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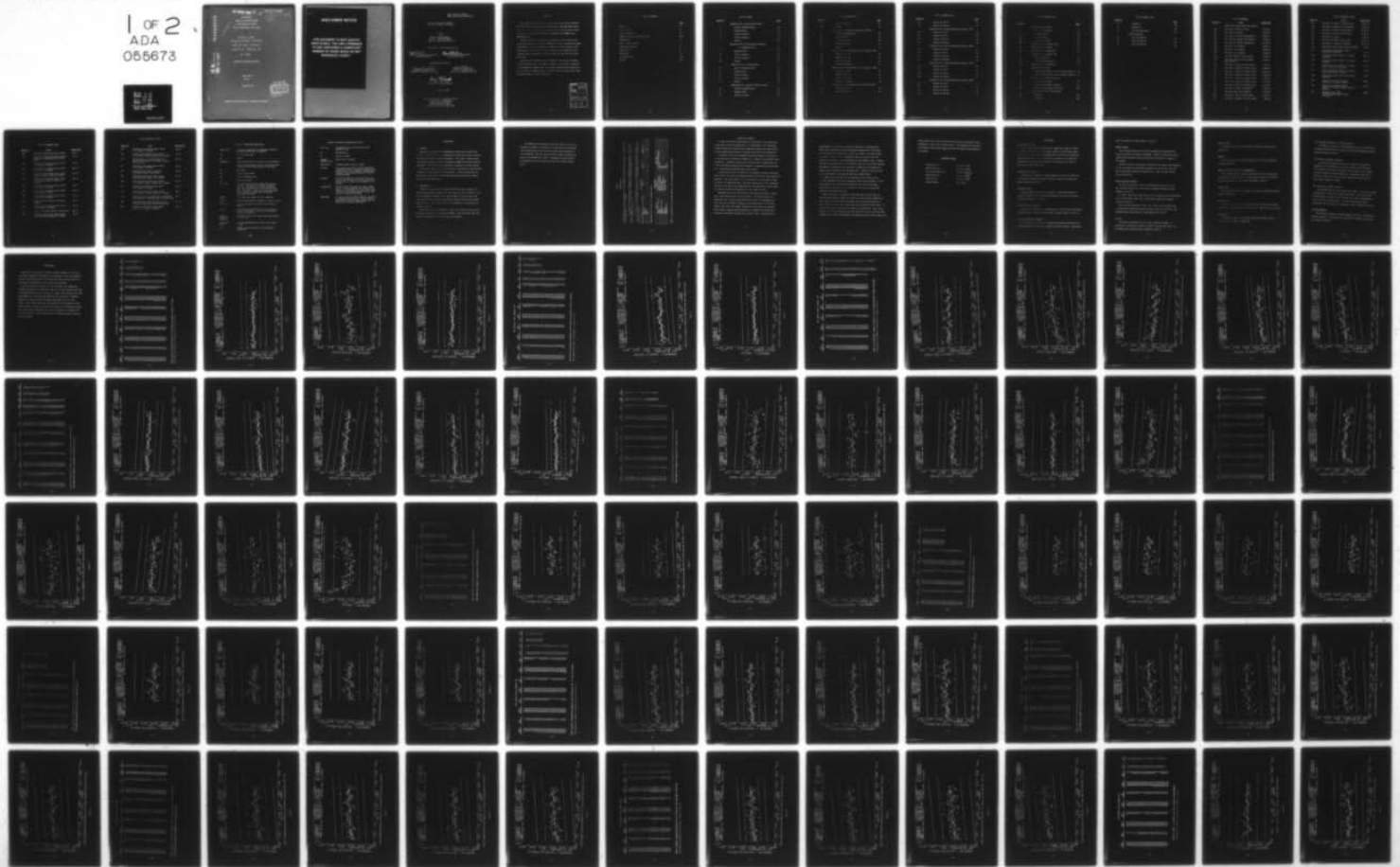
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PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1, PHASE E,--ETC(U)
FEB 78 J A THOMPSON

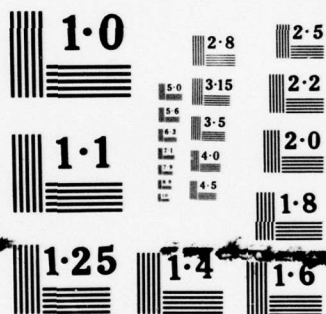
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HEADQUARTERS

OGDEN AIR LOGISTICS CENTER

UNITED STATES AIR FORCE

HILL AIR FORCE BASE, UTAH 84406

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

TP-H 1011

PROPELLANT LABORATORY SECTION

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MANCP REPORT

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FEBRUARY 1978

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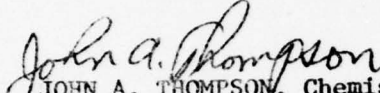
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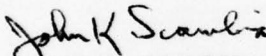
MANCP REPORT NR 390(78)
MMWRM PROJECT M82934C-WNL17514


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

Author

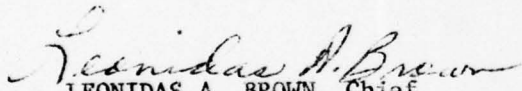

JOHN A. THOMPSON, Chemist
Component & Combustion Test Unit

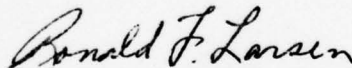
Engineering & Statistical Review By


JOHN K. SCAMBIA, Project Engineer
Service Engineering



EDWARD J. ERICKSON, Statistician
Data Analysis Unit

Recommended Approval By


LEONIDAS A. BROWN, Chief
Component & Combustion Test Unit


RONALD F. LARSEN, Chief
Physical & Mechanical Test Unit

Approved By


DON F. WOODS, Chief
Propellant Laboratory Section

February 1978

Industrial Products & Ldg Gear Division
Directorate of Maintenance
Ogden Air Logistics Center
United States Air Force
Hill Air Force Base, Utah 84406

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 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 (twelve and one half 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.

ACCESSION NO.	
RTIS	White Section <input checked="" type="checkbox"/>
CSB	Buff Section <input type="checkbox"/>
UNANNOUNCED	<input type="checkbox"/>
JUSTIFICATION.....	
BY.....	
DISTRIBUTION/AVAILABILITY CODES	
Dist. to AVAIL. REG. or SPECIAL	
A	23

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

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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
181	ATP Phase III, Wing I	7 May 70
185	ATP Phase I, Wing VI (Third Group)	22 Jun 70
195	ATP Phase III, Wings II-V (Retest)	29 Oct 70
223	Surveillance Report LGM-30 Stage I (TP-H1011)	Sep 71
239	Surveillance Report LGM-30 Stage I (TP-H1011 and TP-H1043)	Apr 72
258	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 72
268	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	May 73
271	Surveillance Report LGM-30 F & G Stage I Phase A Series II, (TP-H1011)	Jul 73
277	Surveillance Report LGM-30 F & G Stage I Phase A Series III, (TP-H1011)	Oct 73
280	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 73
288	Propellant Surveillance Report LGM-30 A & B, Stage I, TP-H1043	Mar 74
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

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 twelve and one half 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	
TCLE	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, six models were fitted to the data (see regression models at the end of this statistical approach). 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' values and the

significance of this statistic, which are reported for each regression model, give an indication of the "statistical significance" of the slope of the trend line as compared to a line of zero slope. Data were plotted by computer. The 'y' axis is computed so that the values at one inch intervals are peculiar to the data spread of the parameter tested. Plotted data points represent means at the particular ages at which testing occurred. The number of specimens at each age point is indicated on the sample size summary sheet accompanying the regression plot. Variance at each test age can be determined by consulting the G085 data storage system.

A comparison of the slopes of the regression trend lines and their Y - axis intercepts found in the regression equation was performed. Of the tests common to this test period and the last test, 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, 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.

REGRESSION MODELS

Reciprocal of X	$Y = a + b (1/X)$
Natural log of X	$Y = a + b (\text{LN } X)$
LOG to the base 10 of X	$Y = a + b (\text{LOG } X)$
Square Root of X	$Y = a + b \sqrt[2]{X}$
Cube Root of X	$Y = a + b \sqrt[3]{X}$
Linear equation	$Y = a + bX$

TEST RESULTS

VERY LOW RATE TENSILE:

Very low rate data 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 (Figures 1 thru 5). The trends are gradual for the respective regressions and no operational problems are expected for at least two years after the last test date.

LOW RATE BIAXIAL TENSILE:

A statistically significant gradual decrease is shown for strains and a statistically significant gradual increase is shown for stresses and modulus (Figures 6 thru 10).

LOW RATE TENSILE:

Low rate tensile data shows 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 strains, maximum stress and modulus show a statistically significant gradual decrease. Stress at rupture shows no change (Figures 16 thru 20).

HIGH RATE HYDROSTATIC TENSILE:

The strains show a statistically significant gradual decrease with the stresses showing a statistically significant gradual increase. The modulus

shows no significant change (Figures 21 thru 25).

TENSILE SUMMARY:

The test data shows that the strain is gradually decreasing and the stress and modulus is gradually increasing, except for high rate triaxial regressions which shows a gradual decrease for stress and no change in the modulus.

Therefore, based on the analysis of data from the tensile test parameters, it does not appear that meaningful degradation is occurring at this time and no operational problems are expected for at least two years beyond the last data point.

STRESS RELAXATION MODULUS:

For the 0.5% strains at -65°F , the regressions for data at 10, 50, 100, and 1000 seconds show a statistically significant gradual increase (Figures 26 thru 29).

At -40°F , the 10 second data does not show a change while the regressions at 50, 100 and 1000 seconds 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 10 sec regression which does not show a change (Figures 34 thru 53).

SOL GEL:

The percent extractables does not show a significant change. A statistically significant increase is shown for the gel swell ratio, sol gel density and crosslink density (Figures 54 thru 57).

CONSTANT STRAIN:

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

HARDNESS:

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

SUMMARY OF SOL GEL, TENSILE AND HARDNESS DATA:

The crosslink density, constant strain and sol gel data regressions correlate with the tensile data. As the polymer continues to crosslink, the strain decreases and the stress and hardness increases.

BURNING RATE:

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

PRESSURE TIME:

Maximum pressure shows a statistically significant gradual decrease and the time to maximum pressure does not show a change (Figures 61 and 62).

IGNITABILITY:

Ignitability shows a statistically significant gradual increase in time required for ignition (Figure 63).

TCLE (Thermal Coefficient of Linear Expansion):

The thermal coefficient of linear expansion for both below and above 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 (9°C rise/min) showing no significant change (Figure 66). The percent weight loss at 250°C hold, model $\frac{1}{X}$ was found to better represent the data than the linear model (Figures 67 and 68).

DTA (Differential Thermal Analysis):

The endotherm does not show a significant change. The first and second exotherms show a statistically significant decrease. For the first and second exotherm, the model log X was found to be a better representative of the data than the linear model. The third exotherm and ignition temperature show a statistically significant increase (Figures 69 thru 73).

FAILURE ENVELOPES:

Three failure envelopes are shown (Figures 74 thru 76). Each failure envelope represents a raw material lot and these lot numbers are listed on the respective figures.

CONCLUSIONS

Twelve and one half 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 twelve and one half 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 a line of zero slope and have not changed appreciably from the last test period.

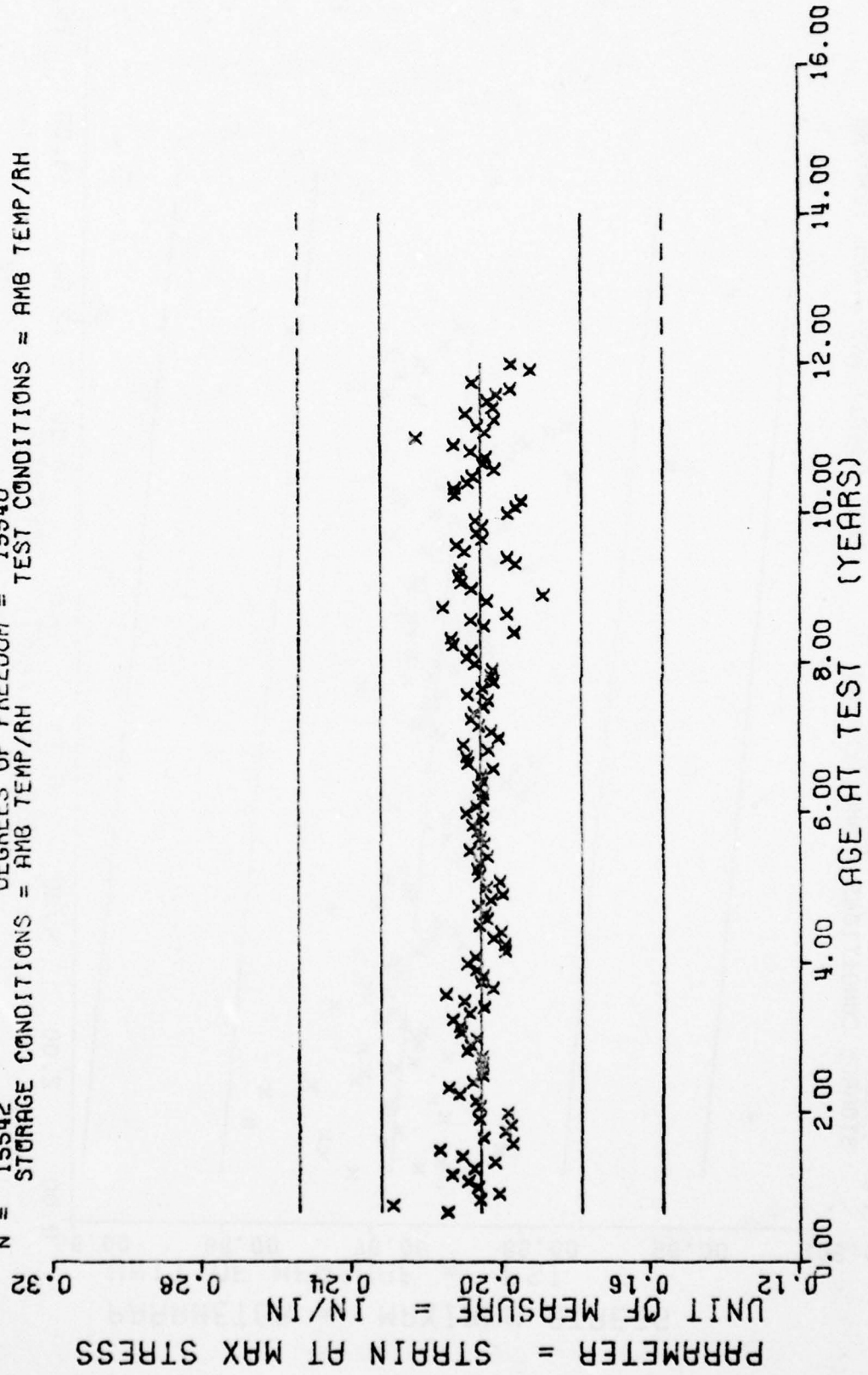
*** SAMPLE SIZE SUMMARY ***

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
8.0	3	33.0	140	58.0	249	83.0	69	108	72	133	50		
9.0	10	34.0	139	59.0	220	84.0	26	109	96	134	72		
10.0	8	35.0	107	60.0	294	85.0	36	110	48	135	33		
11.0	15	36.0	212	61.0	198	86.0	64	111	21	136	24		
12.0	21	37.0	132	62.0	265	87.0	104	112	115	137	84		
13.0	42	38.0	108	63.0	196	88.0	121	113	271	138	234		
14.0	28	39.0	96	64.0	126	89.0	130	114	142	139	139		
15.0	38	40.0	113	65.0	90	90.0	114	115	118	140	36		
16.0	43	41.0	146	66.0	61	91.0	71	116	288	141	9		
17.0	55	42.0	112	67.0	24	92.0	55	117	238	143	6		
18.0	28	43.0	120	68.0	116	93.0	90	118	125	144	6		
19.0	49	44.0	97	69.0	174	94.0	84	119	126				
20.0	24	45.0	135	70.0	207	95.0	122	120	189				
21.0	56	46.0	116	71.0	117	96.0	155	121	102				
22.0	27	47.0	148	72.0	107	97.0	111	122	9				
23.0	67	48.0	138	73.0	80	98.0	135	123	39				
24.0	55	49.0	151	74.0	125	99.0	162	124	36				
25.0	63	50.0	176	75.0	147	100.0	139	125	69				
26.0	47	51.0	329	76.0	108	101.0	121	126	44				
27.0	50	52.0	296	77.0	136	102.0	51	127	95				
28.0	56	53.0	256	78.0	85	103.0	55	128	51				
29.0	40	54.0	226	79.0	108	104.0	45	129	48				
30.0	73	55.0	468	80.0	101	105.0	9	130	160				
31.0	82	56.0	437	81.0	128	106.0	11	131	176				
32.0	148	57.0	367	82.0	117	107.0	10	132	138				

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

This sample size summary is applicable to figures 1 thru 3

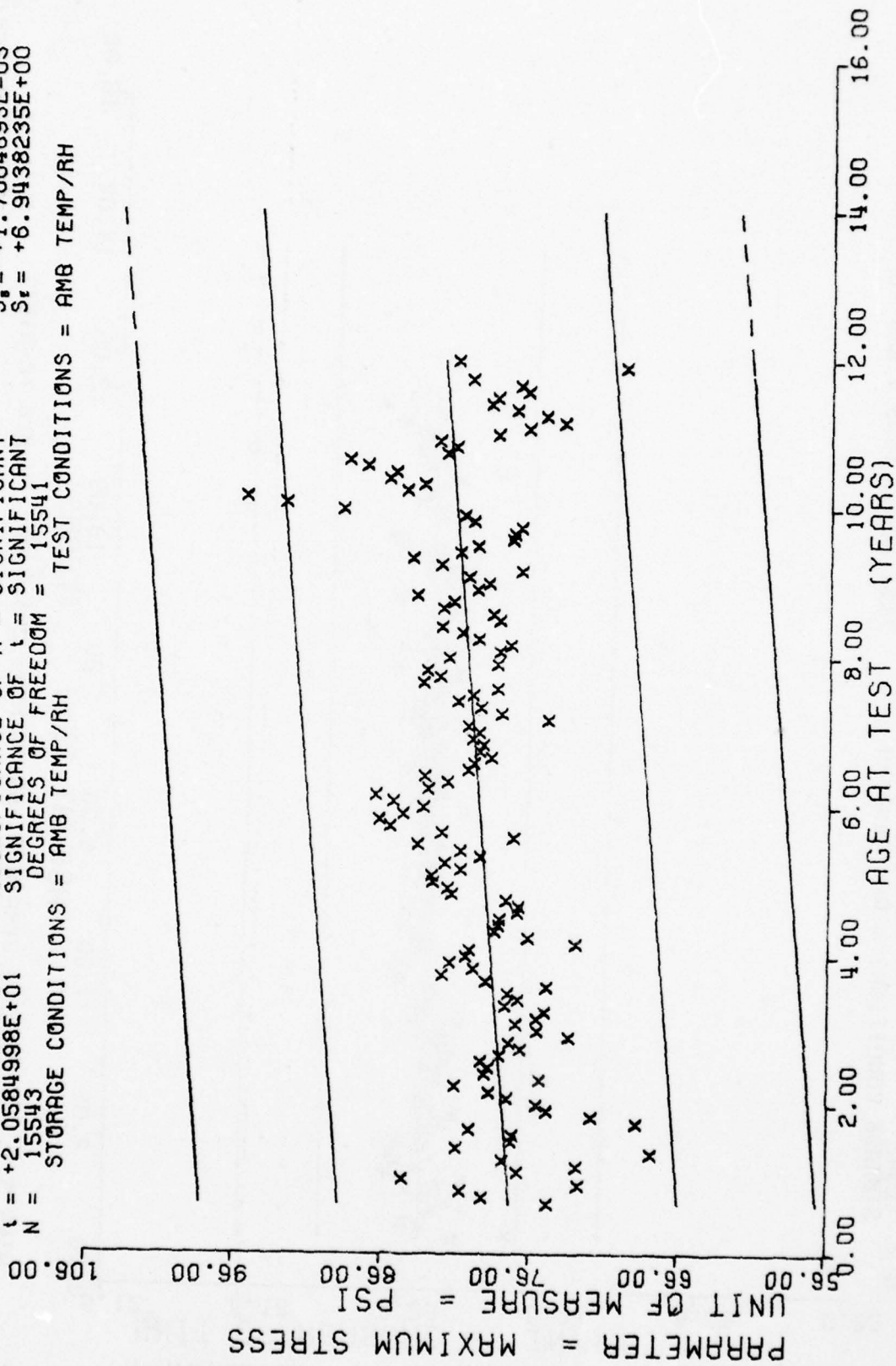
Y = ((+2.0541029E-01) + (+8.6435384E-07) * X)
 F = +4.9038987E-02 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_f = +1.6306203E-02
 R = +1.7764155E-03 SIGNIFICANCE OF R = NOT SIGNIFICANT S_R = +3.9935150E-06
 t = +2.2144748E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_t = +1.6306701E-02
 N = 15542 DEGREES OF FREEDOM = 15540
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



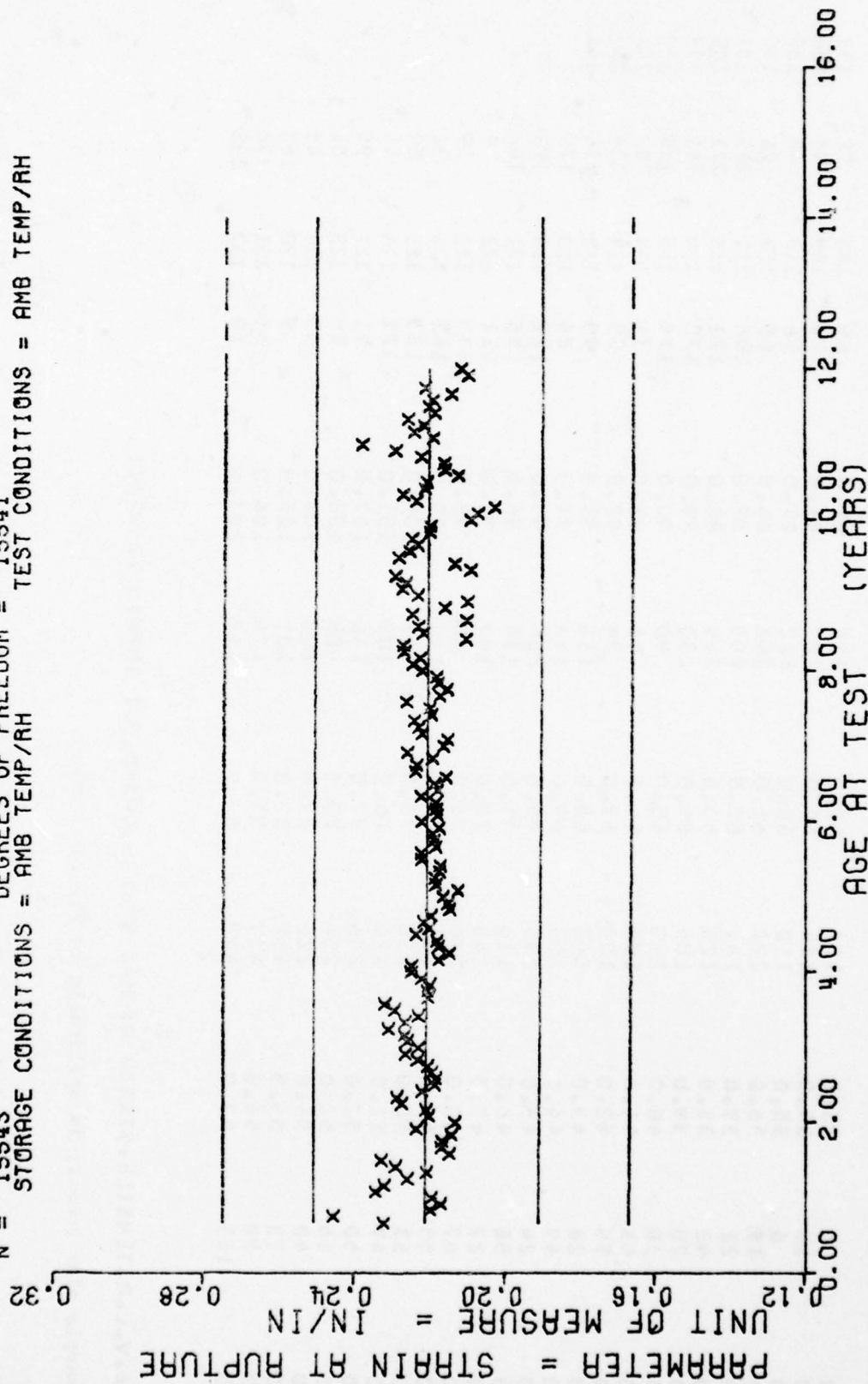
WING 6, V.L.R. TENSILE STRAIN AT MAX STRESS, CHS=0.002 IN/MIN TP-H1011

