	20	51.0	3	102.0	3
23.C	4	53.0	3	103.0	5
24.0	4	56.0	1	104.0	1
25.0	6	57.0	3	105.0	2
26.0	14	59.0	1	106.0	2
27.0	2	61.0	1	110.0	2
28.0	4	62.0	1	120.0	4
29.0	14	63.0	2	121.0	10
30.0	12	64.0	3	122.0	10
31.0	10	65.0	2	123.0	2
32.0	2	66.0	1	131.0	4
33.0	6	67.0	4	132.0	8
34.0	10	69.0	4	133.0	3
35.0	7	70.0	1		
36.0	22	71.0	2		
37.0	12	72.0	1		

STAGE I WING 6 TGA PERCENT WEIGHT LOSS AT IGNITION, 9 DEG C RISE/MIN

This sample size summary is applicable to figure 68

$Y = ((+3.4776418E+01) + (-1.8157176E-02) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma = +7.4606631E+00$
 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_0 = +1.1300605E-02$
 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_1 = +7.4417641E+00$
 N = 312 DEGREES OF FREEDOM = 310
 STORAGE CONDITIONS = AMB TEMP/4H TEST CONDITIONS = 9 DEG C RISE/MIN

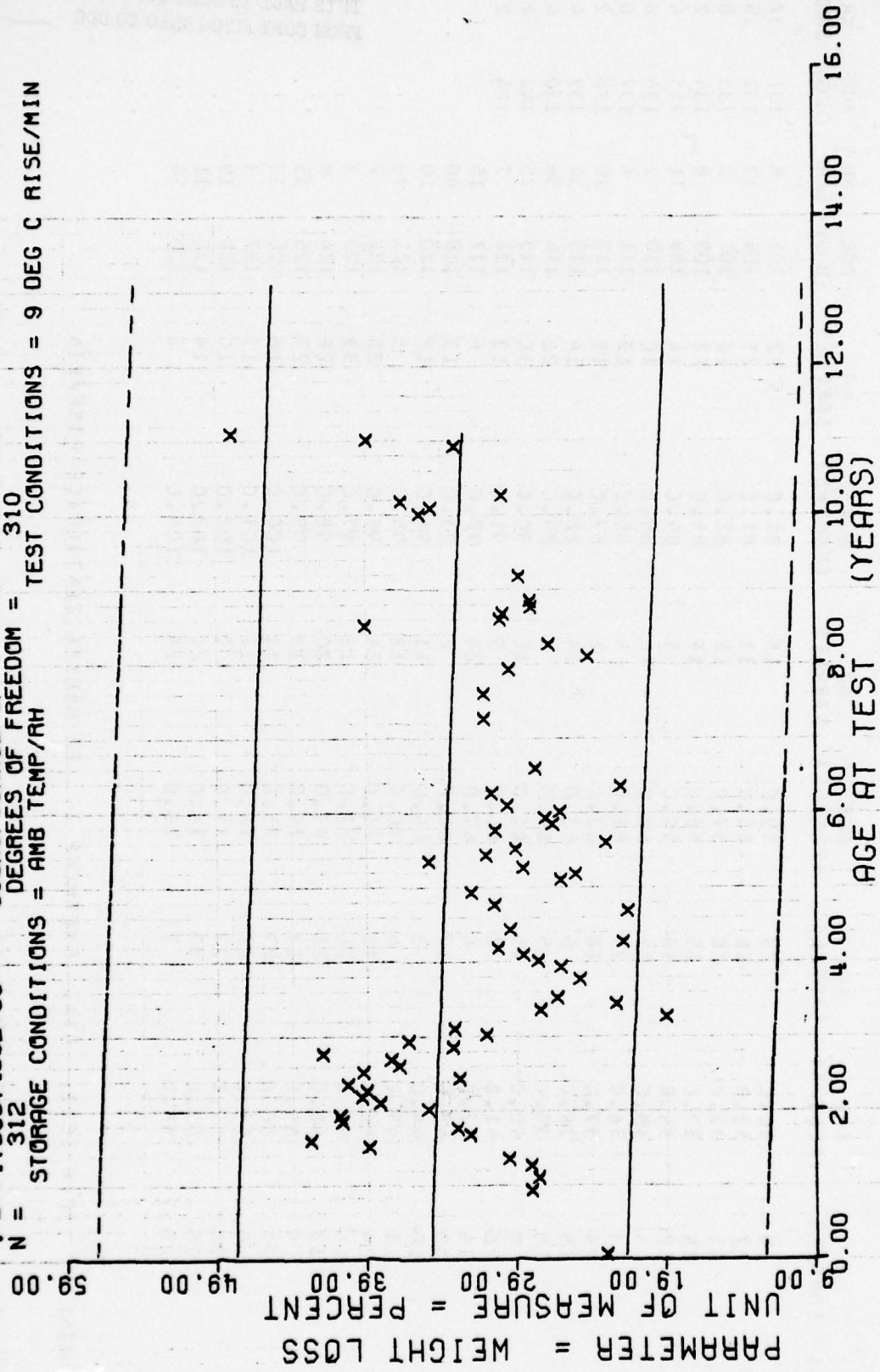


Figure 68

*** SAMPLE SIZE SUMMARY ***

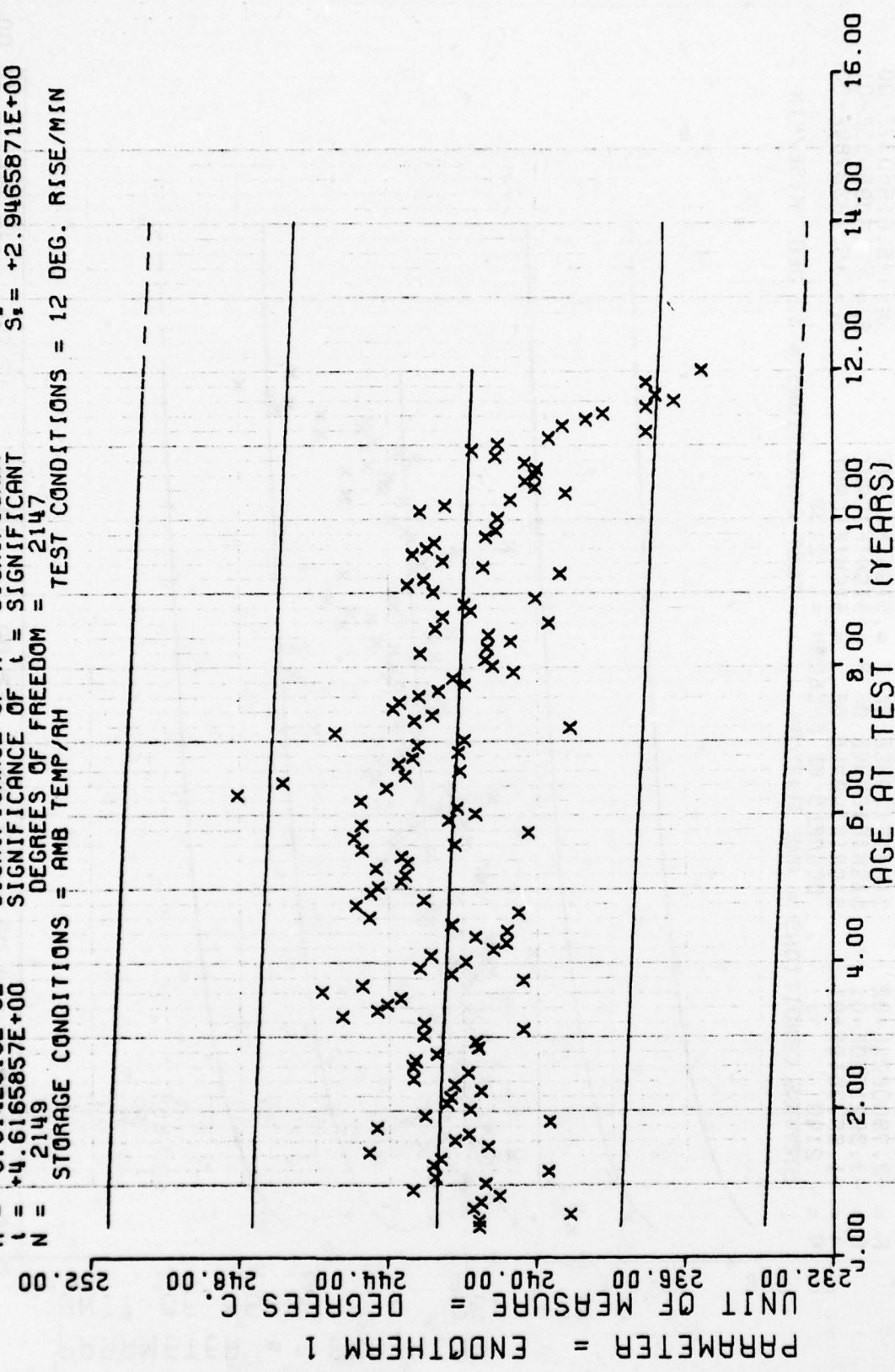
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
5.C	9	30.C	29	55.C	15	80.C	32	105	8	131	37				