Figure 1

$Y = ((+7.7140832E+01) + (+3.5004158E-02) * X)$
 F = +4.2374216E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.6291830E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +2.0584998E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 15543 DEGREES OF FREEDOM = 15541
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



Y = ((+2.2134439E-01) + (-1.2355022E-05) * X)
 F = +7.9057815E+00 SIGNIFICANCE OF F = SIGNIFICANT
 R = -2.2546750E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +2.8117221E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 15543 DEGREES OF FREEDOM = 15541
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

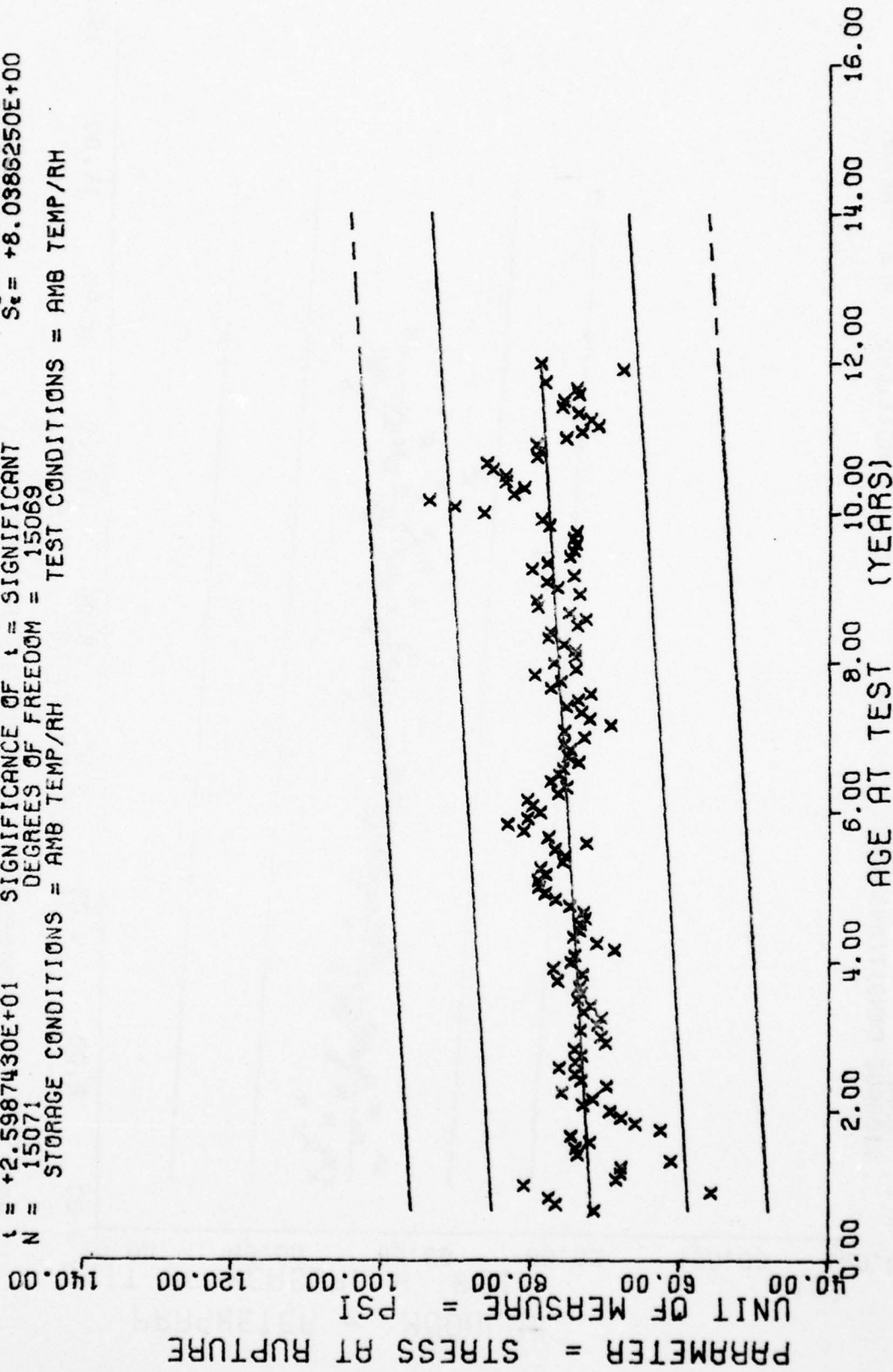
*** SAMPLE SIZE SUMMARY ***

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
8.0	3	33.0	152	58.0	325	83.0	69	108	72	133	50		
9.0	10	34.0	154	59.0	287	84.0	26	109	96	134	72		
10.0	8	35.0	110	60.0	382	85.0	36	110	48	135	33		
11.0	15	36.0	222	61.0	242	86.0	65	111	21	136	24		
12.0	21	37.0	141	62.0	295	87.0	104	112	115	137	84		
13.0	42	38.0	123	63.0	219	88.0	121	113	271	138	234		
14.0	28	39.0	105	64.0	130	89.0	130	114	141	139	139		
15.0	38	40.0	119	65.0	90	90.0	114	115	118	140	36		
16.0	43	41.0	153	66.0	61	91.0	71	116	288	141	9		
17.0	55	42.0	120	67.0	24	92.0	55	117	238	143	6		
18.0	28	43.0	142	68.0	116	93.0	90	118	125	144	6		
19.0	49	44.0	100	69.0	174	94.0	84	119	126				
20.0	24	45.0	135	70.0	206	95.0	122	120	189				
21.0	56	46.0	116	71.0	117	96.0	155	121	102				
22.0	27	47.0	148	72.0	107	97.0	111	122	9				
23.0	67	48.0	138	73.0	80	98.0	135	123	39				
24.0	55	49.0	151	74.0	125	99.0	162	124	36				
25.0	63	50.0	176	75.0	147	100.0	139	125	69				
26.0	47	51.0	329	76.0	108	101.0	121	126	44				
27.0	50	52.0	296	77.0	136	102.0	51	127	95				
28.0	56	53.0	256	78.0	85	103.0	55	128	51				
29.0	40	54.0	226	79.0	108	104.0	45	129	48				
30.0	73	55.0	468	80.0	101	105.0	9	130	160				
31.0	88	56.0	437	81.0	128	106.0	11	131	176				
32.0	153	57.0	377	82.0	117	107.0	10	132	138				

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

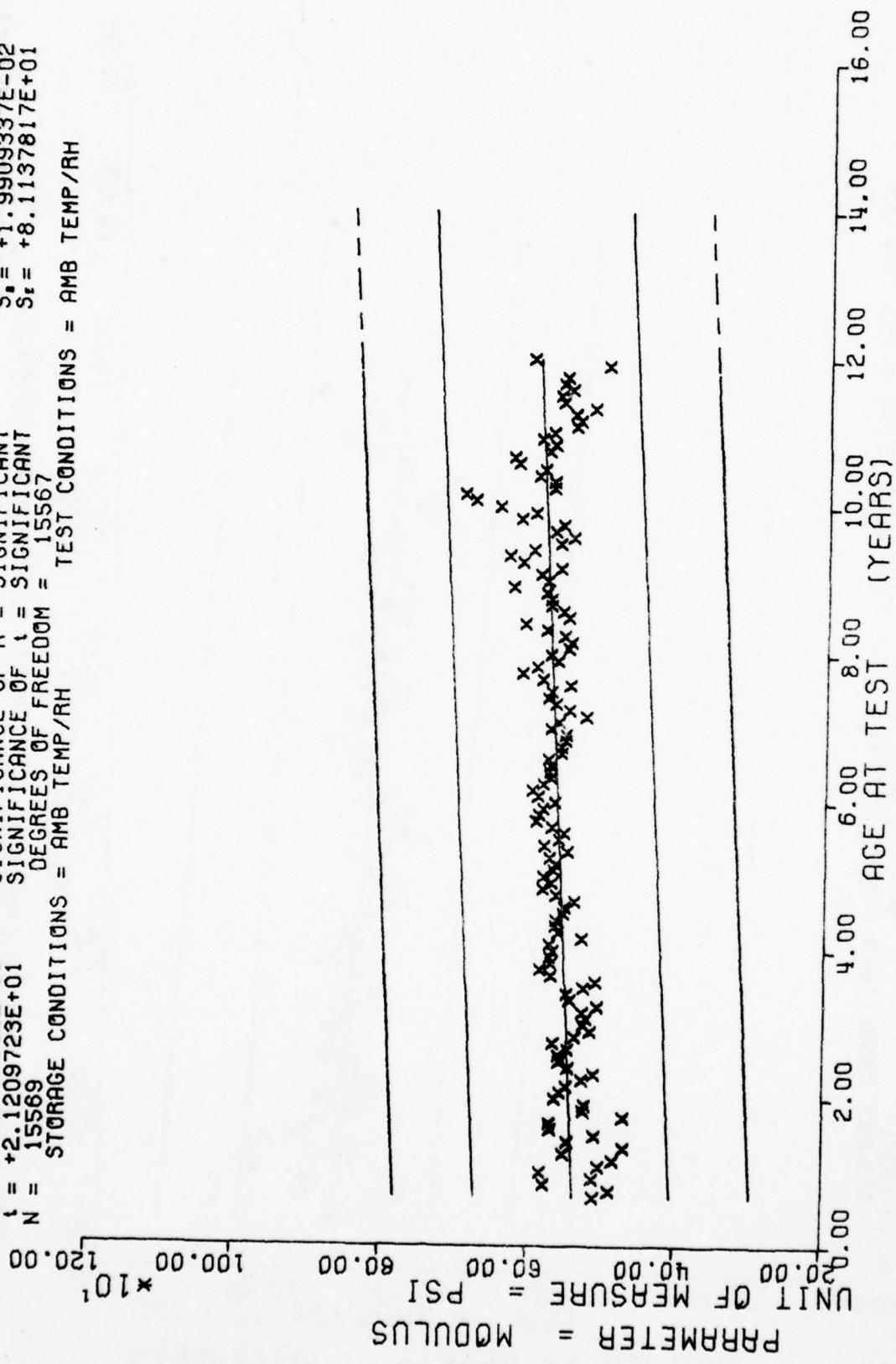
This sample size summary is applicable to Figures 4 and 5

$Y = ((+7.1642489E+01) + (+5.1548869E-02) * X)$
 F = +6.7534655E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_1 = +8.2165114E+00$
 R = +2.0710997E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_a = +1.9836077E-03$
 t = +2.5987430E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +8.0986250E+00$
 N = 15071 DEGREES OF FREEDOM = 15069
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

$F = +4.4985235E+02$
 $R = +1.6758934E-01$
 $t = +2.1209723E+01$
 $N = 15569$
 STORAGE CONDITIONS = AMB TEMP/RH
 $Y = ((+5.3581815E+02) + (+4.2227153E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 15567
 $\sigma_f = +8.2299177E+01$
 $S_e = +1.9909337E-02$
 $S_f = +8.1137817E+01$
 TEST CONDITIONS = AMB TEMP/RH



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

Figure 5

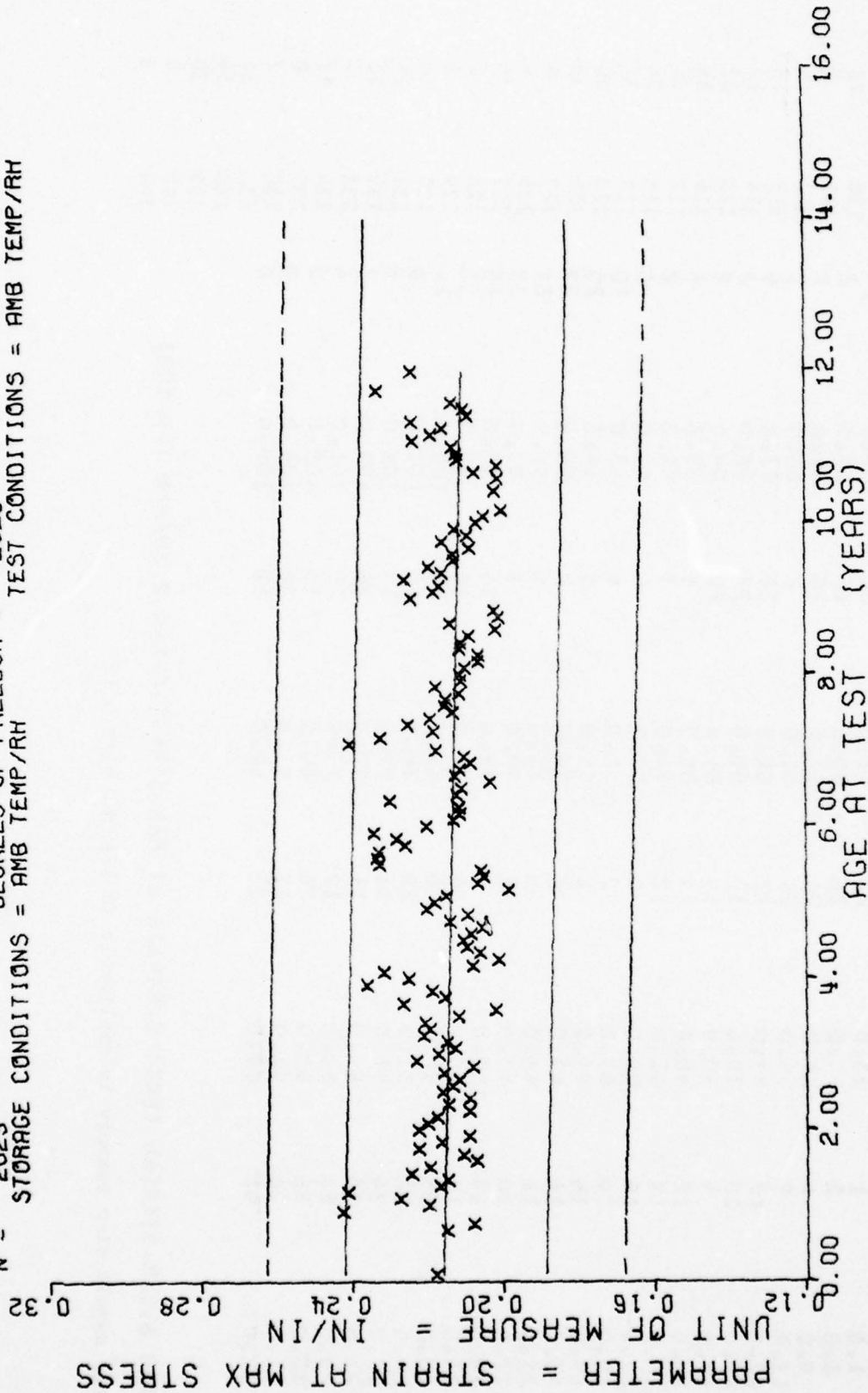
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	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	2	36.0	28	61.0	8	86.0	1	112	8		
12.0	12	37.0	12	62.0	28	87.0	4	113	13		
13.0	20	38.0	10	63.0	28	88.0	2	114	12		
14.0	4	39.0	14	64.0	20	89.0	2	115	12		
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	64		
17.0	14	42.0	6	67.0	6	92.0	8	118	26		
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	4		
22.0	10	47.0	2	72.0	8	97.0	33	125	4		
23.0	13	48.0	4	73.0	16	98.0	45	127	10		
24.0	16	49.0	4	74.0	16	99.0	38	128	1		
25.0	25	50.0	6	75.0	25	100.0	16	129	6		
26.0	22	51.0	28	76.0	10	101.0	8	130	18		
27.0	24	52.0	31	77.0	17	102.0	8	131	74		
28.0	28	53.0	24	78.0	20	103.0	2	132	16		
29.0	23	54.0	12	79.0	18	104.0	4	133	4		
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	8		
32.0	42	57.0	30	82.0	18	108.0	6	136	2		
								137	14		
								138	56		
								139	30		
								141	2		
								144	3		

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.

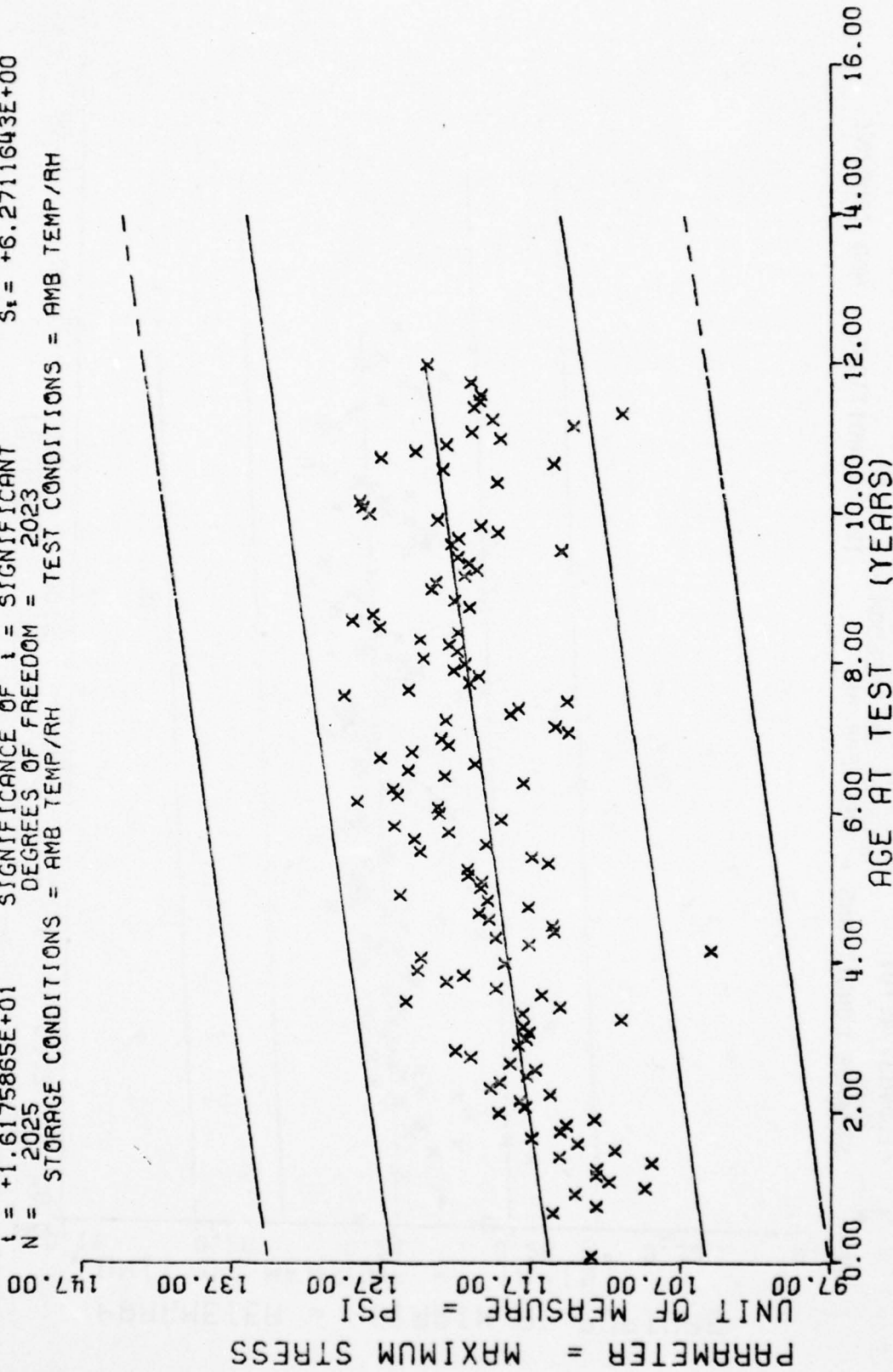
$Y = ((+2.1582109E-01) + (-4.1580152E-05) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +1.5834651E-02$
 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +8.9432405E-06$
 SIGNIFICANCE OF t = SIGNIFICANT $S_e = +1.5754616E-02$
 DEGREES OF FREEDOM = 2023
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 6

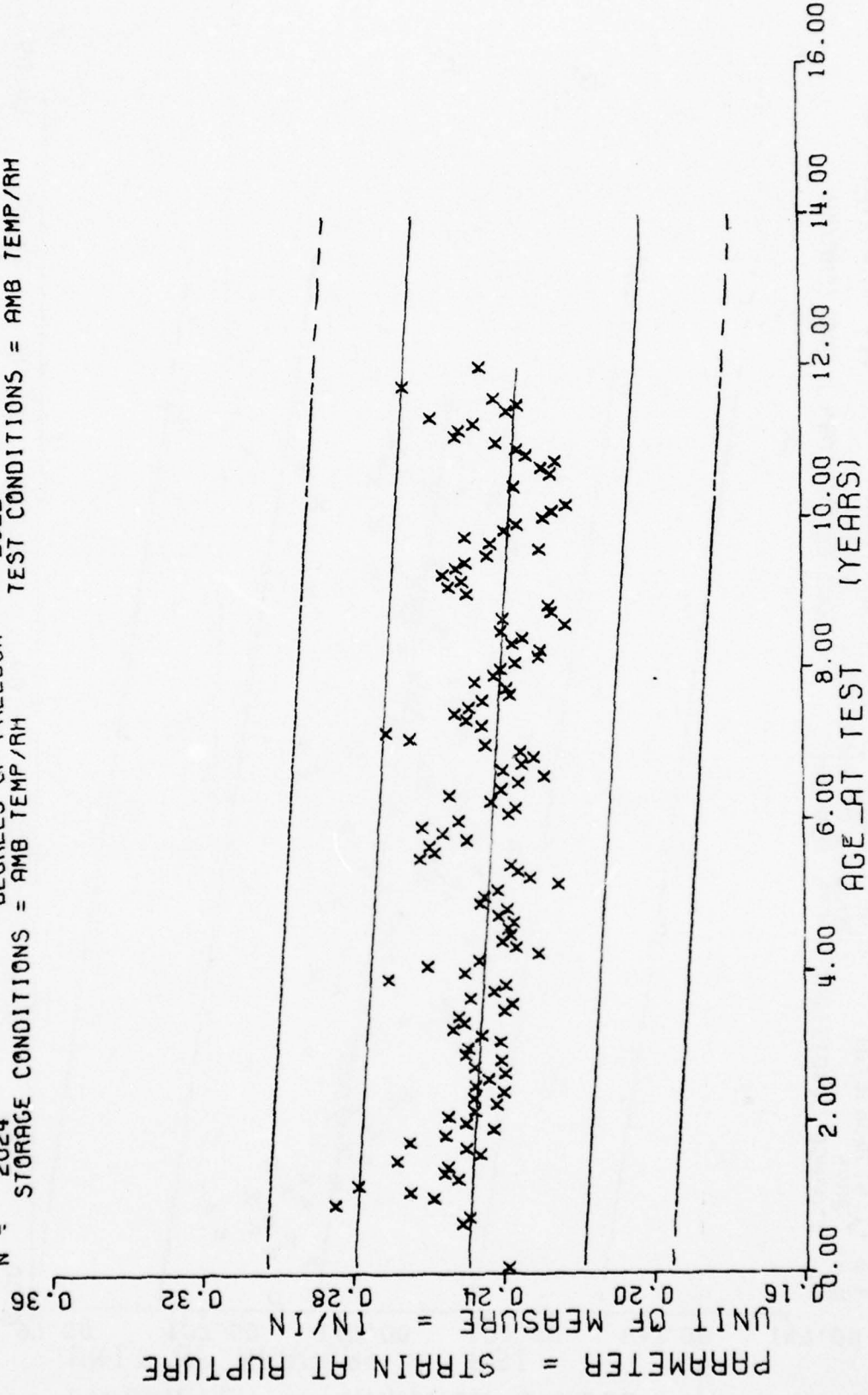
$Y = ((+1.1581482E+02) + (+5.7584126E-02) * X)$
 F = +2.6165862E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +6.6627510E+00$
 R = +3.3842066E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +3.5598791E-03$
 t = +1.6175865E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +6.2711643E+00$
 N = 2025 DEGREES OF FREEDOM = 2023
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 7

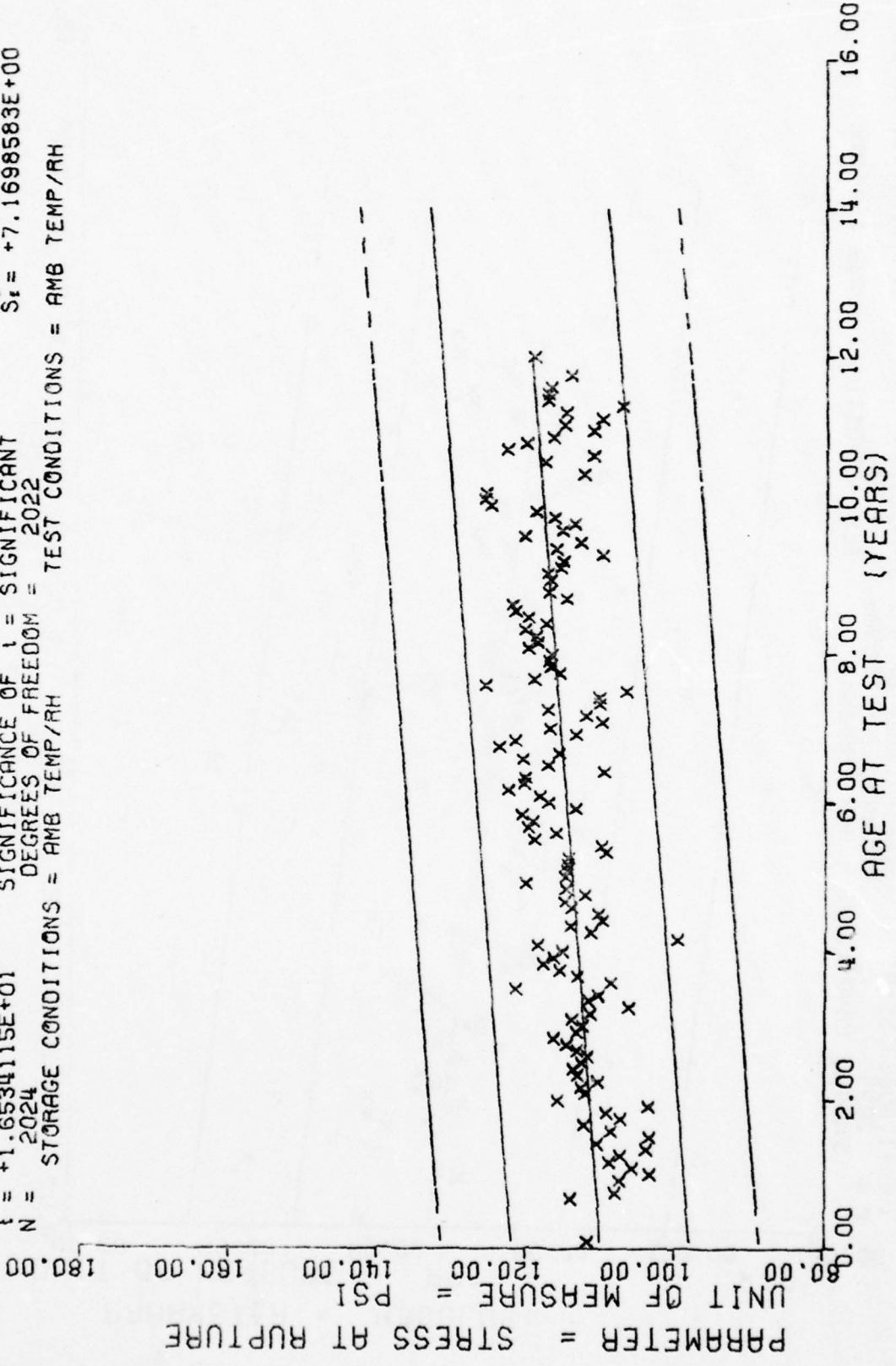
Y = ((+2.4968649E-01) + (-1.0581707E-04) * X)
 F = +1.0823853E+02 SIGNIFICANCE OF F = SIGNIFICANT σ_1 = +1.8381107E-02
 R = -2.2541189E-01 SIGNIFICANCE OF R = SIGNIFICANT S_0 = +1.0171026E-05
 t = +1.0403774E+01 SIGNIFICANCE OF t = SIGNIFICANT S_1 = +1.7912470E-02
 N = 2024 DEGREES OF FREEDOM = 2022
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 8

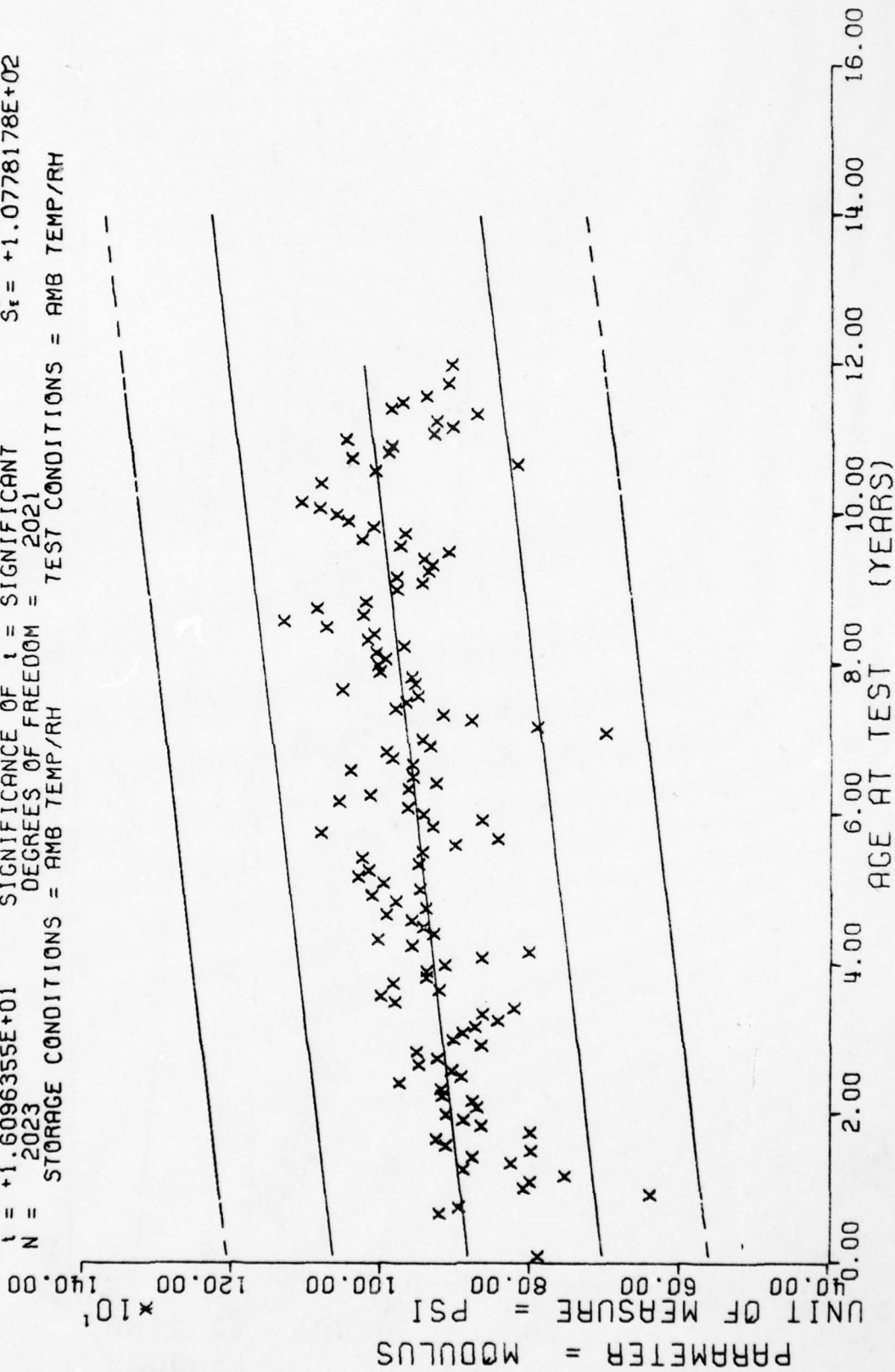
F = +2.7337697E+02
 R = +3.4510715E-01
 t = +1.6534115E+01
 N = 2024
 STORAGE CONDITIONS = AMB TEMP/RH
 Y = ((+1.0997511E+02) + (+6.7313295E-02) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2022
 TEST CONDITIONS = AMB TEMP/RH



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

Figure 9

$Y = ((+8.8323004E+02) + (+9.8587017E-01) * X)$
 F = +2.5909267E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +1.1445401E+02$
 R = +3.3709422E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_b = +6.1248035E-02$
 t = +1.6096355E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_f = +1.0778178E+02$
 N = 2023 DEGREES OF FREEDOM = 2021
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 10

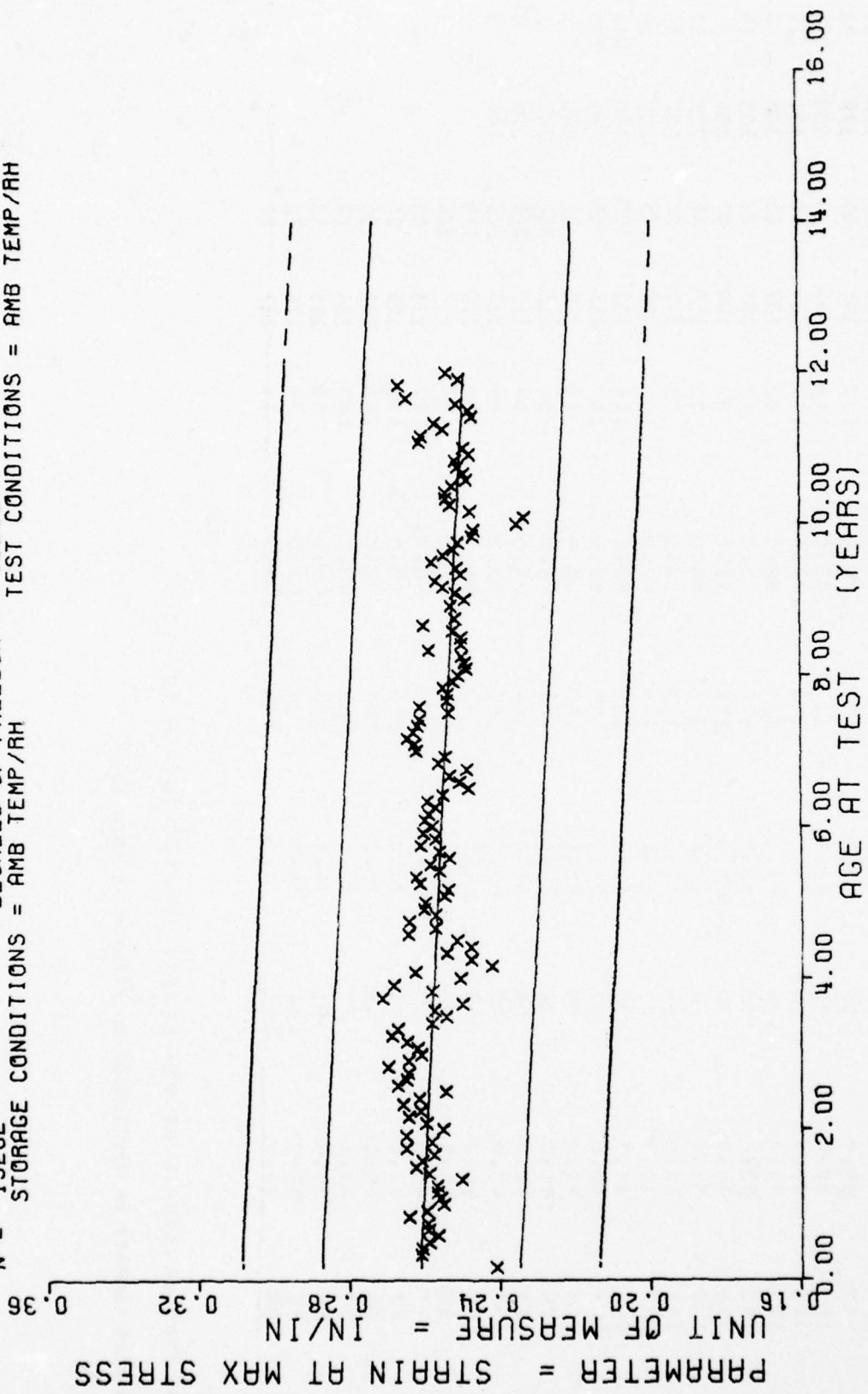
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
2.0	3	28.0	82	53.0	76	78.0	162	103	35	128	45		
4.0	57	29.0	55	54.0	77	79.0	117	104	45	129	33		
5.0	151	30.0	52	55.0	127	80.0	114	105	9	130	234		
6.0	191	31.0	52	56.0	91	81.0	127	106	6	131	111		
7.0	171	32.0	124	57.0	145	82.0	63	107	15	132	12		
8.0	143	33.0	85	58.0	134	83.0	82	108	72	133	18		
9.0	194	34.0	78	59.0	102	84.0	33	109	97	134	81		
10.0	185	35.0	41	60.0	108	85.0	22	110	41	135	14		
11.0	192	36.0	148	61.0	150	86.0	38	111	24	136	27		
12.0	220	37.0	77	62.0	185	87.0	135	112	65	137	63		
13.0	204	38.0	36	63.0	253	88.0	114	113	100	138	246		
14.0	216	39.0	72	64.0	98	89.0	107	114	65	139	132		
15.0	223	40.0	59	65.0	58	90.0	60	115	51	140	9		
16.0	209	41.0	32	66.0	40	91.0	52	116	258	142	1		
17.0	184	42.0	66	67.0	64	92.0	62	117	240	143	4		
18.0	26	43.0	75	68.0	50	93.0	64	118	143	144	3		
19.0	60	44.0	15	69.0	73	94.0	104	119	117				
20.0	18	45.0	20	70.0	120	95.0	114	120	216				
21.0	78	46.0	55	71.0	75	96.0	192	121	93				
22.0	42	47.0	79	72.0	119	97.0	193	122	24				
23.0	30	48.0	40	73.0	129	98.0	185	123	30				
24.0	77	49.0	77	74.0	157	99.0	123	124	27				
25.0	51	50.0	93	75.0	175	100.0	53	125	42				
26.0	56	51.0	154	76.0	134	101.0	76	126	72				
27.0	59	52.0	196	77.0	145	102.0	13	127	57				

WING 6.L.R.TENSILE, STRAIN AT MAX STRESS, CHS=2.0 IN/MIN TP-F1011

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

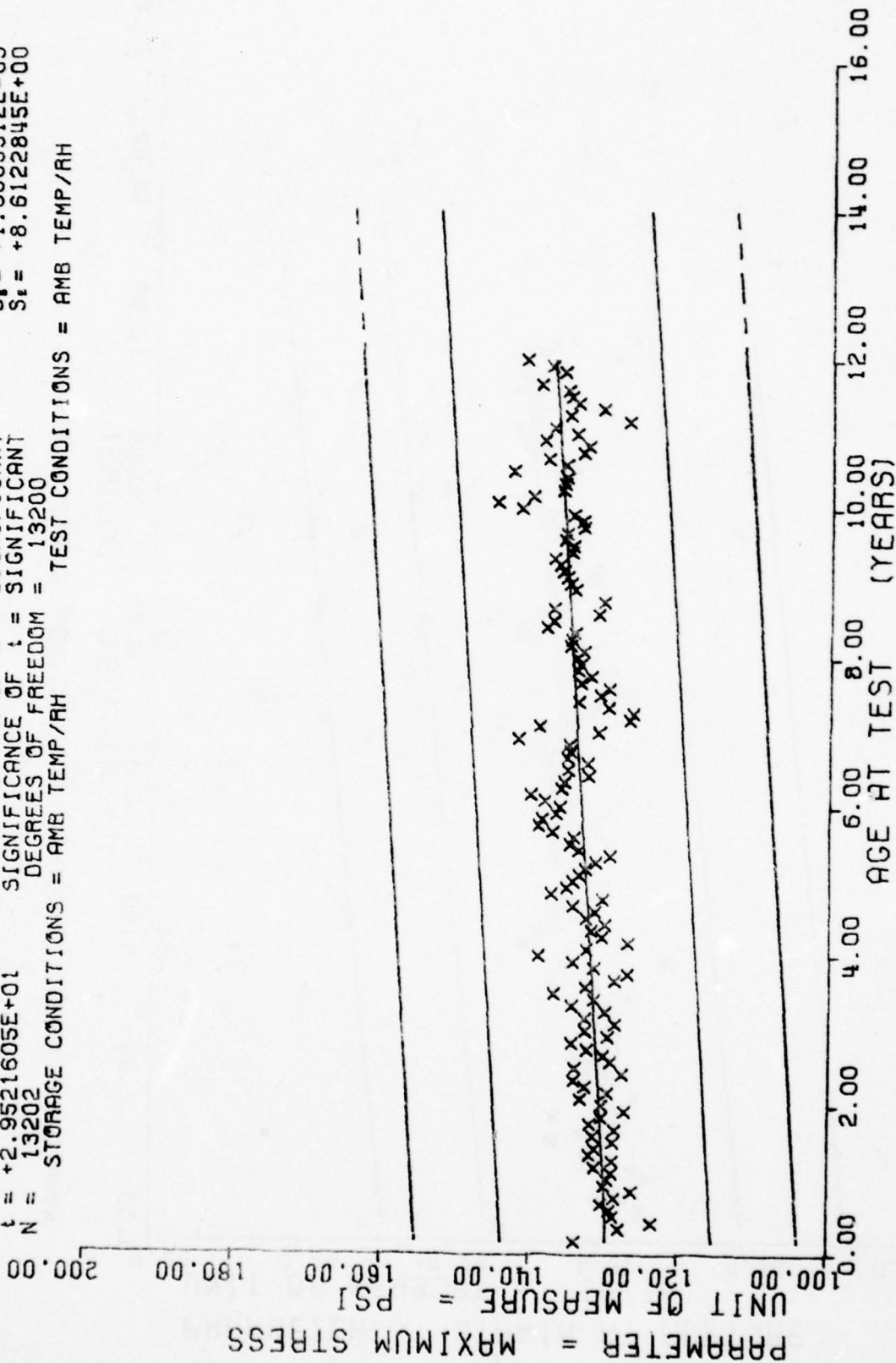
$Y = ((+2.6153626E-01) + (-9.1907505E-05) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 13200
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = AMB TEMP/RH



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

Figure 11

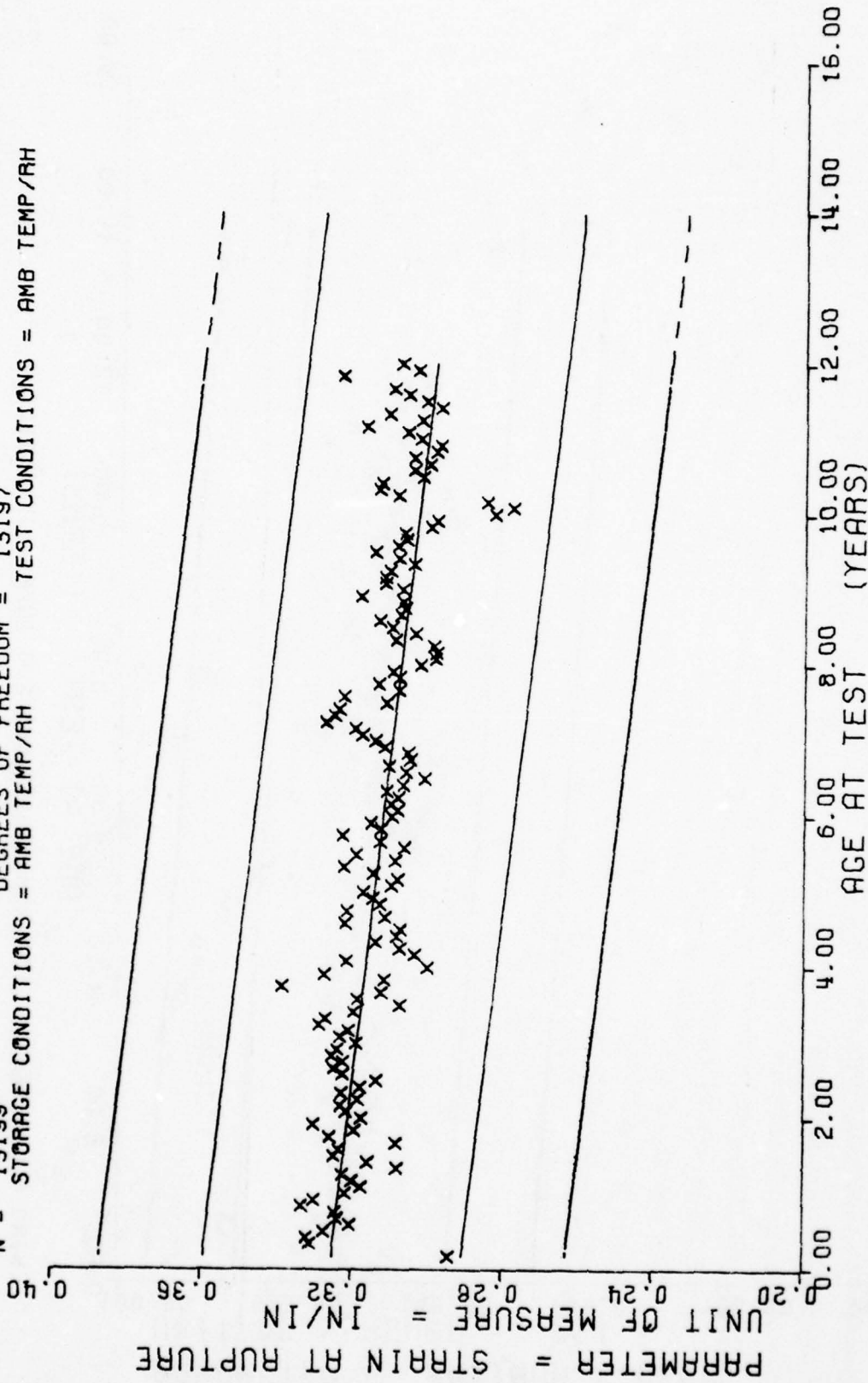
$F = +8.7152519E+02$
 $R = +2.4886818E-01$
 $t = +2.9521605E+01$
 $N = 13202$
 STORAGE CONDITIONS = AMB TEMP/RH
 $\gamma = ((+1.2944136E+02) + (+5.4920557E-02) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 13200
 $\sigma_f = +8.8917151E+00$
 $S_e = +1.8603512E-03$
 $S_t = +8.6122845E+00$
 TEST CONDITIONS = AMB TEMP/RH