6.C	27	31.0	28	56.0	11	81.C	25	106	13	132	18				
7.C	11	32.C	20	57.0	12	82.0	22	107	2	133	8				
8.C	14	33.C	19	58.C	14	83.0	27	108	8	134	2				
9.C	12	34.0	33	59.C	9	84.C	14	109	11	135	4				
10.C	3	35.C	21	60.0	16	85.0	10	110	2	136	8				
11.C	3	36.C	29	61.C	8	86.C	12	111	6	137	6				
12.C	24	37.0	18	62.0	8	87.C	15	112	10	138	2				
13.C	15	38.C	6	63.0	14	88.C	14	113	37	139	4				
14.C	18	39.C	5	64.0	6	89.0	26	114	56	140	4				
15.C	8	40.C	15	65.C	10	90.C	30	115	25	142	2				
16.C	26	41.0	2	66.0	9	91.C	13	116	7	144	2				
17.C	14	42.C	8	67.0	24	92.0	8	117	15						
18.C	30	43.C	12	68.C	8	93.C	13	118	40						
19.C	10	44.0	3	69.0	11	94.C	13	120	10						
20.C	11	45.C	6	70.0	18	95.0	5	121	10						
21.C	24	46.C	15	71.C	24	96.C	25	122	7						
22.C	16	47.0	26	72.C	18	97.C	33	123	3						
23.C	13	48.C	26	73.0	20	98.C	28	124	8						
24.C	9	49.C	17	74.0	13	99.C	27	125	15						
25.C	27	50.C	21	75.0	11	100.C	18	126	15						
26.C	20	51.C	22	76.0	12	101.C	11	127	3						
27.C	20	52.C	27	77.0	9	102.C	10	128	19						
28.C	25	53.C	33	78.C	20	103.C	14	129	11						
29.C	20	54.0	7	79.C	24	104.C	2	130	54						

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STAGE I WING 6, IP-H 1011, CIA, EXCITHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figures 69 and 70

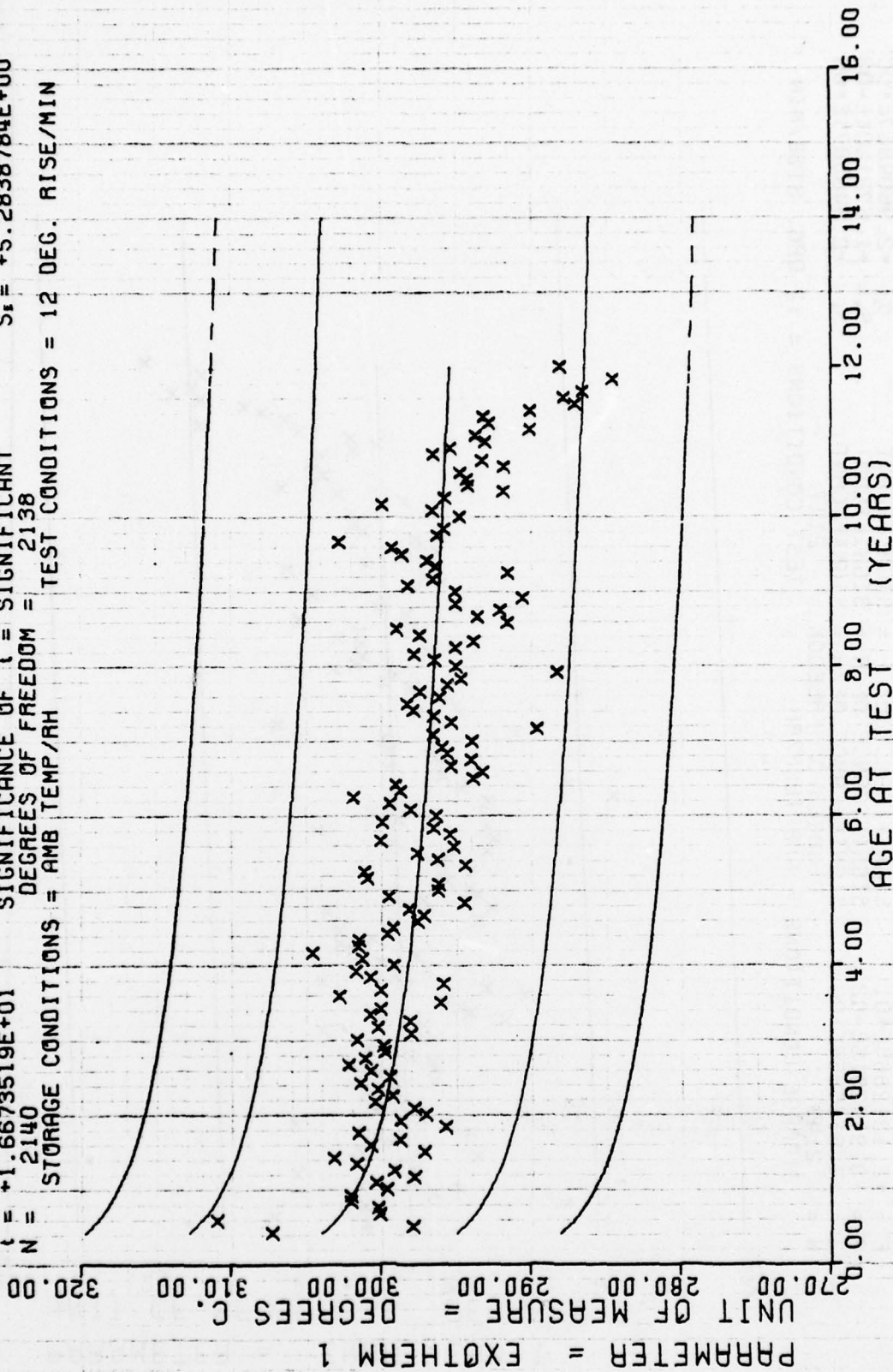
$Y = ((+2.4275439E+02) + (-7.7196707E-03) * X)$
 $F = +2.1312864E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -9.9142515E-02$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +4.6165857E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 2149$ DEGREES OF FREEDOM = 2147
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6, TP-H 1011, OTA, ENDOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

Figure 69

$Y = ((+3.0792850E+02) + (-5.8522274E+00) * LOG (X))$
 $F = +2.7800624E+02$ SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +5.6156037E+00$
 $R = -3.3921750E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_e = +3.5098933E-01$
 $t = +1.6673519E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_e = +5.2838784E+00$
 $N = 2140$ DEGREES OF FREEDOM = 2138
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6, TP-H 1011, OTR, EXOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