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

Figure 12

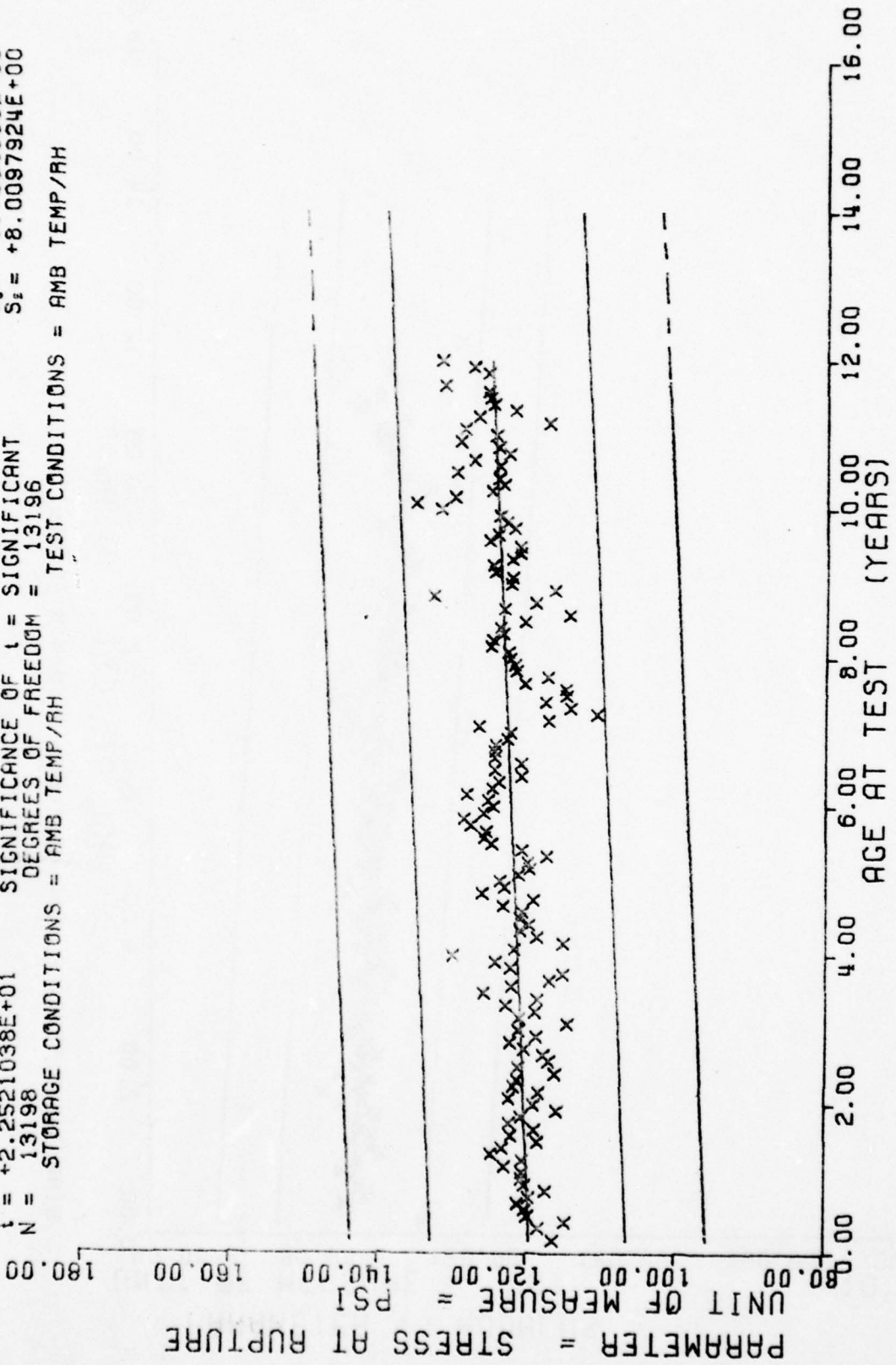
$Y = ((+3.2555221E-01) + (-1.9294176E-04) * X)$
 F = +1.8715225E+03 SIGNIFICANCE OF F = SIGNIFICANT S_f = +2.2057816E-02
 R = -3.5242134E-01 SIGNIFICANCE OF R = SIGNIFICANT S_r = +4.4599368E-06
 t = +4.3261097E+01 SIGNIFICANCE OF t = SIGNIFICANT S_t = +2.0643401E-02
 N = 13199 DEGREES OF FREEDOM = 13197
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 13

$Y = ((+1.1960898E+02) + (+3.8972546E-02) * X)$
 F = +5.0719718E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +8.1619627E+00$
 R = +1.9238777E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +1.7304950E-03$
 t = +2.2521038E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_i = +8.0097924E+00$
 N = 13198 DEGREES OF FREEDOM = 13196
 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

$F = +1.2381071E+03$
 $R = +2.9290669E-01$
 $l = +3.5186747E+01$
 $N = 13195$
 STORAGE CONDITIONS = AMB TEMP/RH
 $Y = ((+9.4228453E+02) + (+9.2499950E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF l = SIGNIFICANT
 DEGREES OF FREEDOM = 13193
 TEST CONDITIONS = AMB TEMP/RH

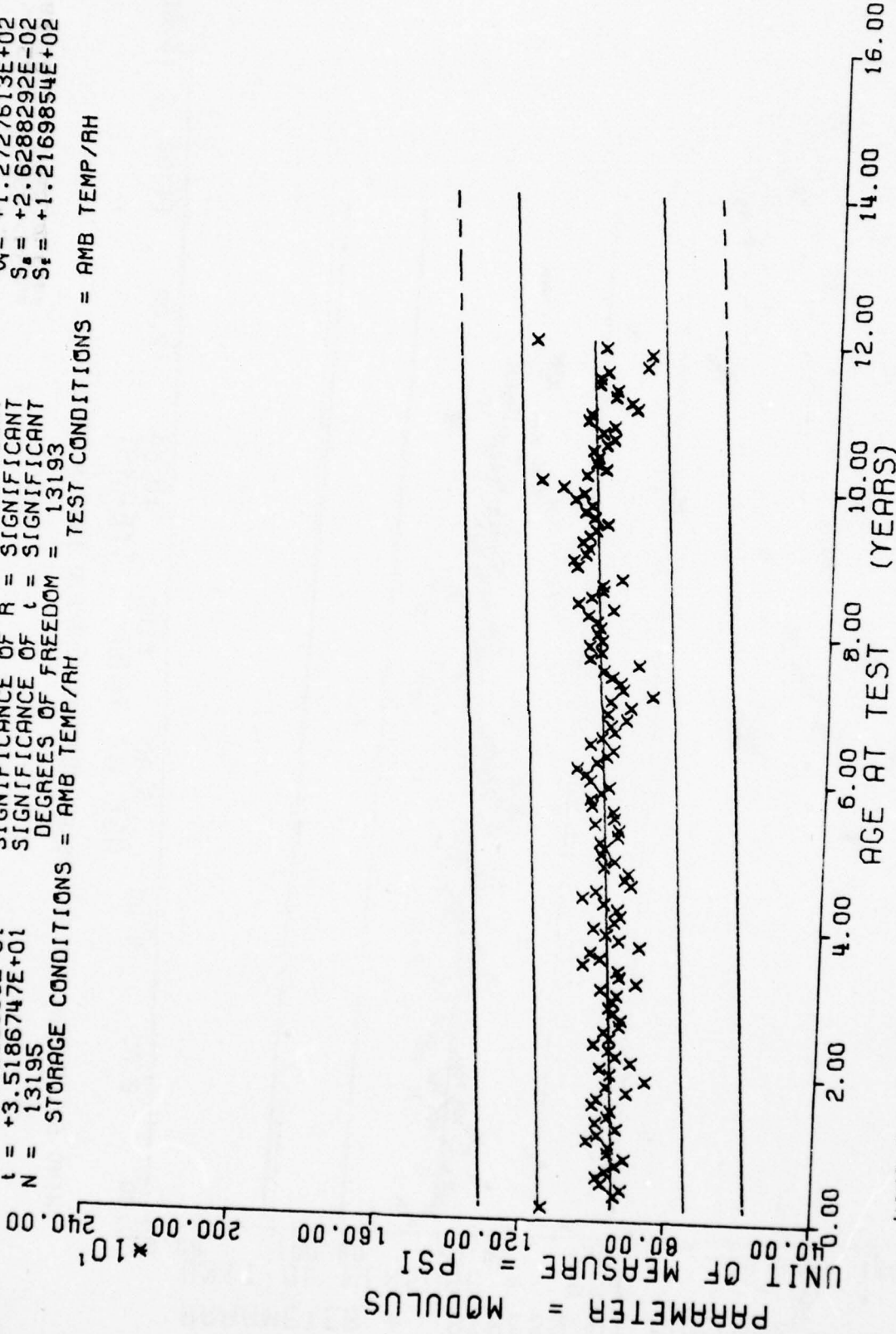


Figure 15

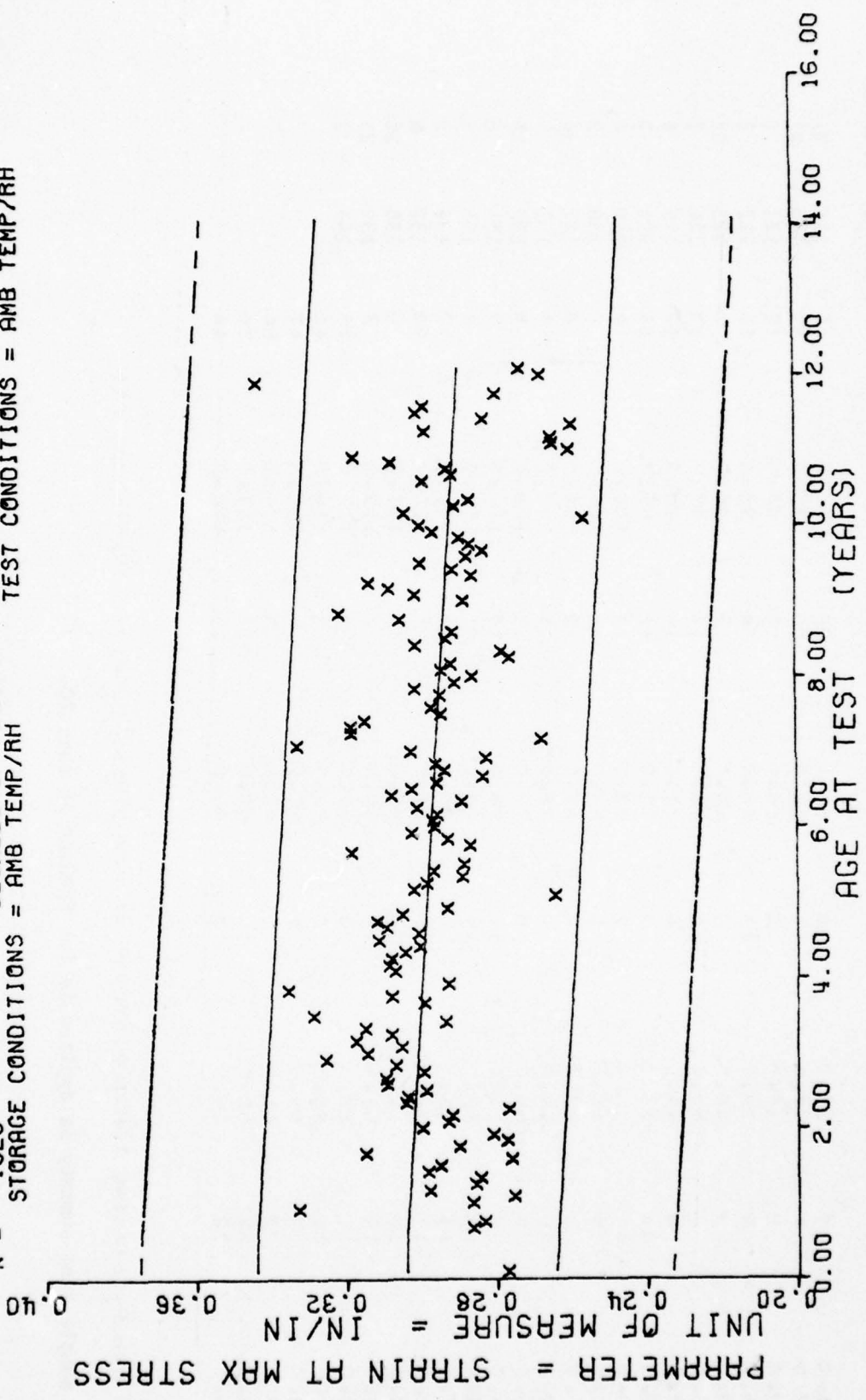
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	2	36.0	20	64.0	20	91.0	10
12.0	4	37.0	14	65.0	20	93.0	12
17.0	8	38.0	9	66.0	10	94.0	10
14.0	2	39.0	11	68.0	4	95.0	10
15.0	2	40.0	9	69.0	2	96.0	8
16.0	8	41.0	6	70.0	10	97.0	13
17.0	4	42.0	4	71.0	14	98.0	12
18.0	14	44.0	2	72.0	12	99.0	24
19.0	11	45.0	2	73.0	18	100.0	14
20.0	20	46.0	2	74.0	20	101.0	8
21.0	4	47.0	4	75.0	12	102.0	8
22.0	10	49.0	4	76.0	16	103.0	4
23.0	6	50.0	8	77.0	12	105.0	6
24.0	8	51.0	16	78.0	10	106.0	4
25.0	23	52.0	24	79.0	21	108.0	4
26.0	13	53.0	26	80.0	12	109.0	4
27.0	11	54.0	6	81.0	7	110.0	2
28.0	17	55.0	26	82.0	14	111.0	6
29.0	14	56.0	12	83.0	4	112.0	35
30.0	18	57.0	22	84.0	2	113.0	25
31.0	16	58.0	12	86.0	3	114.0	2
32.0	22	59.0	5	87.0	6	115.0	41
33.0	23	61.0	5	88.0	8	116.0	47
34.0	22	62.0	12	89.0	11	117.0	54
35.0	22	63.0	13	90.0	13	118.0	38
							16

WING 6,H.R.TRIAXIAL TENSILE,STRAIN AT MAX STRESS,CFS=1750,IN/MIN,900 PSI

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

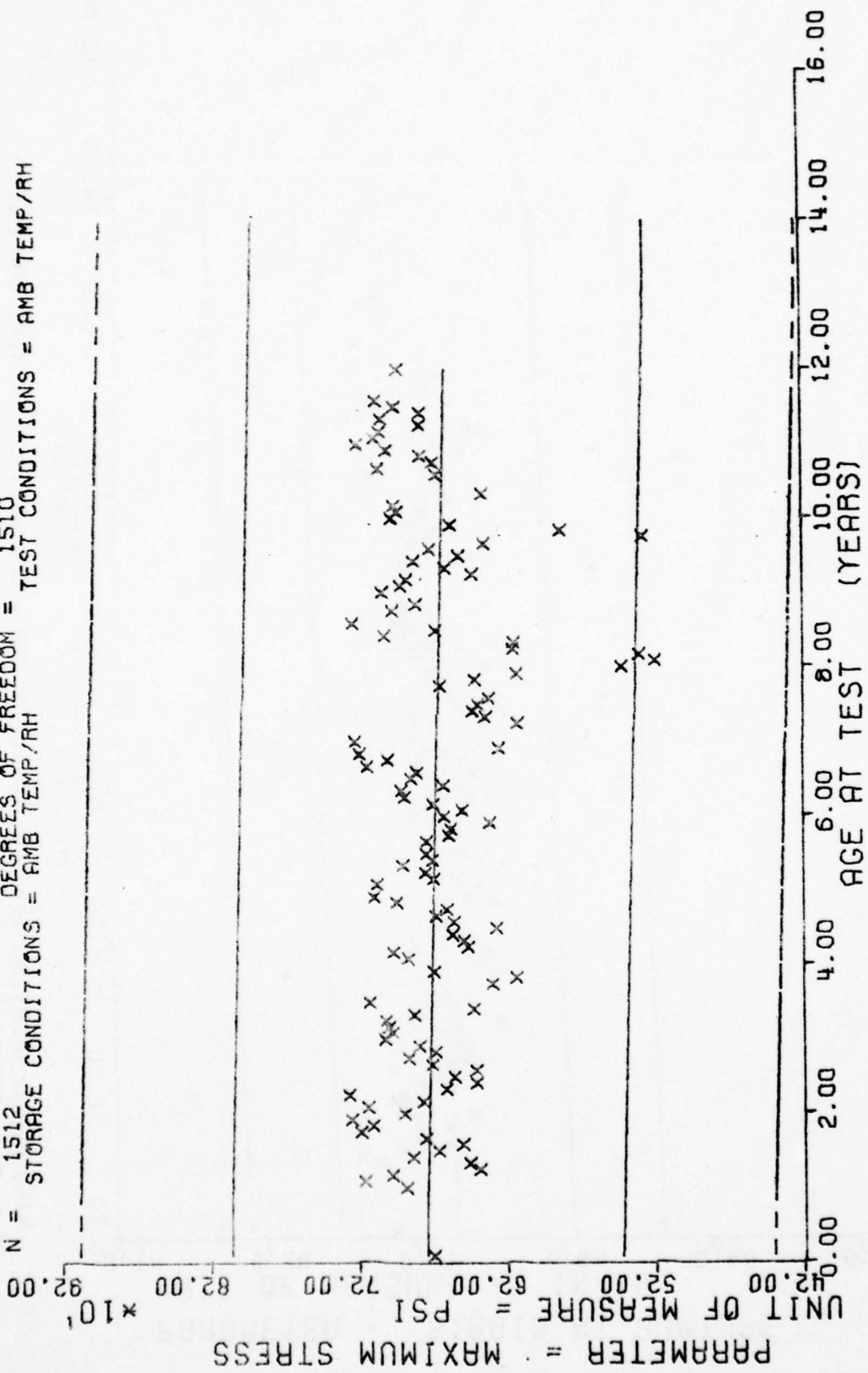
Y = ((+3.0445610E-01) + (-1.0950262E-04) * X)
 F = +5.1474887E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = -1.7559322E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +7.1746001E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1620 DEGREES OF FREEDOM = 1618
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 16

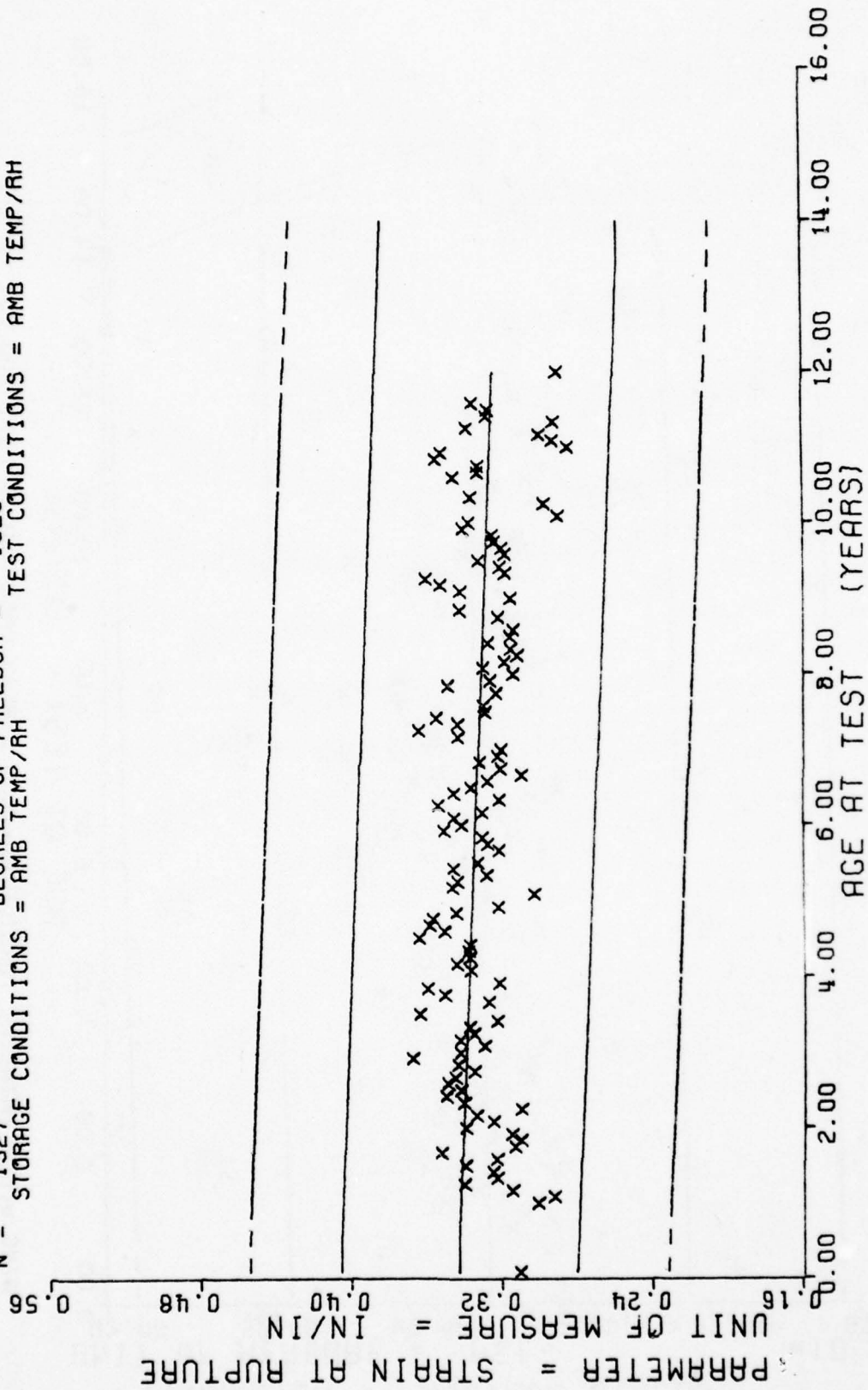
$Y = ((+6.7503831E+02) + (-1.1264647E-01) * X)$
 F = +4.5579055E+00 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +7.8092355E+01$
 R = -5.4857968E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +5.2763664E-02$
 t = +2.1349251E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_b = +7.8000576E+01$
 N = 1512 DEGREES OF FREEDOM = 1510 TEST CONDITIONS = AMB TEMP/RH
 STORAGE CONDITIONS = AMB TEMP/RH



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

Figure 17

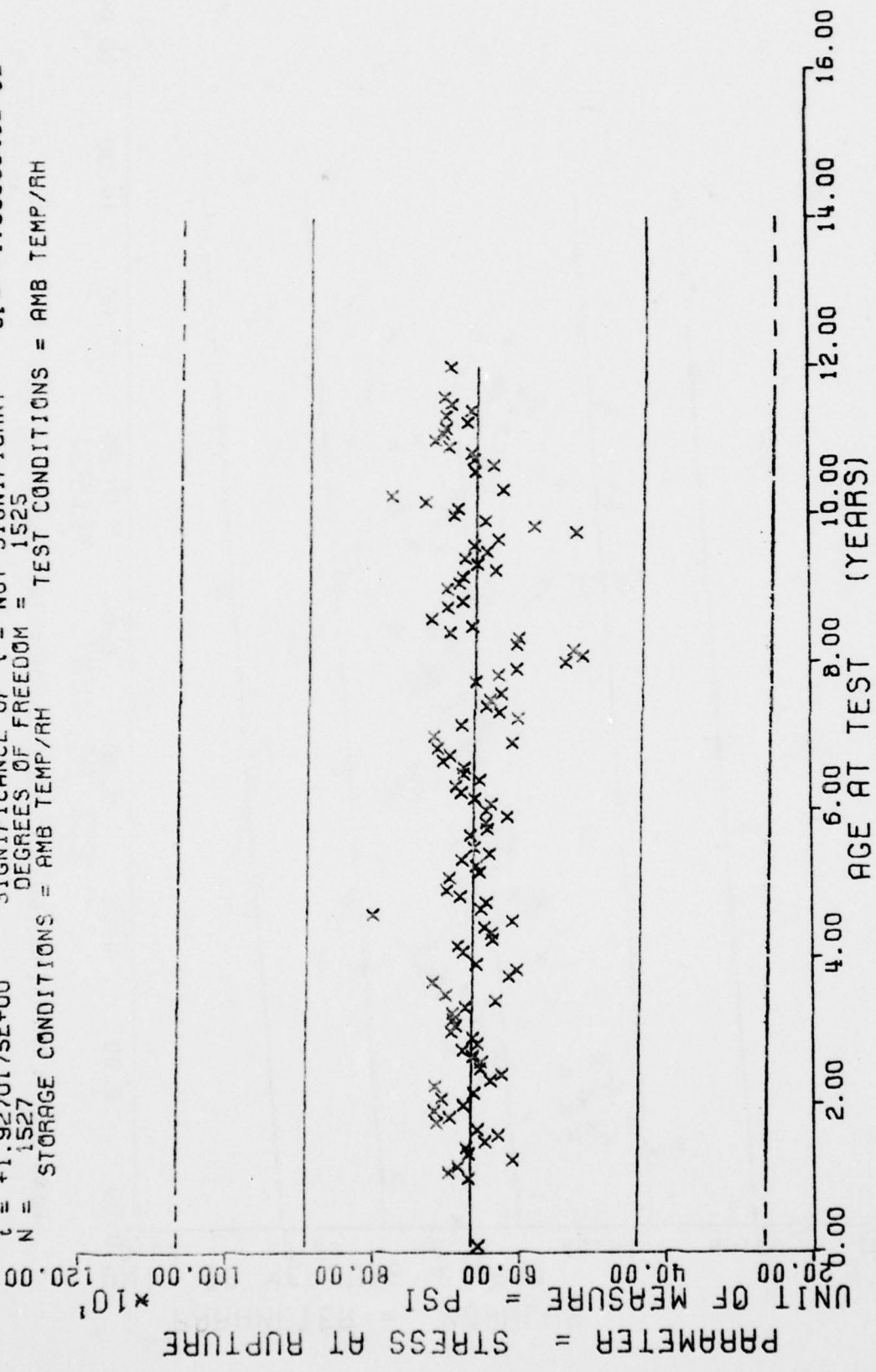
Y = ((+3.4352674E-01) + (-1.4313728E-04) * X)
 F = +3.2752888E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = -1.4500251E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +5.7230139E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1527 DEGREES OF FREEDOM = 1525
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 18