Figure 70

*** SAMPLE SIZE SUMMARY ***

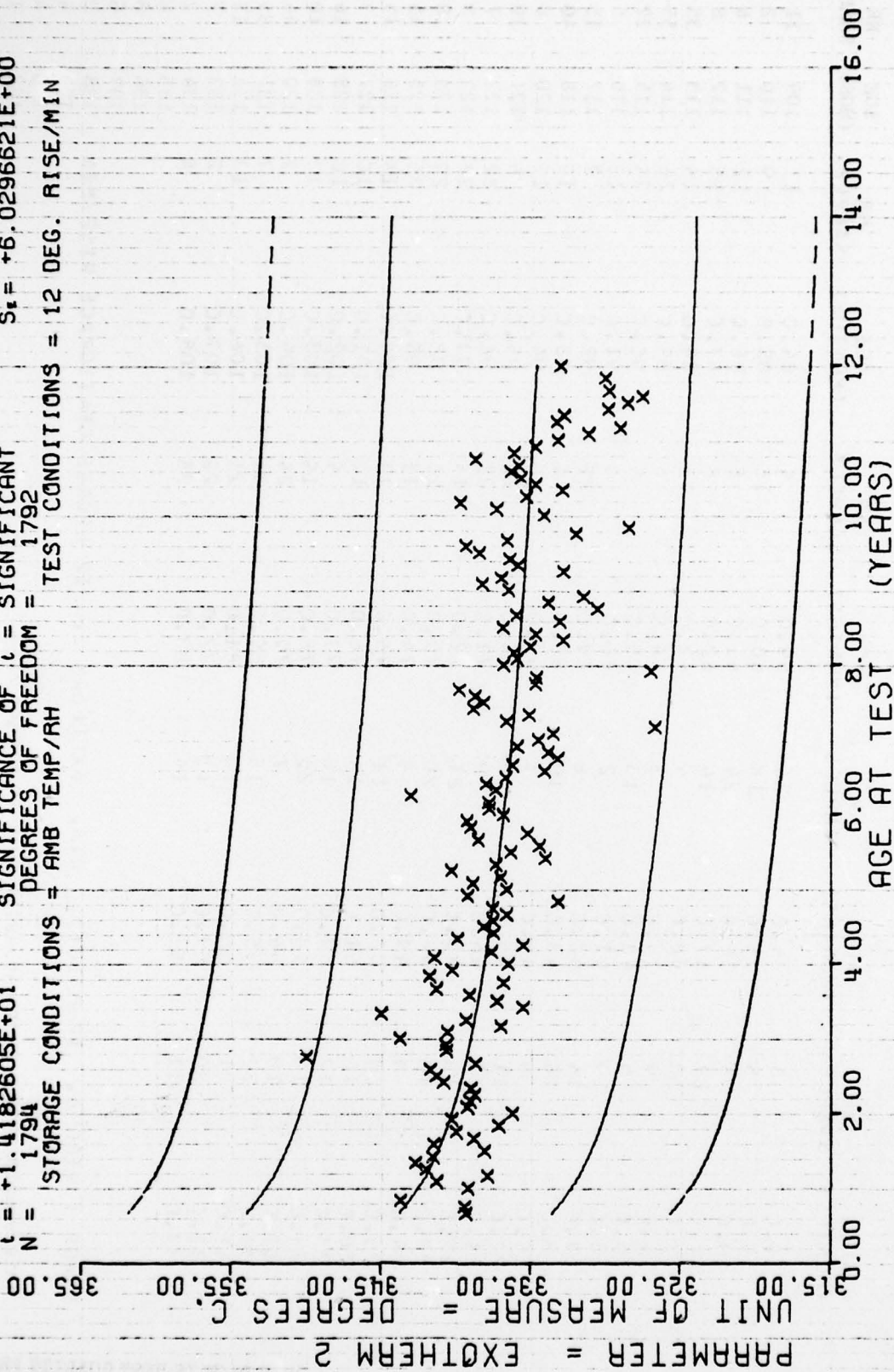
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
8.C	3	34.C	26	59.0	5	84.C	13	109	11
9.C	5	35.C	18	60.0	15	85.C	9	110	2
10.C	3	36.C	24	61.0	8	86.C	12	111	6
12.C	17	37.C	14	62.0	8	87.C	15	112	8
13.C	10	38.C	4	63.0	13	88.0	14	113	35
14.C	9	39.0	3	64.0	6	89.0	26	114	55
15.C	5	40.0	13	65.0	5	90.C	25	115	22
16.C	19	41.C	2	66.0	5	91.0	13	116	5
17.C	14	42.C	8	67.0	22	92.0	7	117	15
18.C	18	43.0	10	68.0	8	93.0	12	118	40
19.C	4	44.0	3	69.0	10	94.0	12	120	8
20.C	11	45.C	6	70.0	12	95.0	4	121	10
21.0	22	46.0	9	71.0	23	96.0	22	122	7
22.C	13	47.C	21	72.0	15	97.0	26	123	3
23.C	10	48.C	20	73.0	16	98.0	27	124	8
24.0	9	49.0	9	74.0	13	99.0	25	125	15
25.0	20	50.0	11	75.0	11	100.0	14	126	15
26.0	16	51.0	14	76.0	12	101.0	10	127	3
27.0	12	52.0	18	77.0	5	102.0	10	128	16
28.0	19	53.0	25	78.0	15	103.0	13	129	10
29.0	18	54.0	7	79.0	24	104.0	2	130	44
30.0	22	55.0	15	80.0	32	105.0	7	131	35
31.0	21	56.0	10	81.0	25	106.0	13	132	17
32.0	20	57.0	11	82.0	22	107.0	2	133	7
33.0	11	58.0	14	83.0	24	108.0	8	134	2
								135	4
								136	8
								137	6
								138	2
								139	4
								140	4
								142	1
								144	2

STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figure 71

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$Y = ((+3.5041425E+02) + (-7.3656276E+00) * LOG (X))$
 $F = +2.0114630E+02$ SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +6.3572958E+00$
 $R = -3.1767748E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +5.1934234E-01$
 $t = +1.4182605E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +6.0296621E+00$
 $N = 1794$ DEGREES OF FREEDOM = 1792
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6, TP-H 1011, OTA, EXOTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

Figure 71

*** SAMPLE SIZE SUMMARY ***

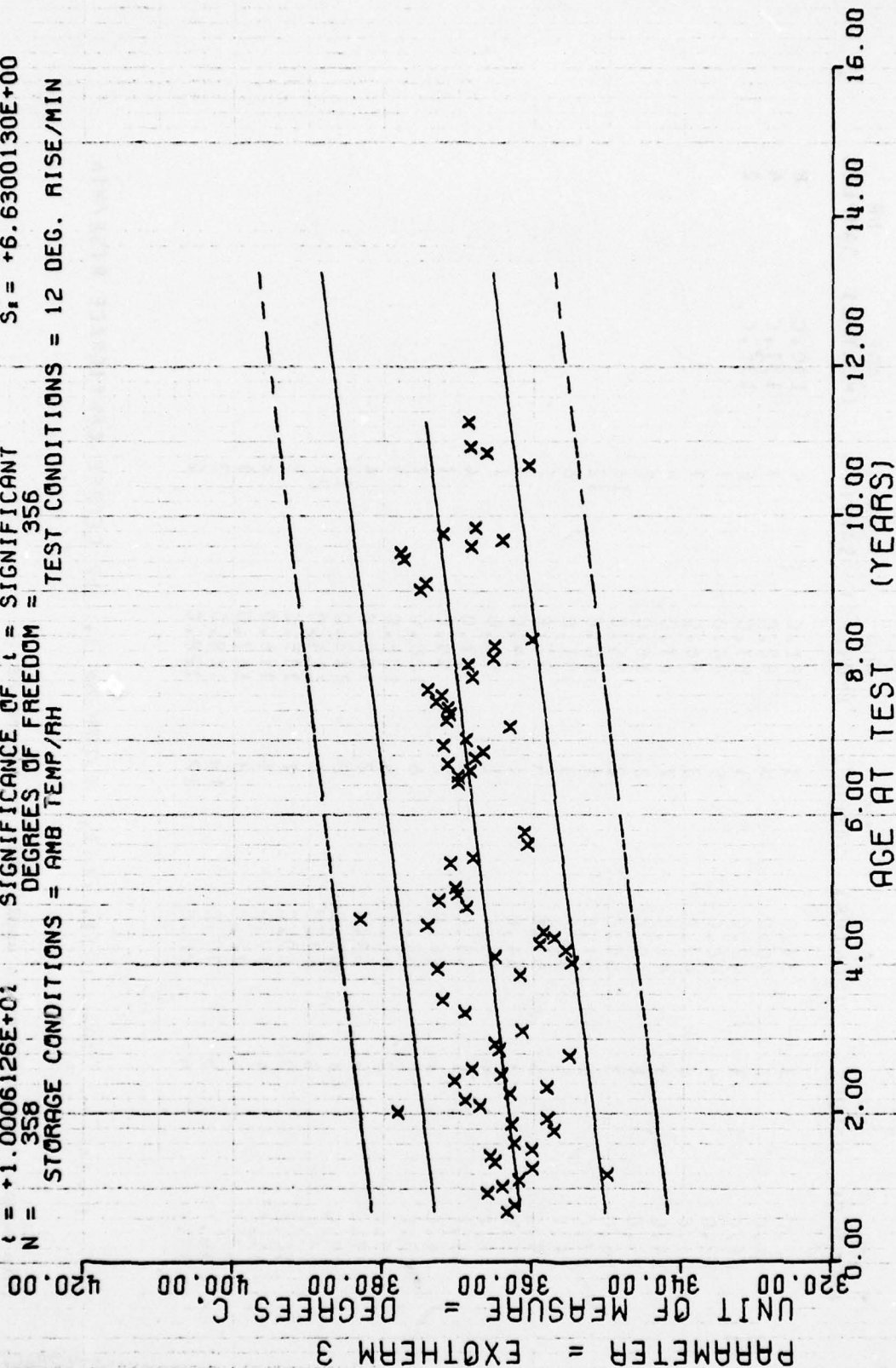
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
2.C	3	37.C	3	81.C	5
5.C	7	40.0	5	82.C	7
11.C	3	42.0	3	83.C	8
12.C	4	46.C	5	84.C	7
13.C	5	47.0	3	86.C	1
14.C	3	48.0	7	87.0	6
15.C	1	49.C	2	88.0	8
16.0	3	50.0	2	89.C	16
17.C	5	51.0	1	90.C	12
18.C	5	52.C	3	91.0	6
19.C	6	53.C	4	92.0	2
21.C	2	54.C	1	94.C	2
22.C	4	55.C	1	96.0	6
23.C	1	57.C	5	97.0	4
24.C	1	58.C	2	99.C	1
25.C	1	59.C	6	100.0	1
26.C	2	60.C	4	108.C	3
27.C	4	64.C	2	109.C	4
28.C	3	65.0	2	113.0	11
29.C	5	67.C	6	114.0	21
30.C	9	69.C	1	115.C	5
31.C	4	77.0	1	116.0	2
33.C	4	78.C	3	117.0	1
34.C	5	79.C	18	118.C	3
35.C	4	80.C	12	128.C	2