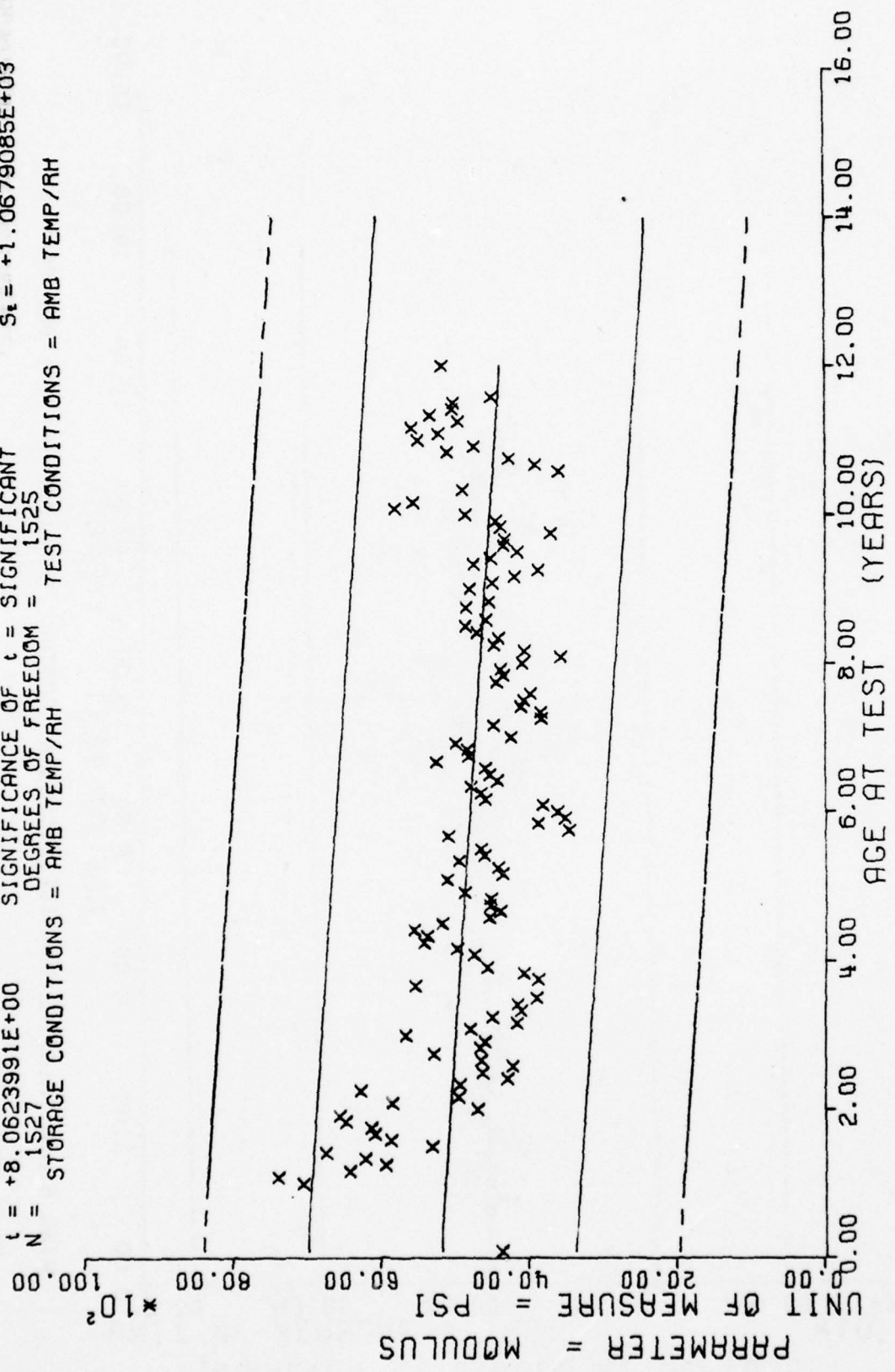
$Y = ((+6.6795666E+02) + (-1.7354952E-01) * X)$
 F = +3.7133967E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma^2 = +1.3342186E+02$
 R = -4.9285894E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_e = +8.0061205E-02$
 t = +1.9270175E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_t = +1.3330340E+02$
 N = 1527 DEGREES OF FREEDOM = 1525
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 19

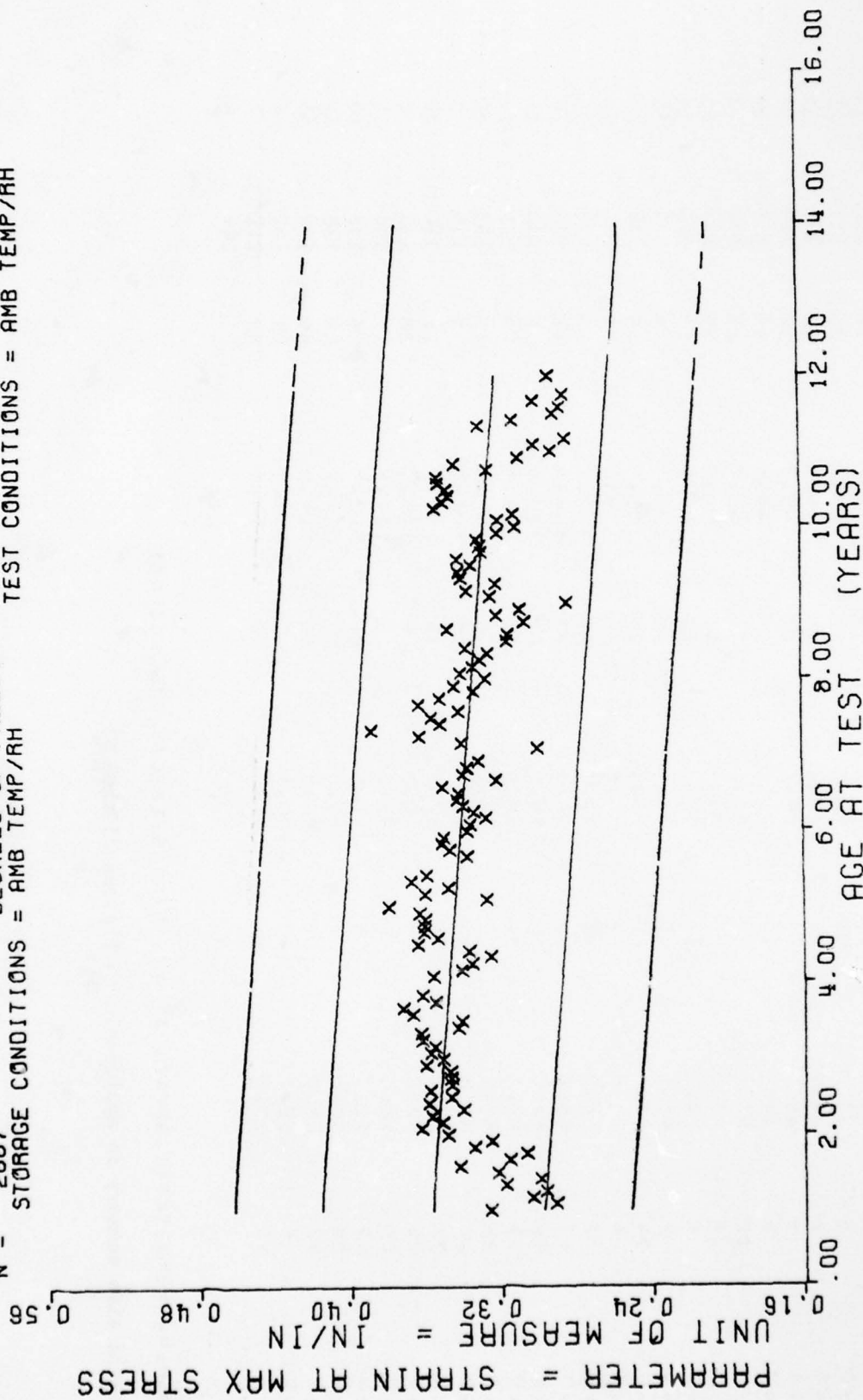
$Y = ((+5.1960532E+03) + (-5.8169436E+00) * X)$
 F = +6.5002280E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +1.0900731E+03$
 R = -2.0219267E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +7.2149040E-01$
 t = +8.0623991E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_e = +1.0679085E+03$
 N = 1527 DEGREES OF FREEDOM = 1525
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 20

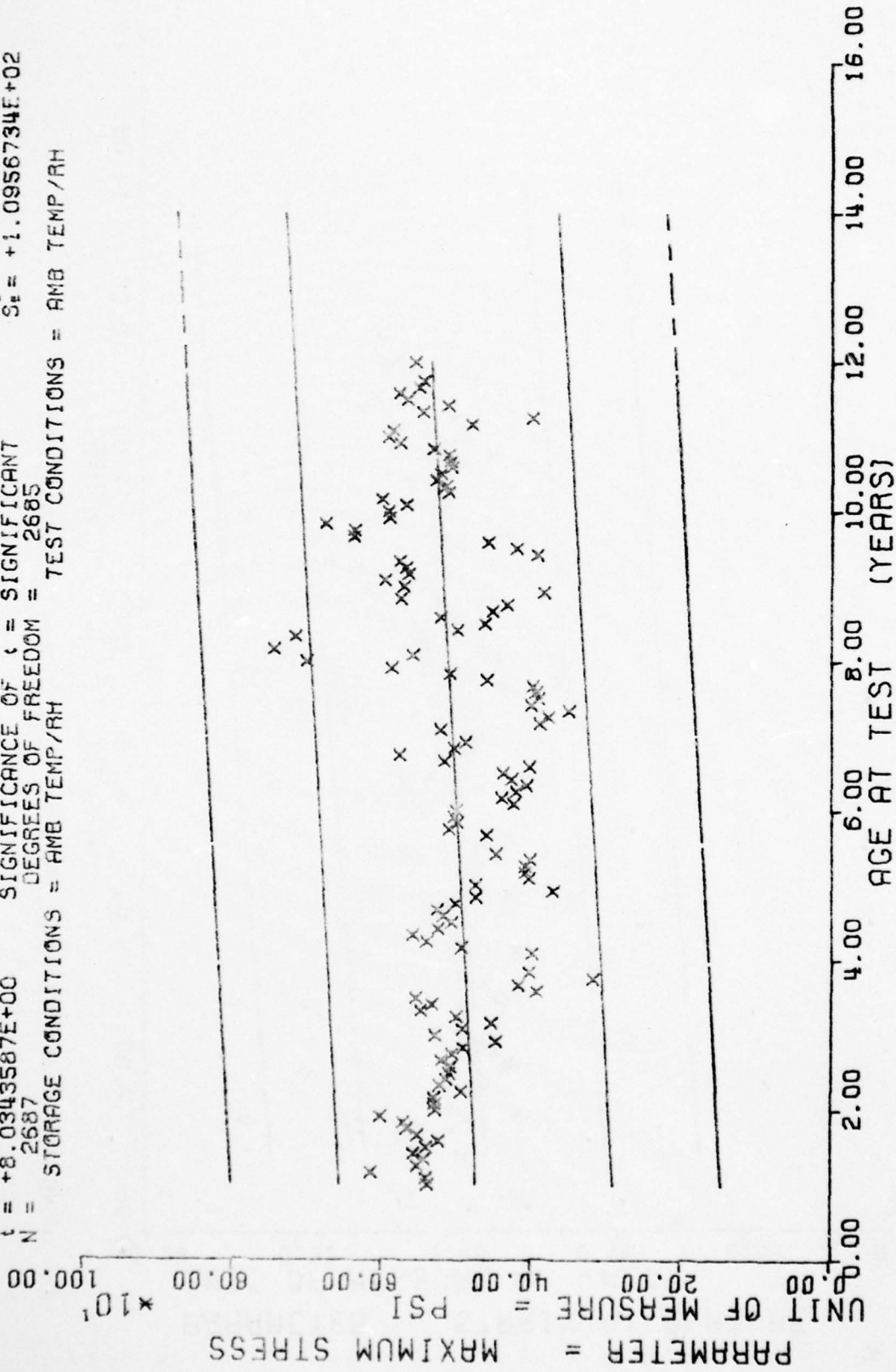
Y = ((+3.6067657E-01) + (-2.8567227E-04) * X)
 F = +2.2334347E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = -2.7711739E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +1.4944680E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2687 DEGREES OF FREEDOM = 2685
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 21

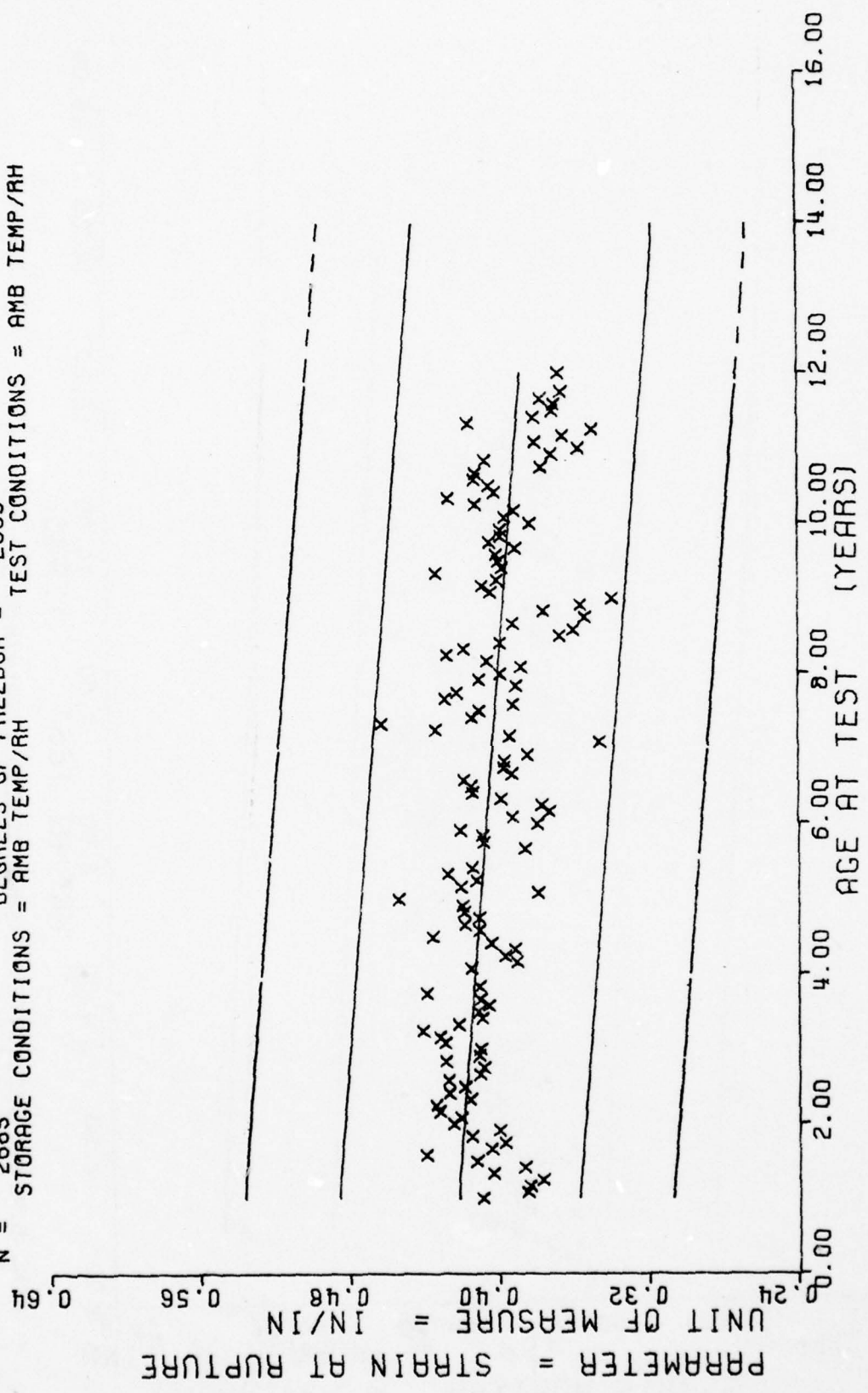
$Y = ((+4.6749050E+02) + (+4.8035671E-01) * X)$
 F = +6.4550920E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma^2 = +1.1085594E+02$
 R = +1.5322172E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +5.9787810E-02$
 t = +8.0343587E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_e = +1.0956734E+02$
 N = 2687 DEGREES OF FREEDOM = 2685
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 22

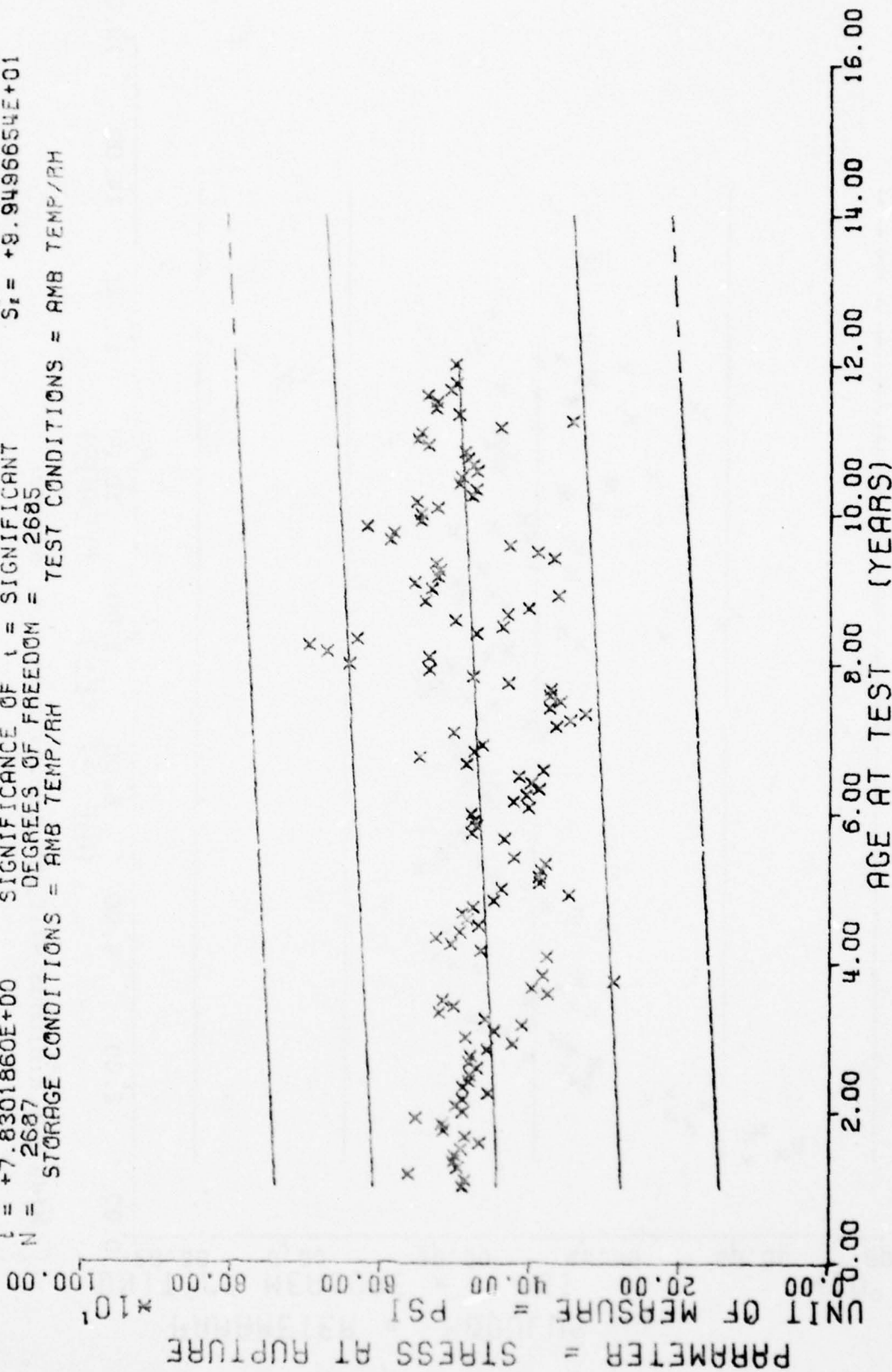
$Y = ((+4.2538454E-01) + (-2.6663702E-04) * X)$
 F = +1.6390694E+02 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +3.9281286E-02$
 R = -2.3994518E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +2.0826762E-05$
 t = +1.2802614E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +3.8140846E-02$
 N = 2685 DEGREES OF FREEDOM = 2683
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

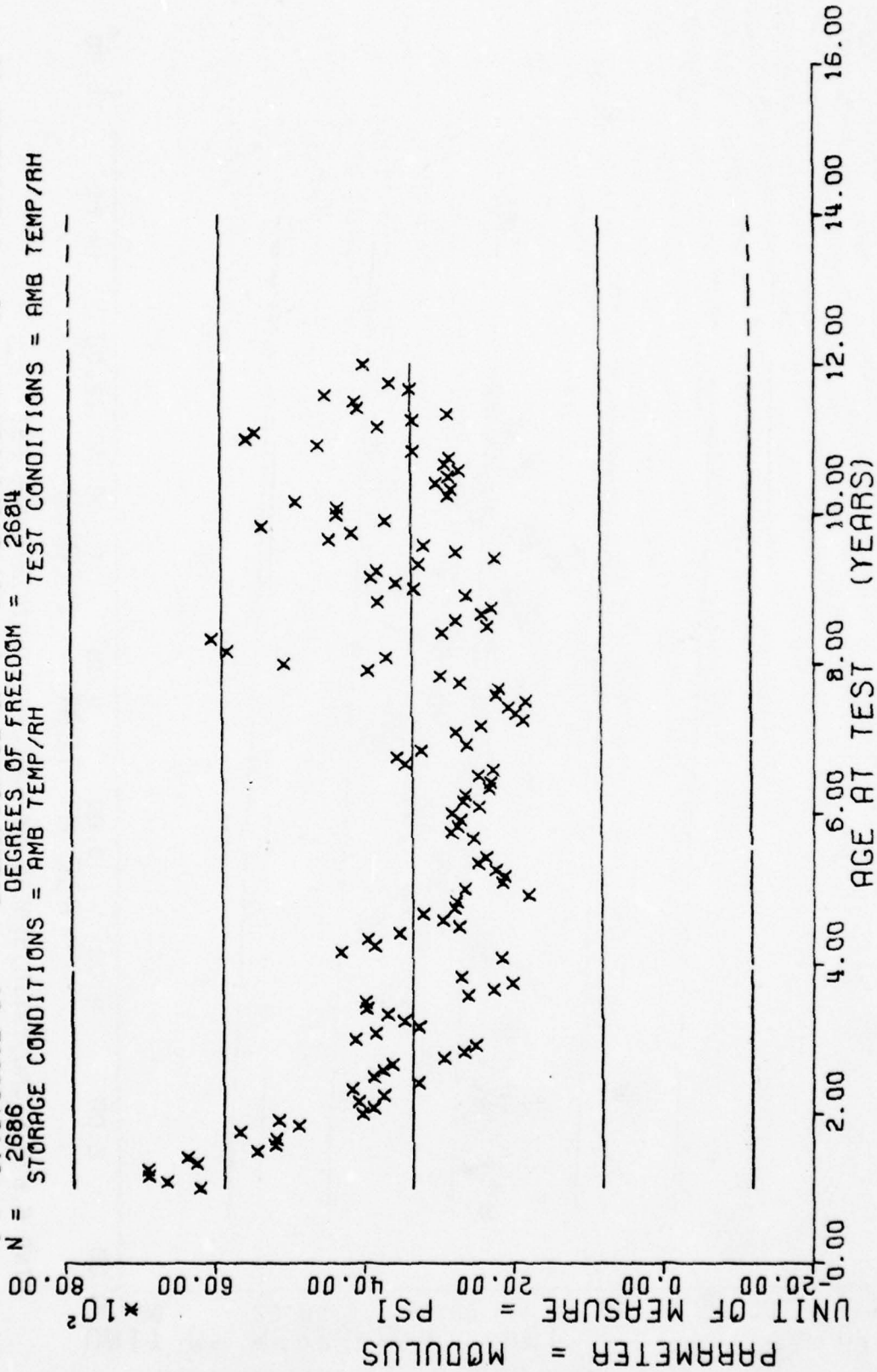
Figure 23

$Y = ((+4.3813718E+02) + (+4.2512053E-01) * X)$
 F = +6.1311812E+01 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +1.0060750E+02$
 R = +1.4941601E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +5.4292520E-02$
 t = +7.8301860E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +8.9496654E+01$
 N = 2687 DEGREES OF FREEDOM = 2685
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