STAGE 1 WING 6, TP-H 1011, CIA, EXCITERM 3, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figure 72

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Y = ((+3.6082876E+02) + (+1.0010188E-01) * X) * X)
 F = +1.0012256E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = +4.6851684E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +1.0006126E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 358 DEGREES OF FREEDOM = 356
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 3, 12 DEGREE CENTIGRADE RISE/MIN

Figure 72

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
5.C	9	31.C	25	56.0	11	81.C	16
6.C	27	32.C	20	57.0	7	82.0	15
7.0	11	33.C	15	58.C	12	83.C	20
8.C	11	34.0	28	59.C	3	84.C	5
9.C	5	35.C	18	60.C	12	85.0	10
10.C	3	36.C	26	61.C	7	86.C	10
12.C	20	37.0	14	62.0	6	87.C	35
13.C	10	38.C	6	63.0	14	88.0	21
14.C	17	39.C	5	64.C	5	89.C	6
15.0	7	40.0	10	65.0	8	90.C	14
16.C	21	41.C	2	66.0	8	91.C	37
17.C	10	42.C	5	67.0	15	92.C	10
18.C	25	43.C	11	68.C	8	93.C	10
19.C	6	44.0	3	69.0	10	94.C	7
20.C	2	45.C	5	70.0	19	95.0	3
21.0	12	46.C	10	71.0	24	96.C	8
22.C	7	47.0	23	72.0	18	97.C	15
23.C	12	48.C	17	73.0	20	98.0	15
24.C	8	49.C	14	74.C	13	99.0	3
25.C	26	50.0	17	75.0	11	100.C	17
26.C	18	51.C	23	76.0	12	101.C	11
27.C	18	52.C	28	77.0	8	102.0	50
28.0	22	53.C	31	78.C	17	103.C	31
29.C	15	54.0	8	79.0	7	104.C	18
30.C	20	55.C	15	80.C	21	105.C	8
						106.0	2
						107.0	2
						108.0	8
							6
							2
							2
							4
							4
							2
							2

STAGE 1 WING 6, IP-H 1011, DIA, IGNITION TEMPERATURE, 12 DEGRFE CENT, RISE/MIN

This sample size summary is applicable to figure 73

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PARAMETER = IGNITION TEMPERATURE

UNIT OF MEASURE = DEGREES C.

Y = ((+3.7037862E+02) + (+2.4479745E-02) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 1754
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 12 DEG. RISE/MIN

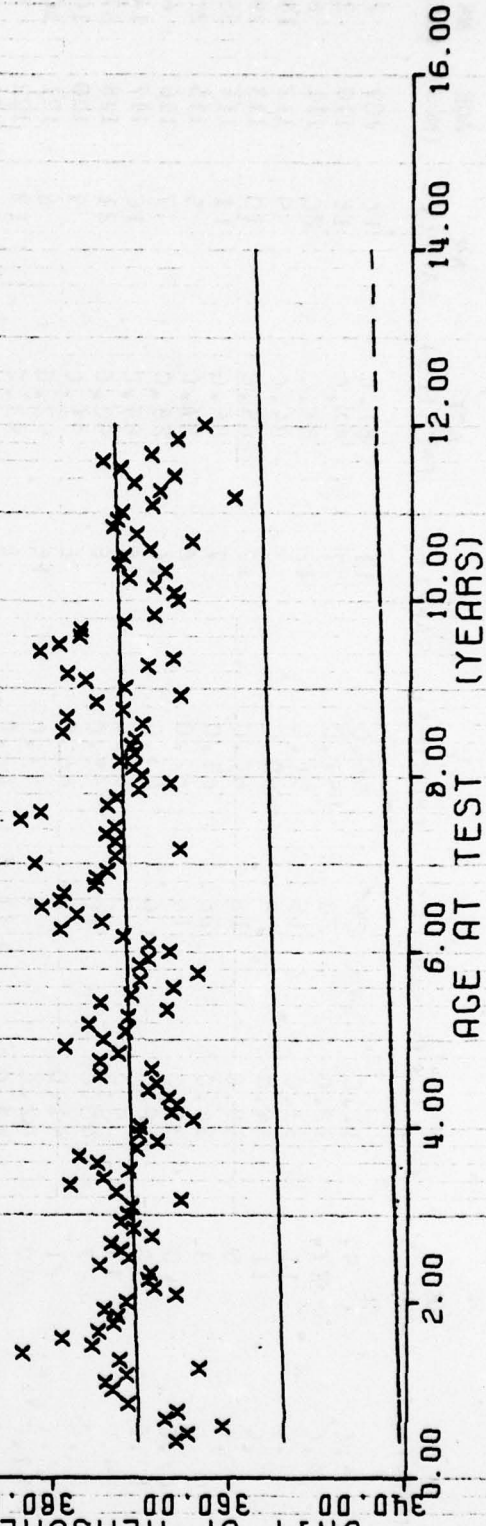
F = +1.5648592E+01
 R = +9.4035994E-02
 N = +3.9558302E+00

σ_f = +1.0045584E+01

S_b = +6.1882700E-03

S_t = +1.0003921E+01

TEST CONDITIONS = 12 DEG. RISE/MIN



STAGE 1 WING 6, TP-H 1011, OTA, IGNITION TEMPERATURE, 12 DEGREE CENT. RISE/MIN

Figure 73

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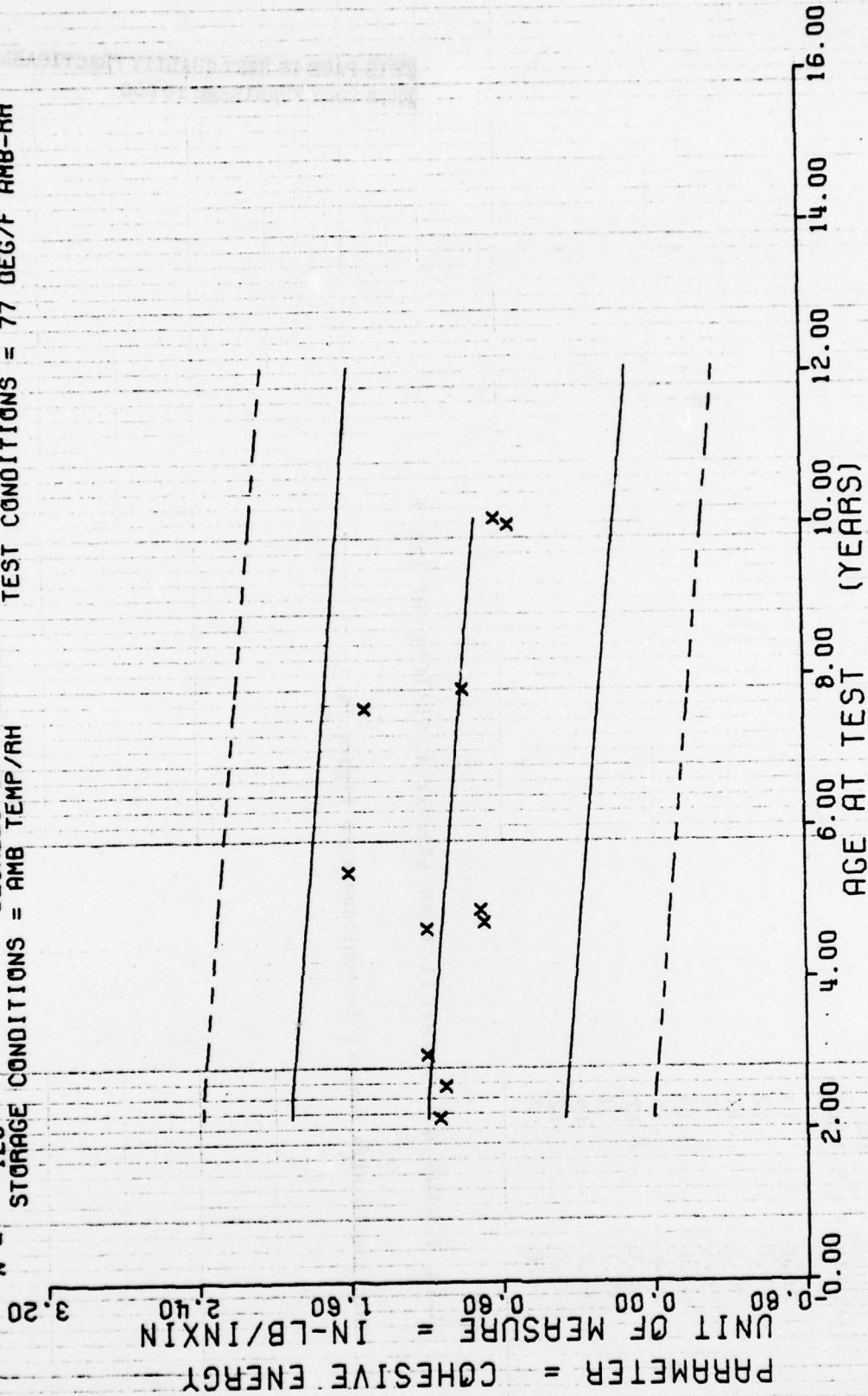
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES
26.C	13
31.C	12
36.C	11
56.C	5
57.C	13
59.C	14
65.C	12
91.C	7
94.C	14
120.C	12
121.C	12