$F = +2.6601384E-01$ $Y = ((+3.3350572E+03) + (+4.2751591E-01) * X)$ $\sigma = +1.5187425E+03$
 $R = +9.9549560E-03$ SIGNIFICANCE OF F = NOT SIGNIFICANT $S_1 = +8.2889621E-01$
 $t = +5.1576530E-01$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_2 = +1.5189501E+03$
 $N = 2686$ SIGNIFICANCE OF t = NOT SIGNIFICANT DEGREES OF FREEDOM = 2684
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 25

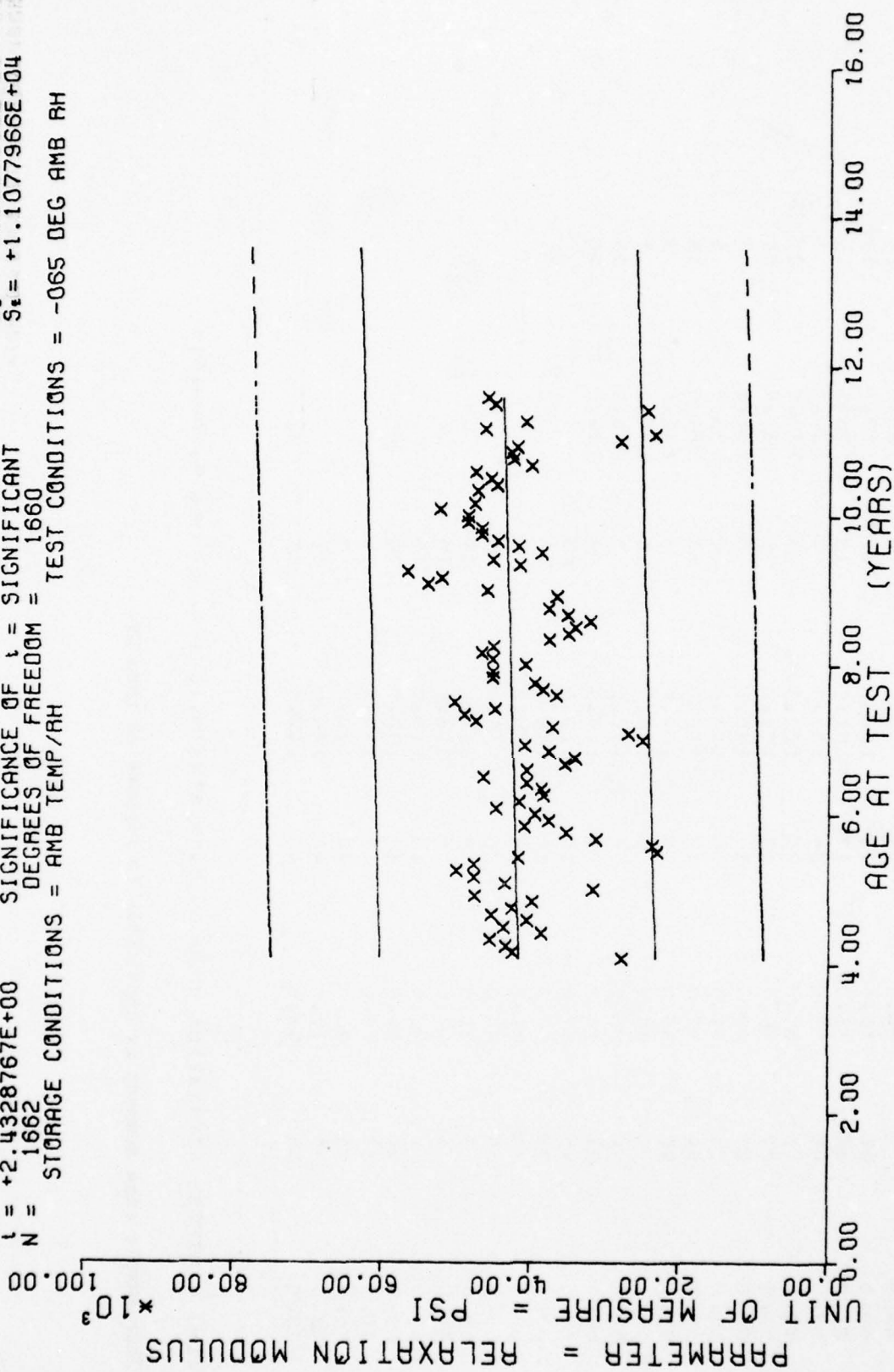
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	2	74.0	29	99.0	32	126.0	18
50.0	26	75.0	23	100.0	17	127.0	12
51.0	46	76.0	17	101.0	18	128.0	18
52.0	46	77.0	34	102.0	5	129.0	2
53.0	18	78.0	25	103.0	6	130.0	27
54.0	27	79.0	12	104.0	6	131.0	30
55.0	27	80.0	14	105.0	6	132.0	8
56.0	21	81.0	8	107.0	6	133.0	6
57.0	24	82.0	17	108.0	12	134.0	16
58.0	20	83.0	9	109.0	6	135.0	9
59.0	9	84.0	5	110.0	6	137.0	3
60.0	9	85.0	6	111.0	3	138.0	28
61.0	21	86.0	3	112.0	8	139.0	39
62.0	46	87.0	18	113.0	45		
63.0	23	88.0	16	114.0	30		
64.0	30	89.0	15	115.0	37		
65.0	9	90.0	6	116.0	30		
66.0	2	91.0	5	117.0	27		
67.0	5	92.0	6	118.0	15		
68.0	6	93.0	19	119.0	19		
69.0	20	94.0	17	120.0	30		
70.0	30	95.0	17	121.0	15		
71.0	41	96.0	42	122.0	3		
72.0	30	97.0	42	124.0	21		
73.0	36	98.0	40	125.0	17		

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

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

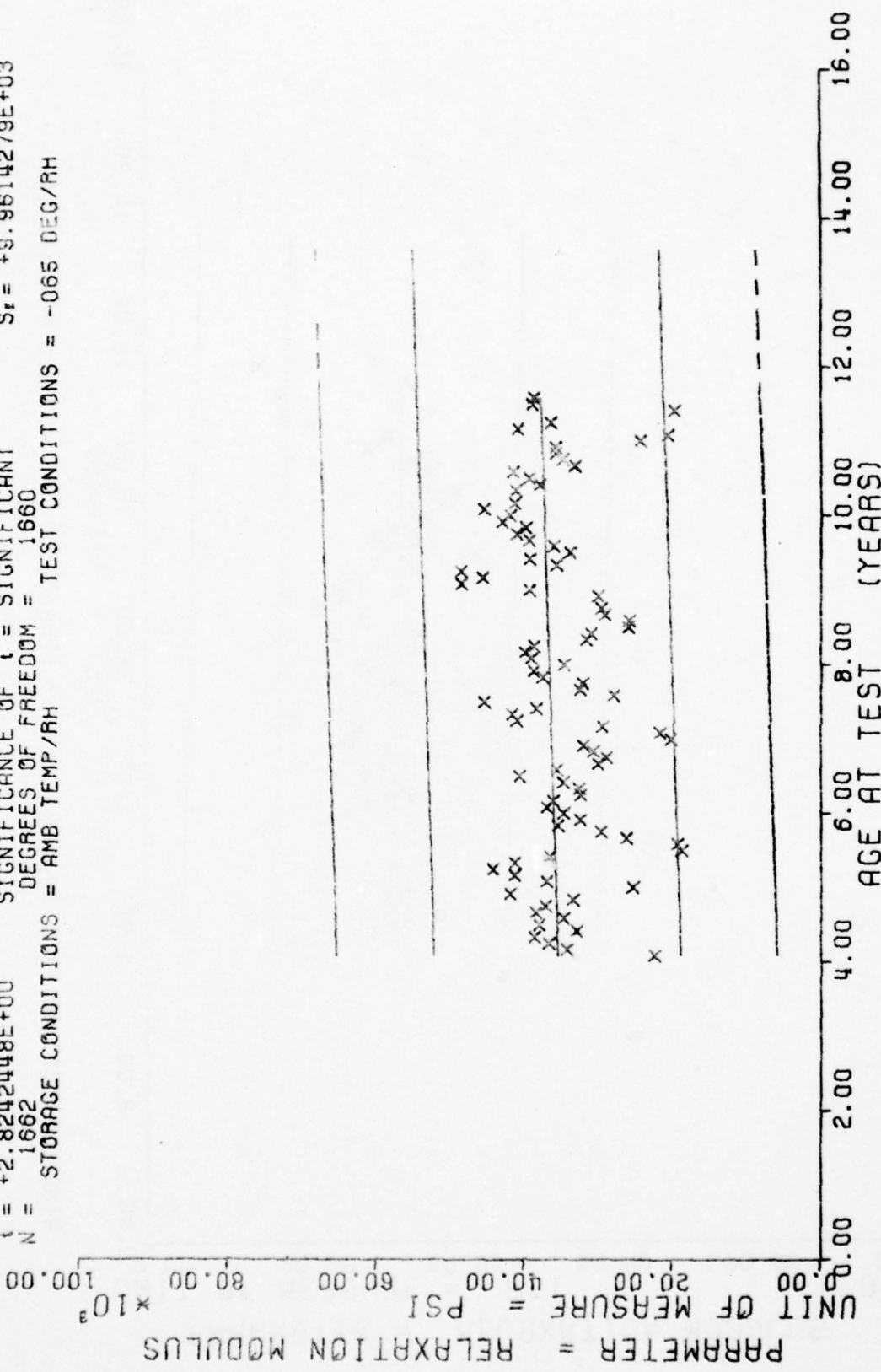
Y = ((+4.0521403E+04) + (+2.4459169E+01) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 1660
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = -065 DEG AMB RH
 F = +5.9188893E+00
 R = +5.9606440E-02
 t = +2.4328767E+00
 N = 1662



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

Figure 26

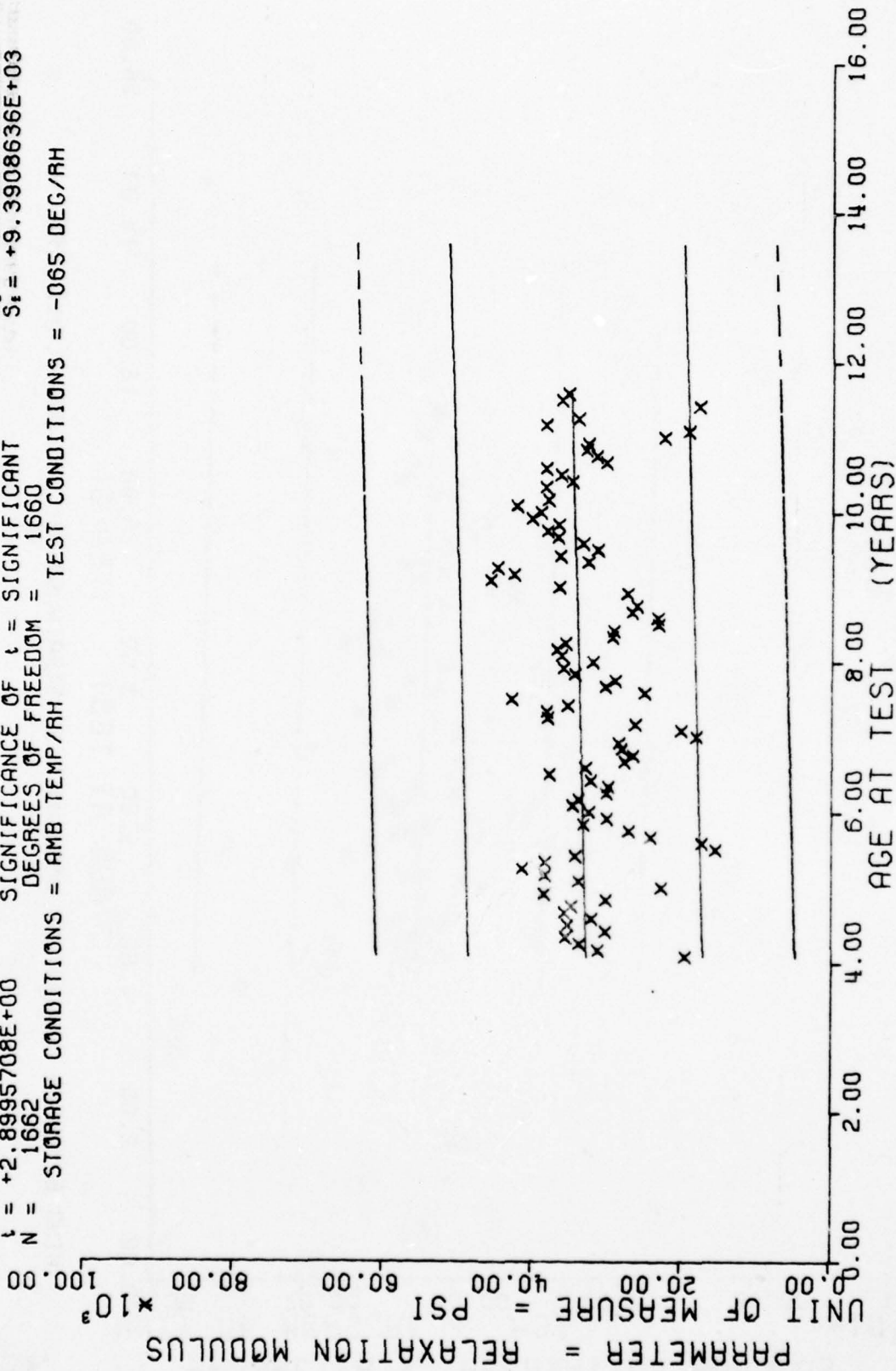
$Y = ((+3.4271027E+04) + (+2.5532039E+01) * X)$
 F = +7.9763591E+00 SIGNIFICANCE OF F = SIGNIFICANT
 R = +6.9152423E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +2.8242448E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1662 DEGREES OF FREEDOM = 1660
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH



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

Figure 27

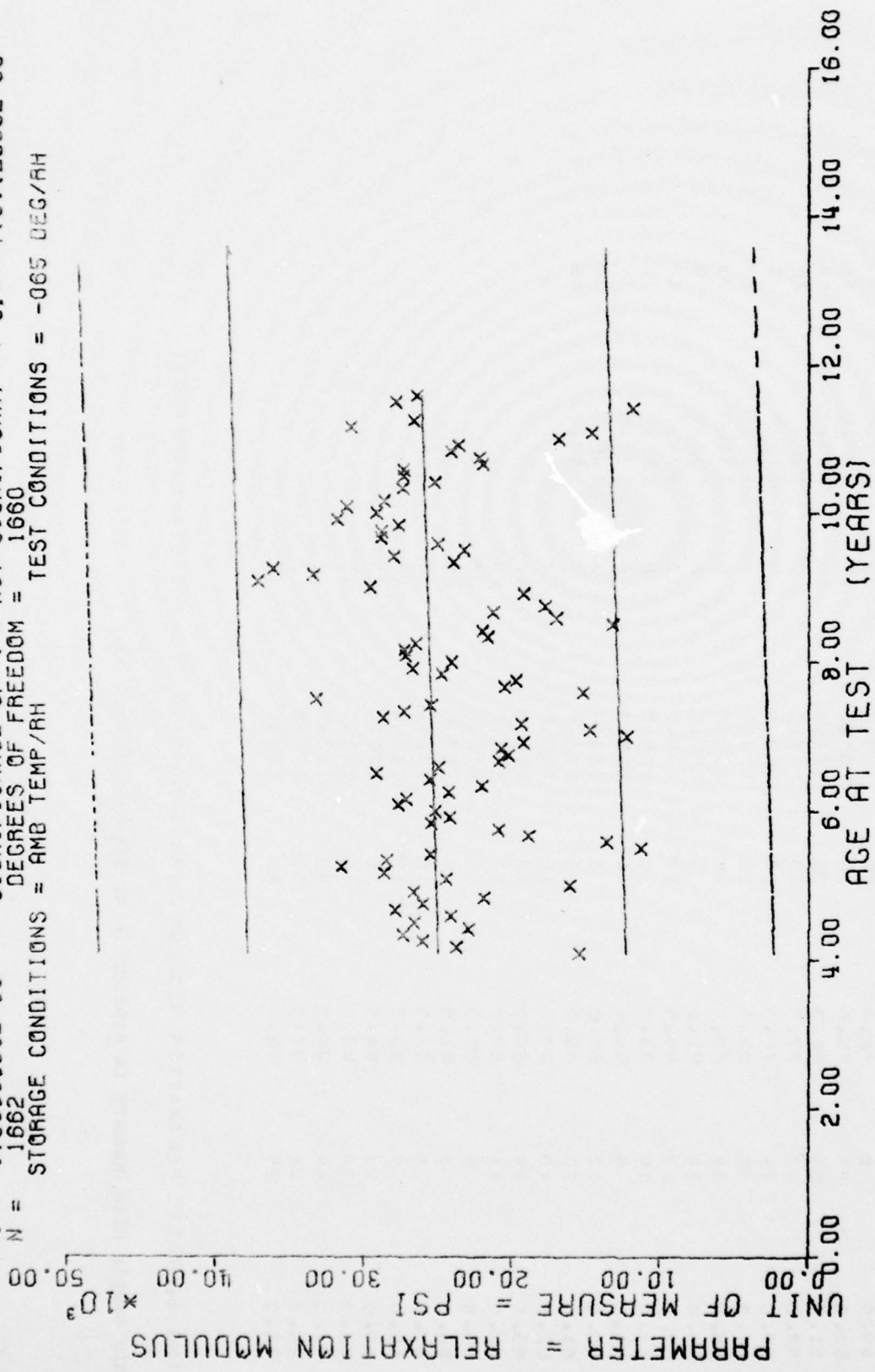
$Y = ((+3.1562706E+04) + (+2.4711596E+01) * X)$
 F = +8.4075109E+00 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +9.4117804E+03$
 R = +7.0987625E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +8.5225015E+00$
 t = +2.8995708E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +9.3908636E+03$
 N = 1662 DEGREES OF FREEDOM = 1660
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH



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

Figure 28

$Y = ((+2.4444177E+04) + (+1.2468292E+01) * X)$
 F = +3.2582184E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT $S_a = +7.6164105E+03$
 R = +4.4259882E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_b = +6.9074361E+00$
 t = +1.8050535E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_c = +7.6112363E+03$
 N = .1662 DEGREES OF FREEDOM = 1660
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH



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

Figure 29

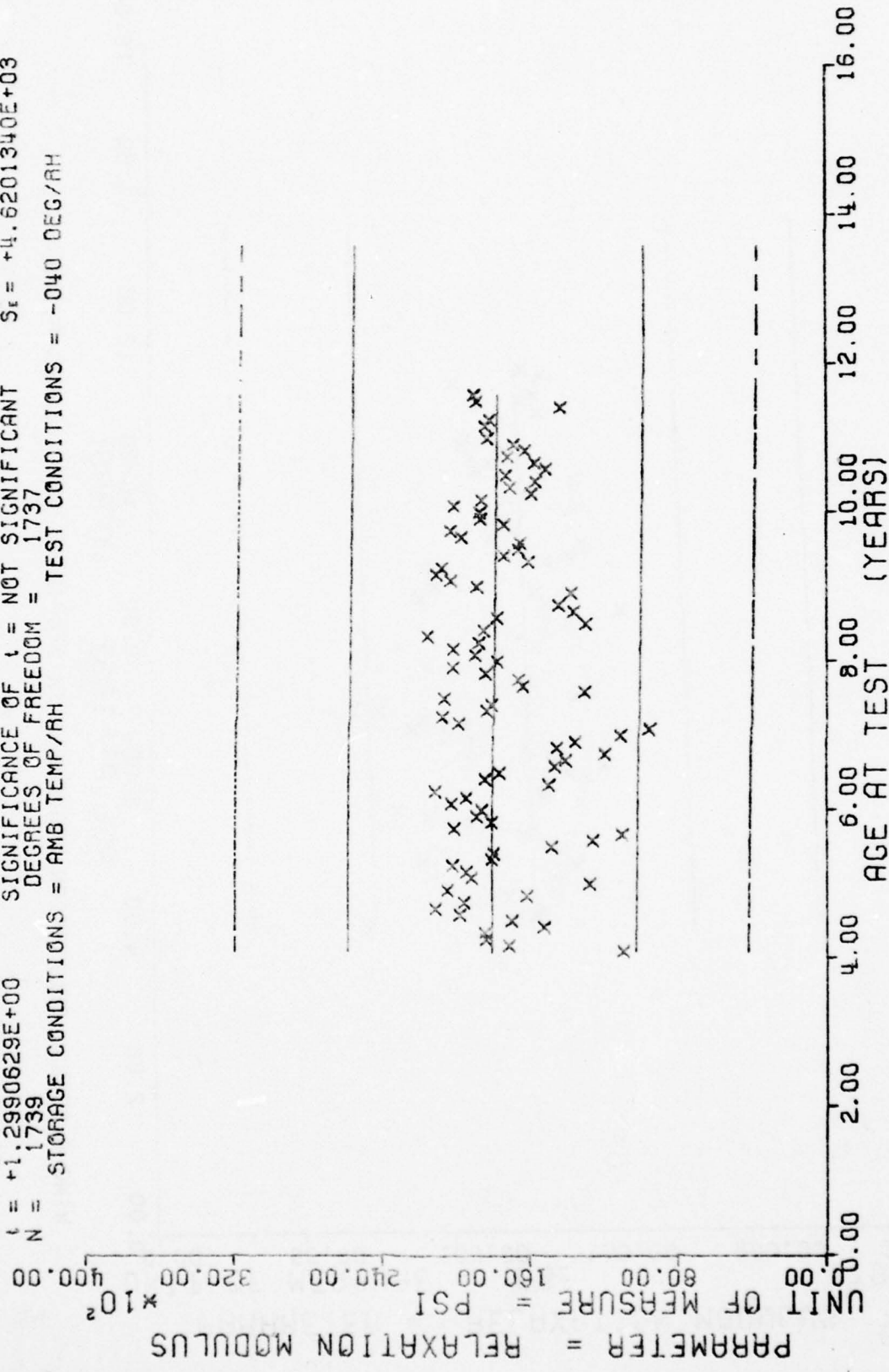
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	6	74.0	25	59.0	30	125.0	13
50.0	27	75.0	19	100.0	18	126.0	16
51.0	51	76.0	26	101.0	15	127.0	44
52.0	47	77.0	30	102.0	6	128.0	14
53.0	14	78.0	32	103.0	9	129.0	1
54.0	30	79.0	12	104.0	3	130.0	24
55.0	18	80.0	16	105.0	6	131.0	39
56.0	12	81.0	9	107.0	6	132.0	9
57.0	27	82.0	18	108.0	12	134.0	28
58.0	19	83.0	6	109.0	6	135.0	6
59.0	9	84.0	9	110.0	6	137.0	9
60.0	12	85.0	3	111.0	3	138.0	38
61.0	20	86.0	6	112.0	9	139.0	45
62.0	48	87.0	15	113.0	53		
63.0	24	88.0	20	114.0	31		
64.0	24	89.0	12	115.0	48		
65.0	9	90.0	5	116.0	37		
66.0	6	91.0	9	117.0	21		
67.0	6	92.0	15	118.0	15		
68.0	9	93.0	12	119.0	15		
69.0	21	94.0	16	120.0	23		
70.0	30	95.0	15	121.0	15		
71.0	44	96.0	48	122.0	3		
72.0	36	97.0	50	123.0	2		
73.0	29	98.0	45	124.0	10		