STAGE I WING 6 TP-HIC11 TEAR ENERGY TEST/TEMP=77 DEG F

This sample size summary is applicable to figure 74

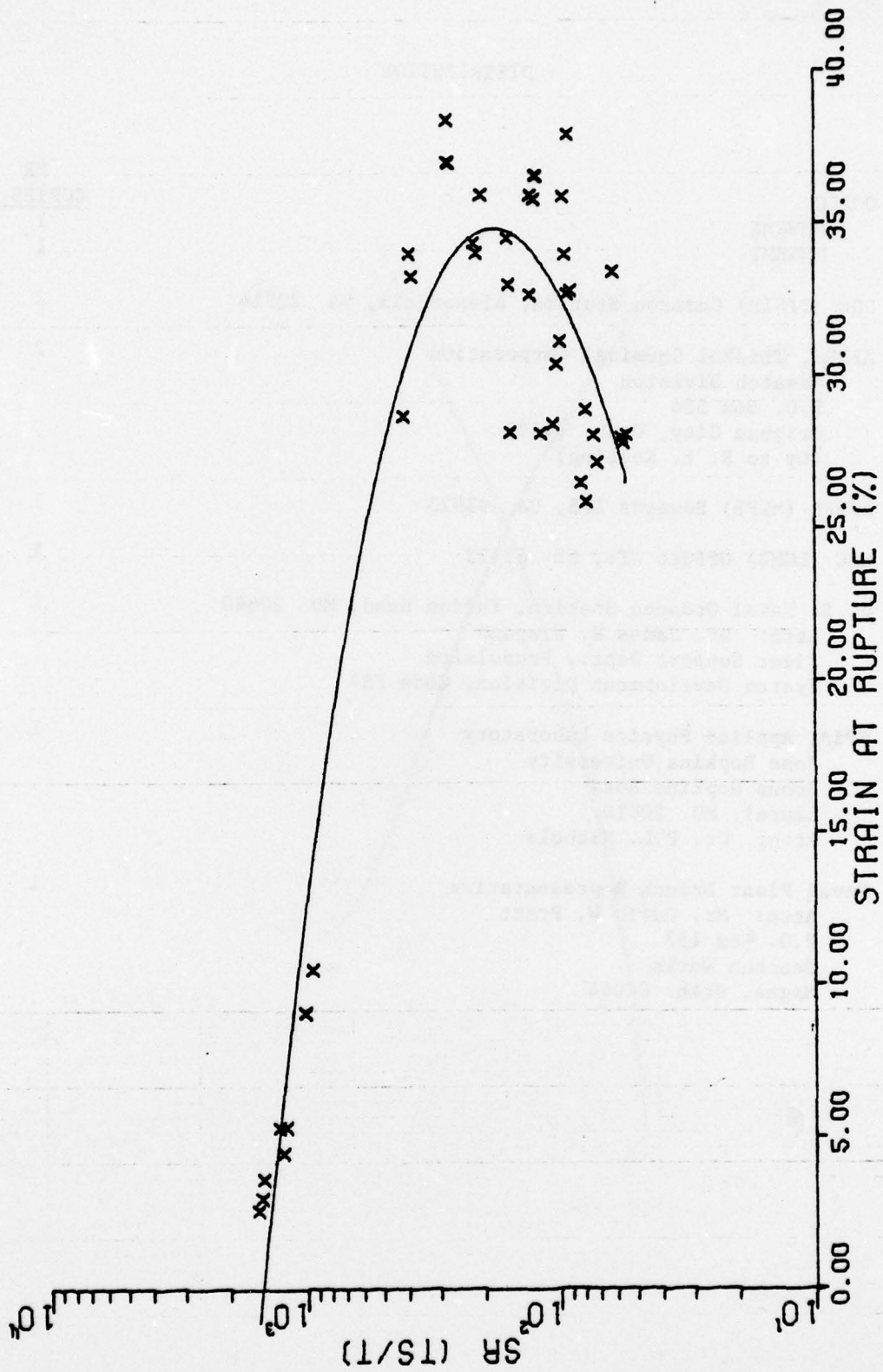
$Y = ((+1.2718053E+00) + (-2.9404487E-03) * X)$
 F = +7.3959993E+00 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +4.0501268E-01$
 R = -2.3815861E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +1.0812227E-03$
 t = +2.7195586E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +3.9495474E-01$
 N = 125 DEGREES OF FREEDOM = 123
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG/F AMB-AH



STAGE I WING 6 TP-H1011 TEAR ENERGY TEST/TEMP=77 DEG F

Figure 74

TEMPERATURE CORRECTED FAILURE ENVELOPE



FAILURE ENVELOPE (MOTOR/SN 0013670) STAGE 1, WING 6, TP-H1011

Figure 75

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↓
F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system. ↙

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 396(78)	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Propellant Surveillance Report LGM-30 F & G Stage 1, Phase E, Series V, TP-H1011		5. TYPE OF REPORT & PERIOD COVERED Test Results-Semi-annual
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) John A. Thompson		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Propellant Lab Section Directorate of Maintenance OO/ALC Hill AFB, Utah 84406		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS MMEMP Project M82934C-WNL17514
11. CONTROLLING OFFICE NAME AND ADDRESS Service Engineering Division Directorate of Materiel Management OO/ALC Hill AFB, Utah 84406		12. REPORT DATE June 1978
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18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Solid Propellant Minuteman		
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 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M82934CWNL17514. The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (thirteen years for		

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