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

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

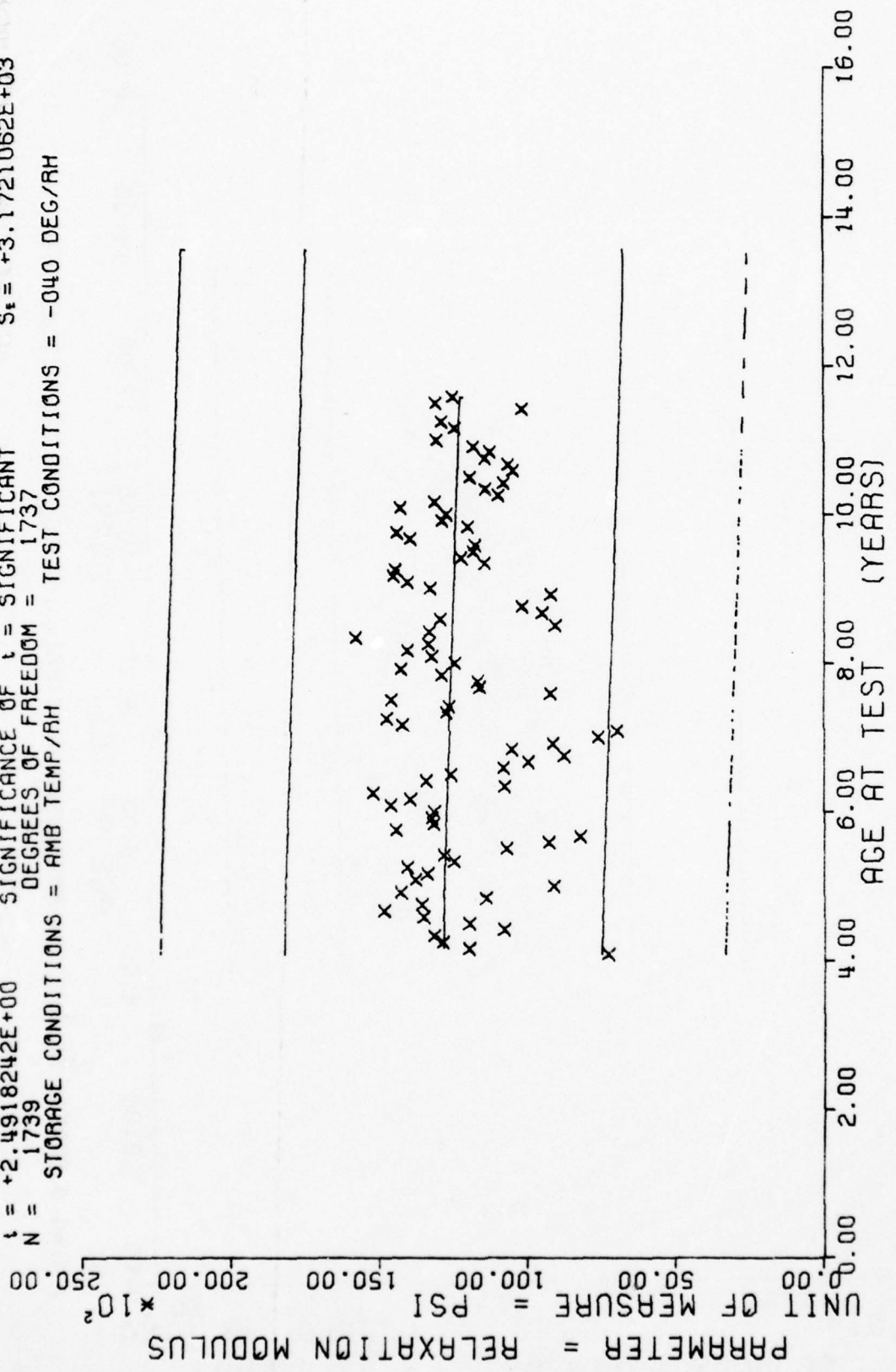
Y = ((+1.8365050E+04) + (-5.2712924E+00) * X)
 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_f = +4.6210478E+03$
 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_R = +4.0577652E+00$
 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_t = +4.6201340E+03$
 DEGREES OF FREEDOM = 1737
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = -040 DEG/AH



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

Figure 30

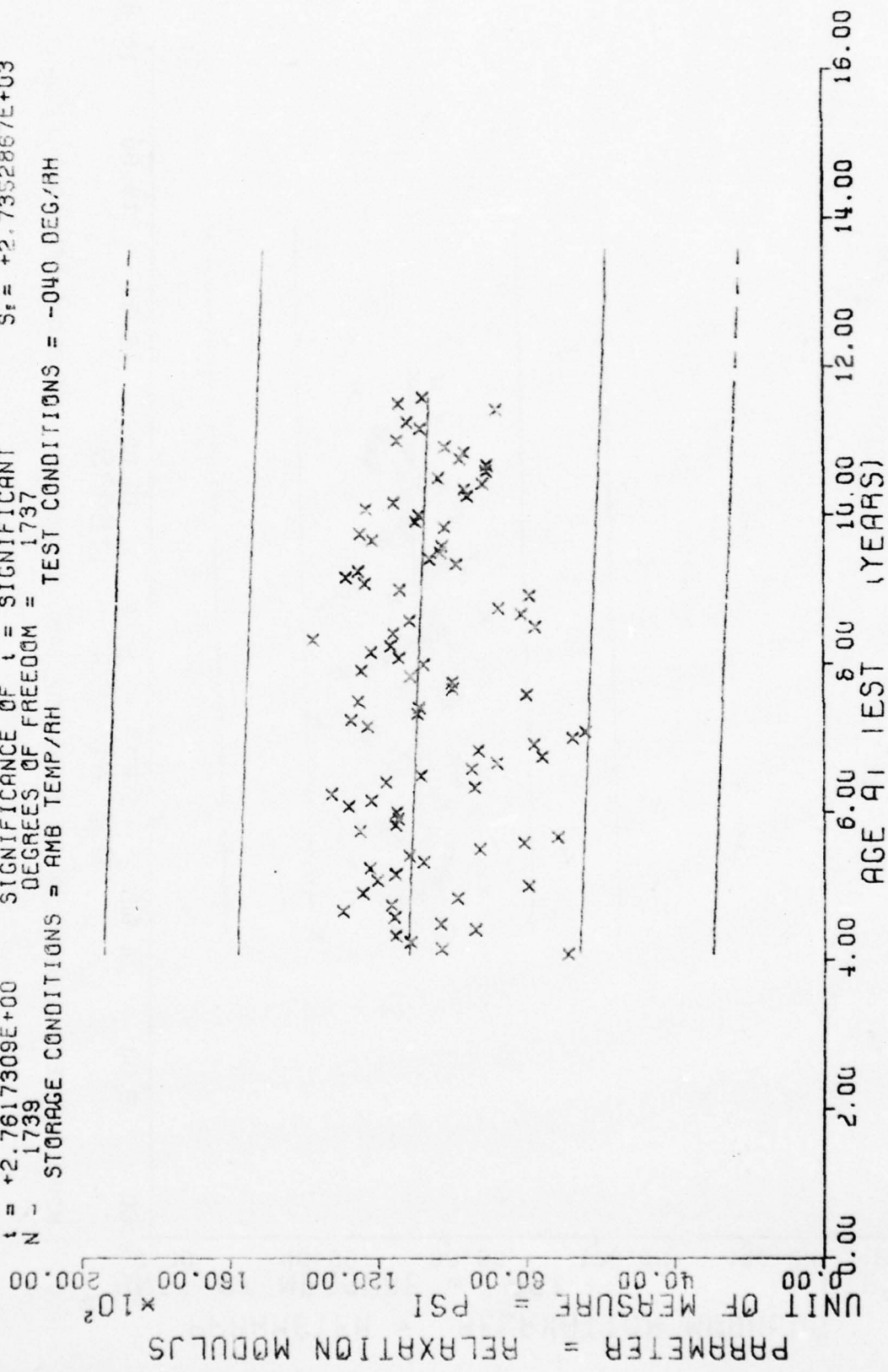
$Y = ((+1.3194845E+04) + (-6.9422054E+00) * X)$
 F = +6.2091879E+00 SIGNIFICANCE OF F = SIGNIFICANT
 R = -5.9681901E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +2.4918242E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 1739 DEGREES OF FREEDOM = 1737
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH



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

Figure 31

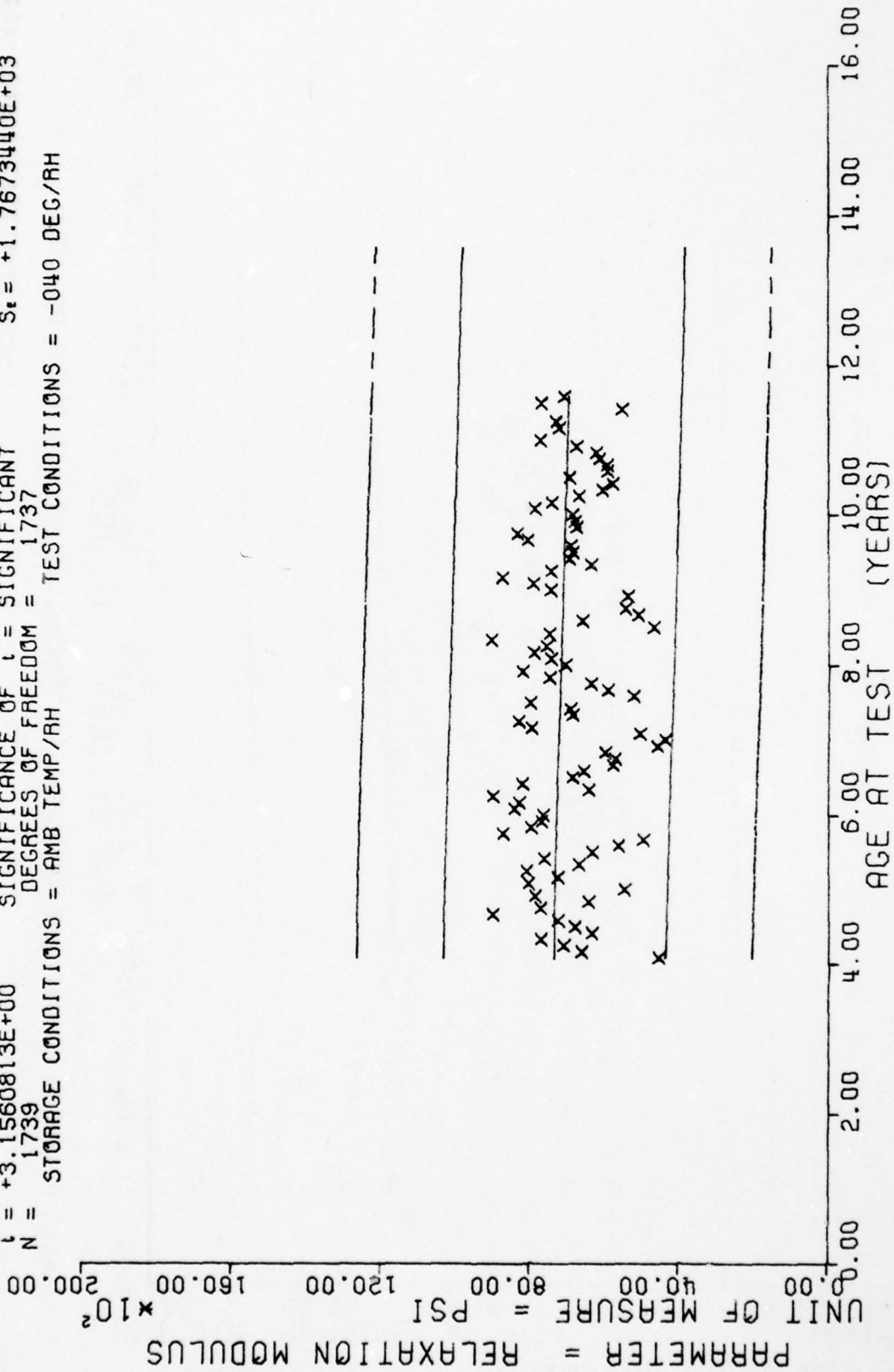
Y = ((+1.1533/08E+04) + (-6.6346277E+00) * X)
 F = +7.6271575E+00 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +2.7404967E+03$
 R = -6.6119573E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_b = +2.4023440E+00$
 t = +2.7617309E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_f = +2.7352867E+03$
 N = 1739 DEGREES OF FREEDOM = 1737
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH



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

Figure 32

$Y = ((+7.5924192E+03) + (-4.8989345E+00) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 $G_1 = +1.7718943E+03$
 SIGNIFICANCE OF R = SIGNIFICANT
 $S_0 = +1.5522206E+00$
 SIGNIFICANCE OF λ = SIGNIFICANT
 $N = 1739$
 DEGREES OF FREEDOM = 1737
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = -040 DEG/RH



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

Figure 33

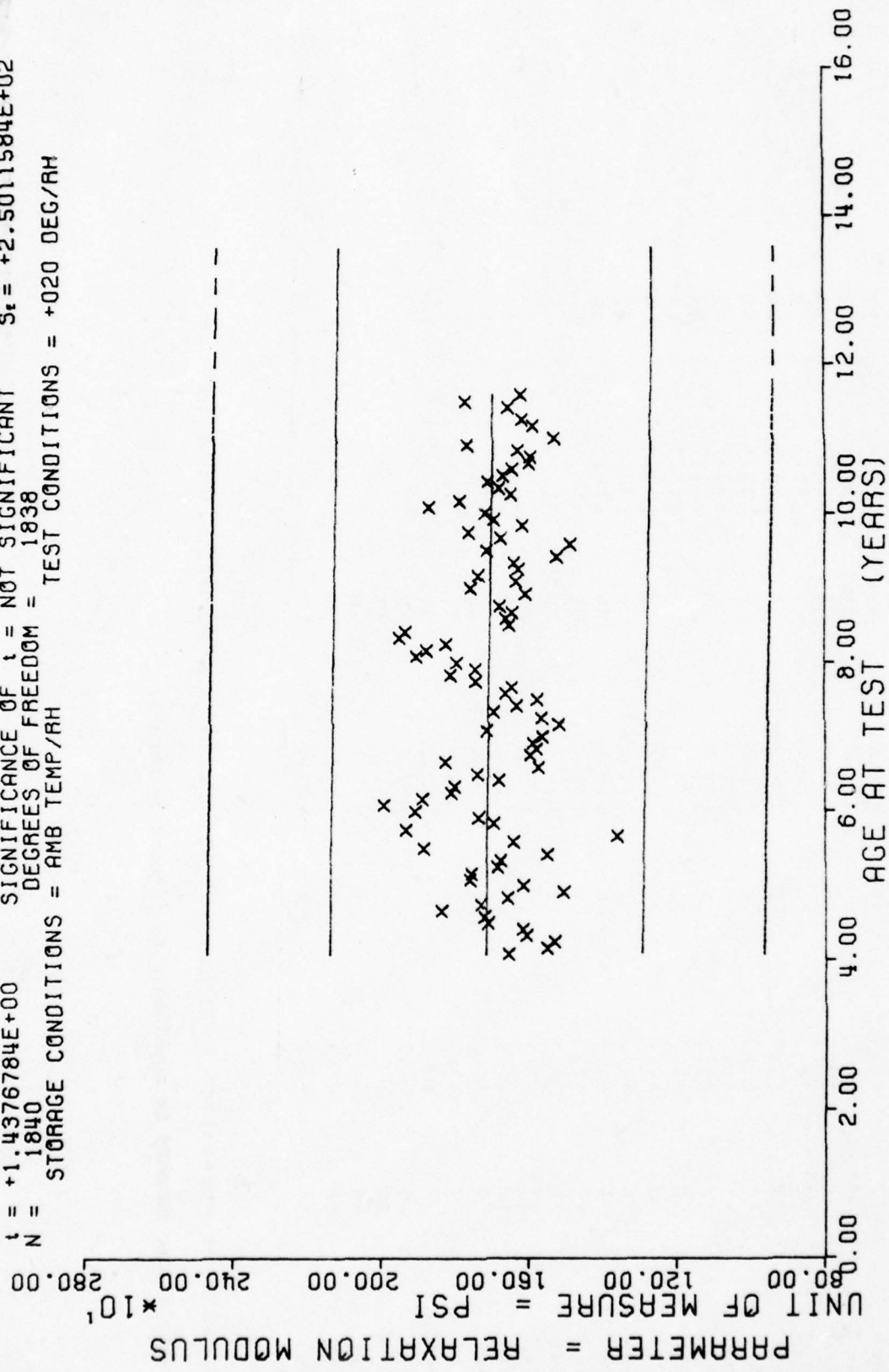
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	6	74.0	37	99.0	33	125.0	15
50.0	27	75.0	29	100.0	18	126.0	17
51.0	59	76.0	23	101.0	18	127.0	11
52.0	48	77.0	28	102.0	5	128.0	18
53.0	15	78.0	33	103.0	9	129.0	3
54.0	32	79.0	15	104.0	3	130.0	24
55.0	19	80.0	21	105.0	6	131.0	42
56.0	18	81.0	15	107.0	9	132.0	9
57.0	30	82.0	18	108.0	9	134.0	27
58.0	16	83.0	12	109.0	6	135.0	6
59.0	6	84.0	9	110.0	6	137.0	9
60.0	22	85.0	3	111.0	3	138.0	20
61.0	21	86.0	15	112.0	24	139.0	60
62.0	49	87.0	14	113.0	47		
63.0	24	88.0	21	114.0	25		
64.0	27	89.0	15	115.0	33		
65.0	12	90.0	15	116.0	39		
66.0	9	91.0	12	117.0	21		
67.0	7	92.0	15	118.0	15		
68.0	5	93.0	15	119.0	27		
69.0	29	94.0	15	120.0	21		
70.0	24	95.0	23	121.0	15		
71.0	46	96.0	48	122.0	3		
72.0	42	97.0	42	123.0	6		
73.0	21	98.0	45	124.0	17		

WING 6, STRESS RELAXATION MCDULUS, 3.0% STRAIN, 1.0 SEC, 20 DEG F, TPH-1011

This sample size summary is applicable to figures 34 thru 37.

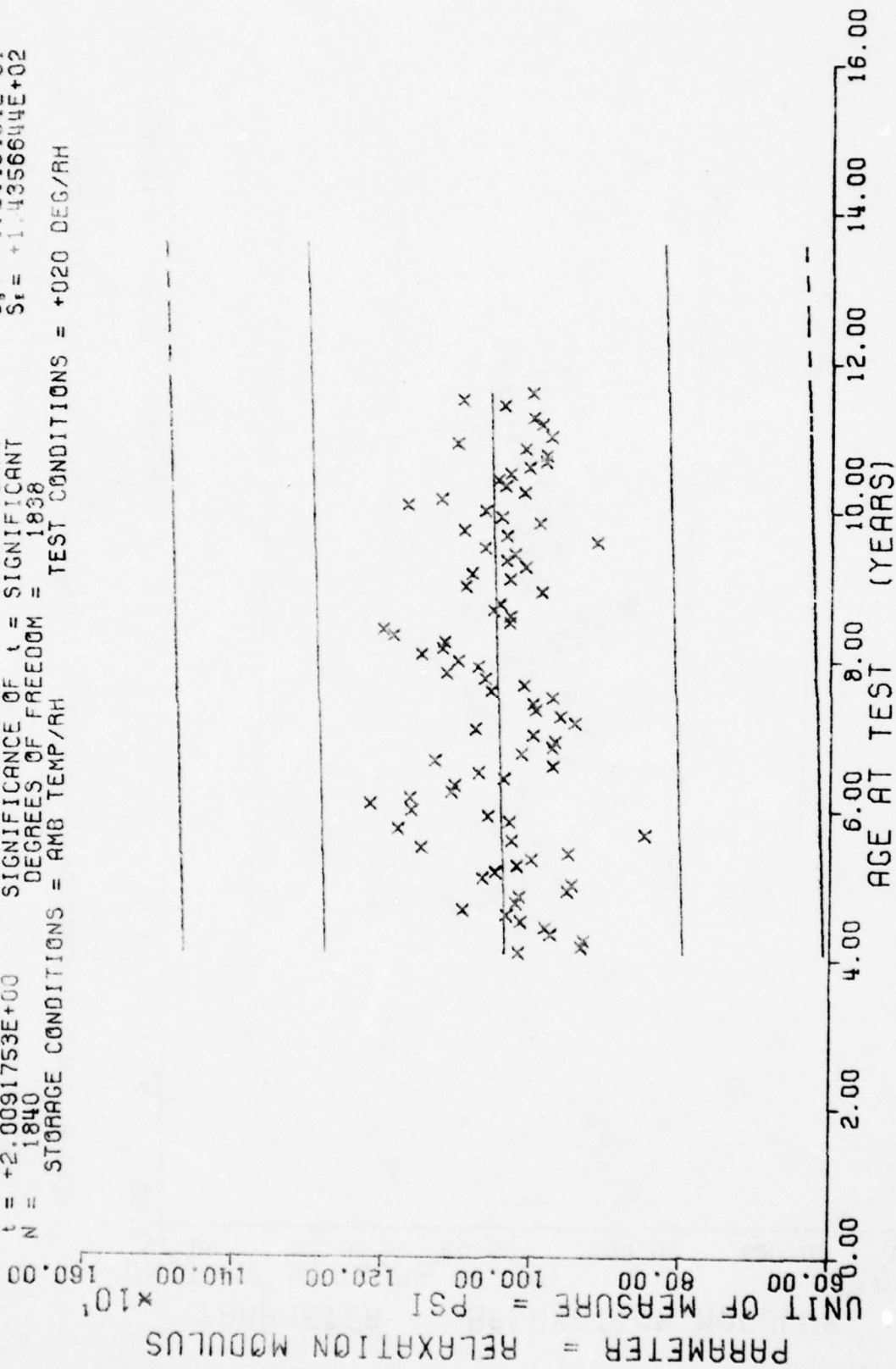
Y = ((+1.7306467E+03) + (-3.1174300E-01) * X)
 F = +2.0669192E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT G = +2.5018838E+02
 R = -3.3515441E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S = +2.1683778E-01
 t = +1.4376784E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT S = +2.5011584E+02
 N = 1840 DEGREES OF FREEDOM = 1838
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = +020 DEG/AH



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

Figure 34

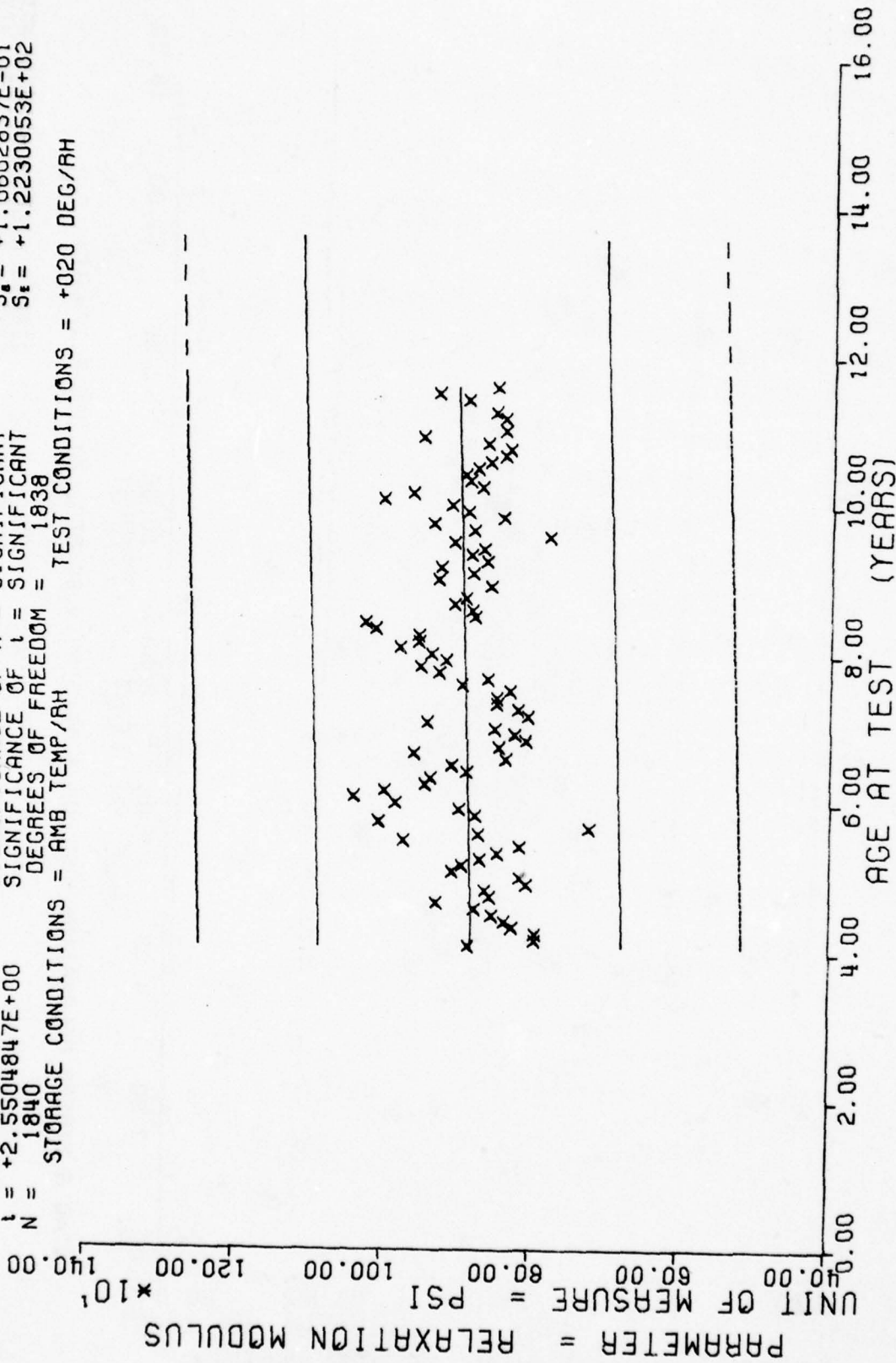
$Y = ((+1.0248003E+03) + (+2.5007171E-01) * X)$
 F = +4.0367856E+00 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_f = +1.4368493E+02$
 R = +4.6813239E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_p = +1.2446484E-01$
 t = +2.0091753E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_f = +1.4356644E+02$
 N = 1840 DEGREES OF FREEDOM = 1838
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH



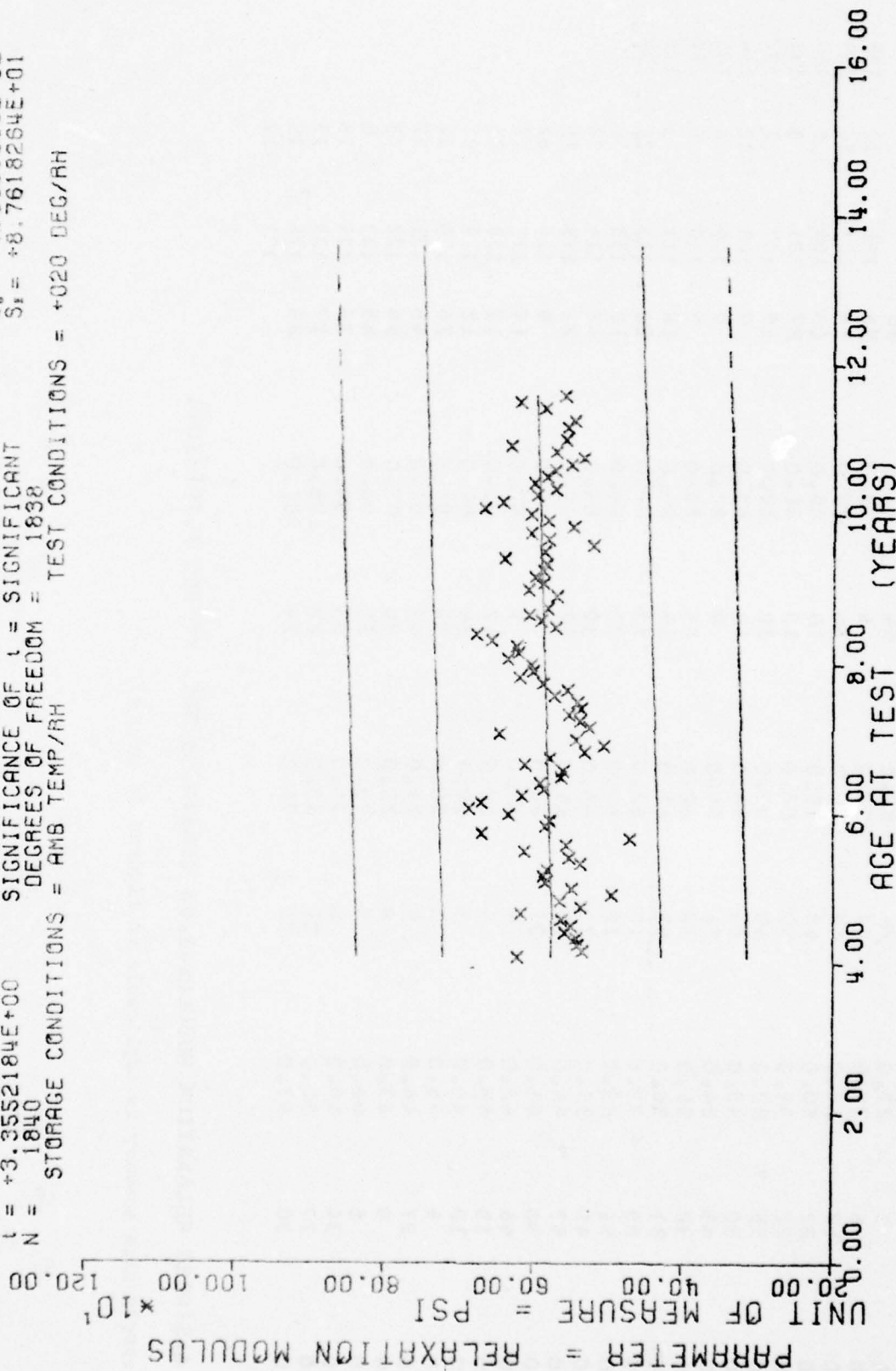
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 20 DEG F, TPH-1011

Figure 35

F = +6.5049727E+00
 R = +5.9385829E-02
 I = +2.5504847E+00
 N = 1840
 STORAGE CONDITIONS = AMB TEMP/RH
 Y = ((+8.6902256E+02) + (+2.7042377E-01) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF I = SIGNIFICANT
 DEGREES OF FREEDOM = 1838
 TEST CONDITIONS = +020 DEG/RH
 $\sigma = +1.2248345E+02$
 $S_e = +1.0602837E-01$
 $S_e = +1.2230053E+02$



$F = +1.1257490E+01$
 $R = +7.8022903E-02$
 $l = +3.3552184E+00$
 $N = 1840$
 STORAGE CONDITIONS = AMB TEMP/RH
 $Y = ((+5.6271317E+02) + (+2.5486441E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF l = SIGNIFICANT
 DEGREES OF FREEDOM = 1838
 $\sigma = +8.7862281E+01$
 $S_e = +7.5960609E-02$
 $S_f = +8.7618264E+01$
 TEST CONDITIONS = +020 DEG/RH



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

Figure 37

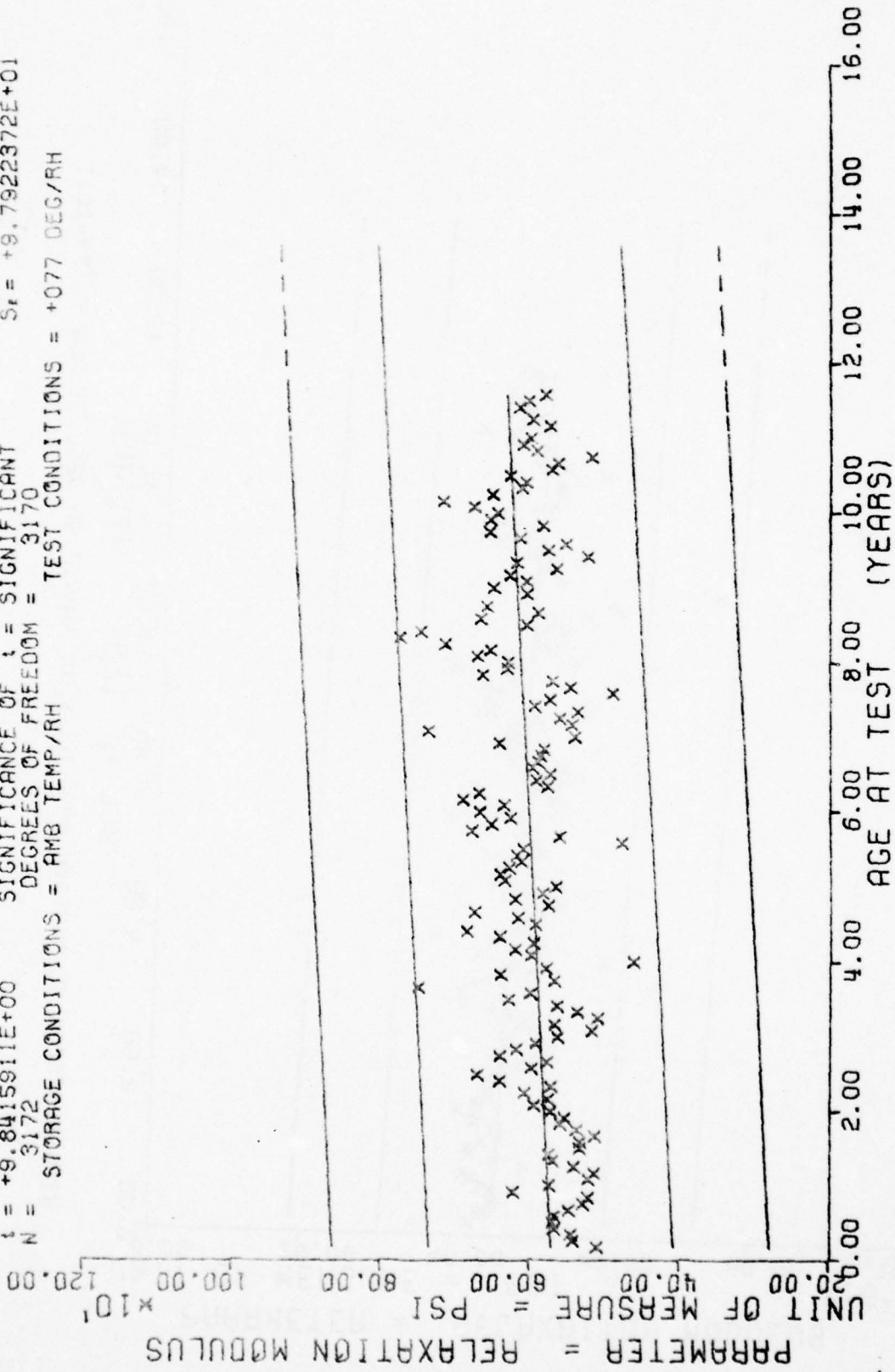
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
2.0	3	27.0	24	52.0	54	77.0	30	102	12	128	18
3.0	6	28.0	27	53.0	6	78.0	36	103	14	129	3
4.0	18	29.0	48	54.0	36	79.0	18	104	6	130	33
5.0	22	30.0	43	55.0	16	80.0	15	105	3	131	36
6.0	21	31.0	30	56.0	18	81.0	27	107	7	132	8
7.0	35	32.0	60	57.0	30	82.0	15	108	12	134	27
8.0	30	33.0	29	58.0	15	83.0	9	109	6	135	6
9.0	45	34.0	51	59.0	9	84.0	9	110	6	137	9
10.0	38	35.0	30	60.0	23	85.0	3	111	3	138	39
11.0	37	36.0	52	61.0	15	86.0	18	112	21	139	42
12.0	65	37.0	15	62.0	56	87.0	21	113	56		
13.0	51	38.0	18	63.0	21	88.0	18	114	38		
14.0	46	39.0	21	64.0	30	89.0	18	115	15		
15.0	57	40.0	18	65.0	12	90.0	21	116	62		
16.0	36	41.0	21	66.0	9	91.0	9	117	18		
17.0	46	42.0	9	67.0	3	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	12		
21.0	27	46.0	9	71.0	47	96.0	48	122	3		
22.0	9	47.0	9	72.0	39	97.0	54	123	6		
23.0	6	48.0	3	73.0	21	98.0	45	124	18		
24.0	34	49.0	6	74.0	33	99.0	36	125	15		
25.0	27	50.0	21	75.0	27	100.0	17	126	19		
26.0	30	51.0	76	76.0	24	101.0	25	127	12		

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

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

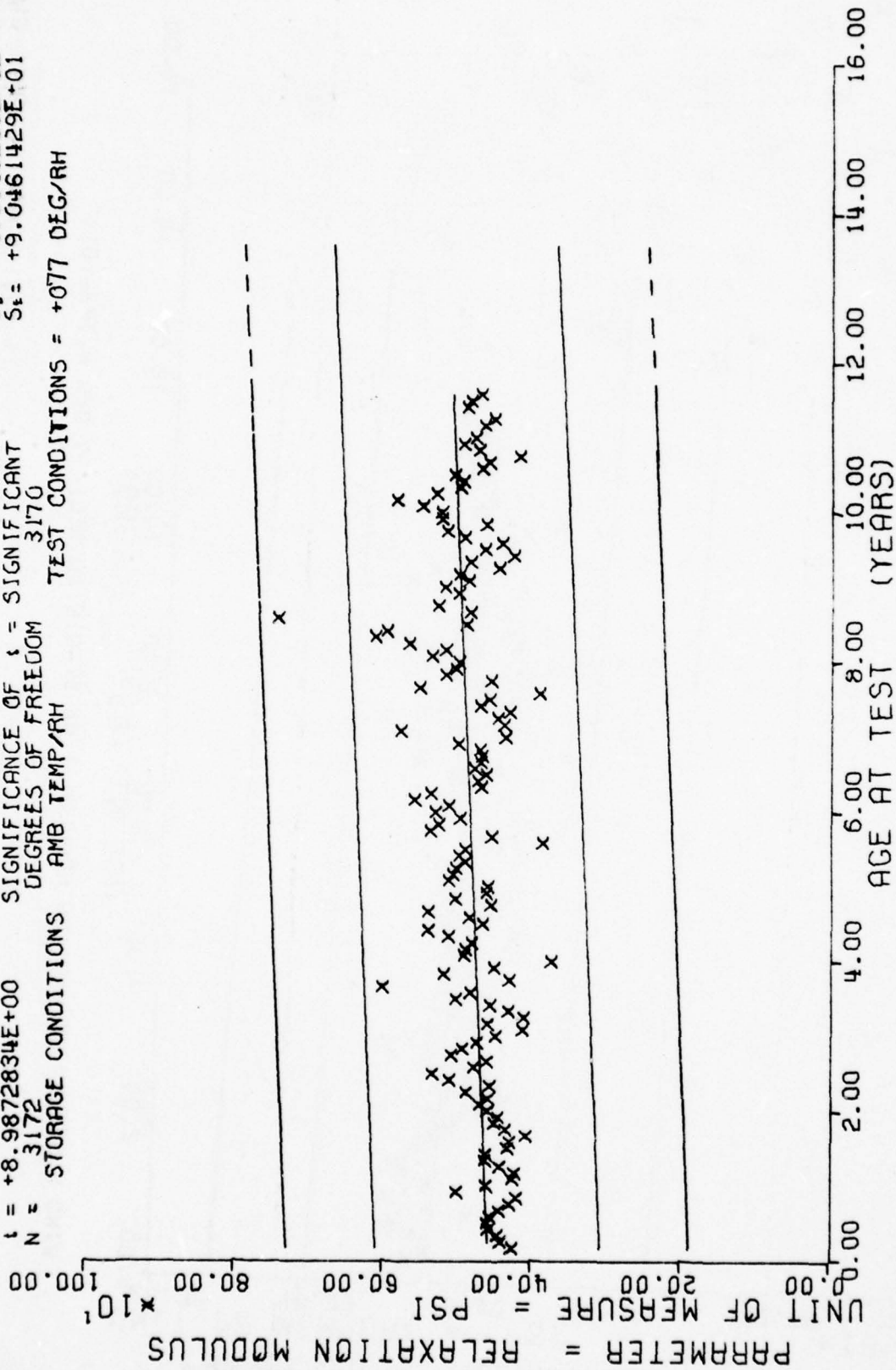
F = +9.6856916E+01
 R = +1.7218696E-01
 t = +9.8415911E+00
 N = 3172
 Y = ((+5.7118656E+02) + (+4.2975664E-01) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 3170
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = +077 DEG/RH



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

Figure 38

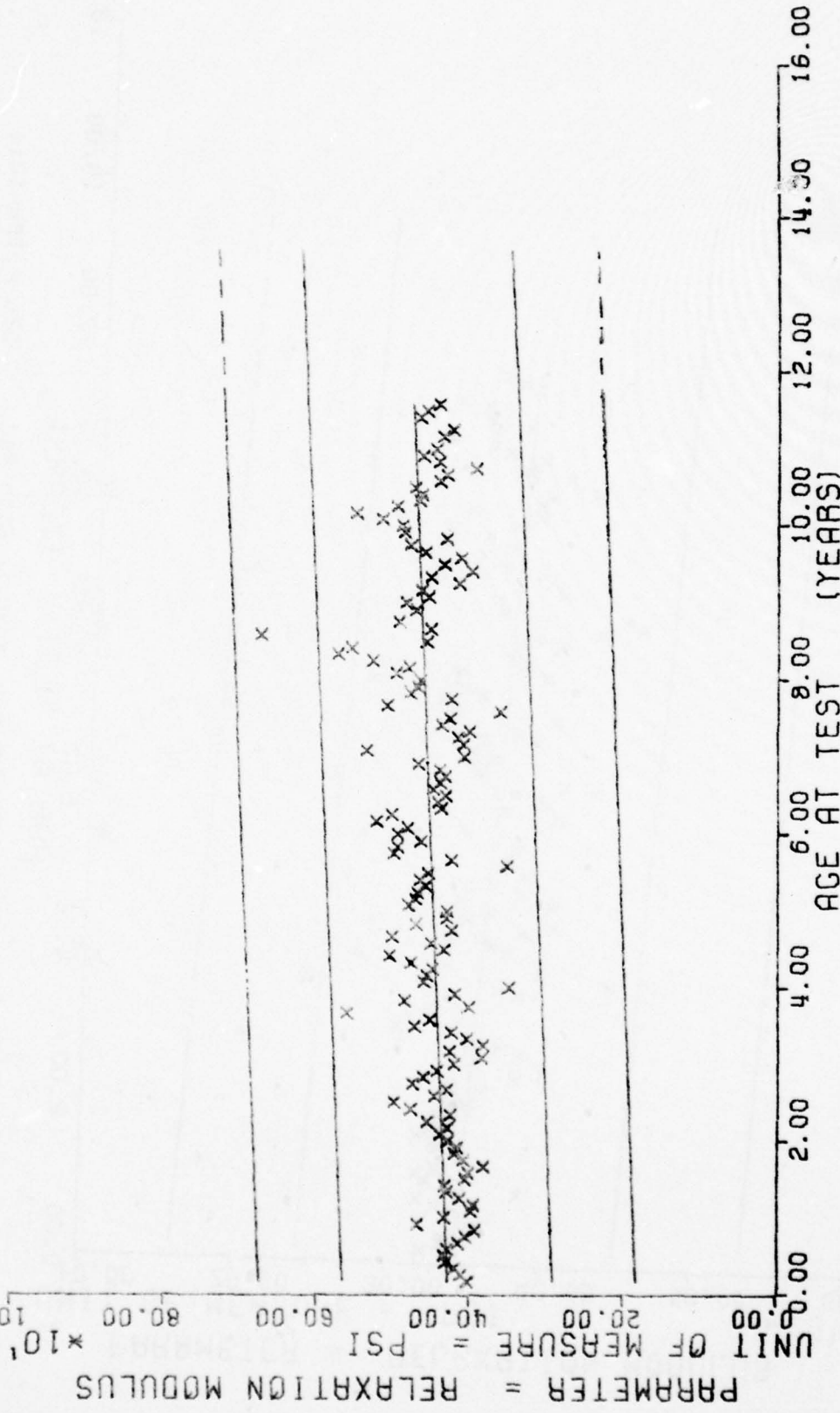
$Y = ((+4.5813091E+02) + (+3.6254943E-01) * X)$
 F = +8.0771264E+01 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +9.1592208E+01$
 R = +1.5762867E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +4.0340269E-02$
 t = +8.9872834E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +9.0461429E+01$
 N = 3172 DEGREES OF FREEDOM 3170
 STORAGE CONDITIONS AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



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

Figure 39

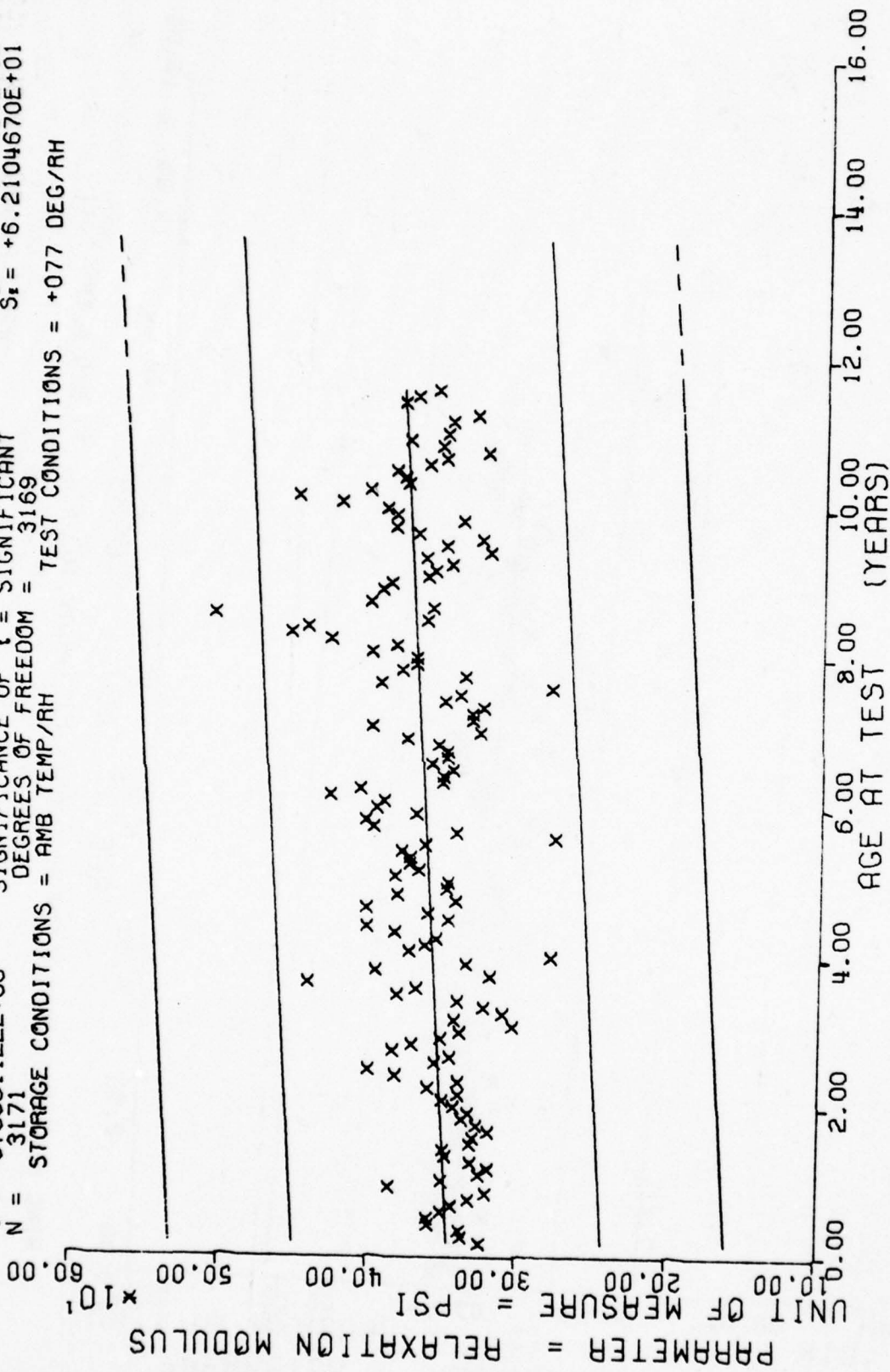
$Y = ((+4.2868964E+02) + (+3.3223496E-01) * X)$
 F = +8.1740181E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.5854767E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +9.0410276E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 3172 DEGREES OF FREEDOM = 3170
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH



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

Figure 40

$Y = ((+3.4582488E+02) + (+2.6582296E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 3169
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH
 F = +9.2123758E+01
 R = +1.6807463E-01
 t = +9.5981122E+00
 N = 3171
 S_e = +6.2990966E+01
 S_b = +2.7695337E-02
 S_t = +6.2104670E+01



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

Figure 41

*** SAMPLE SIZE SUMMARY ***

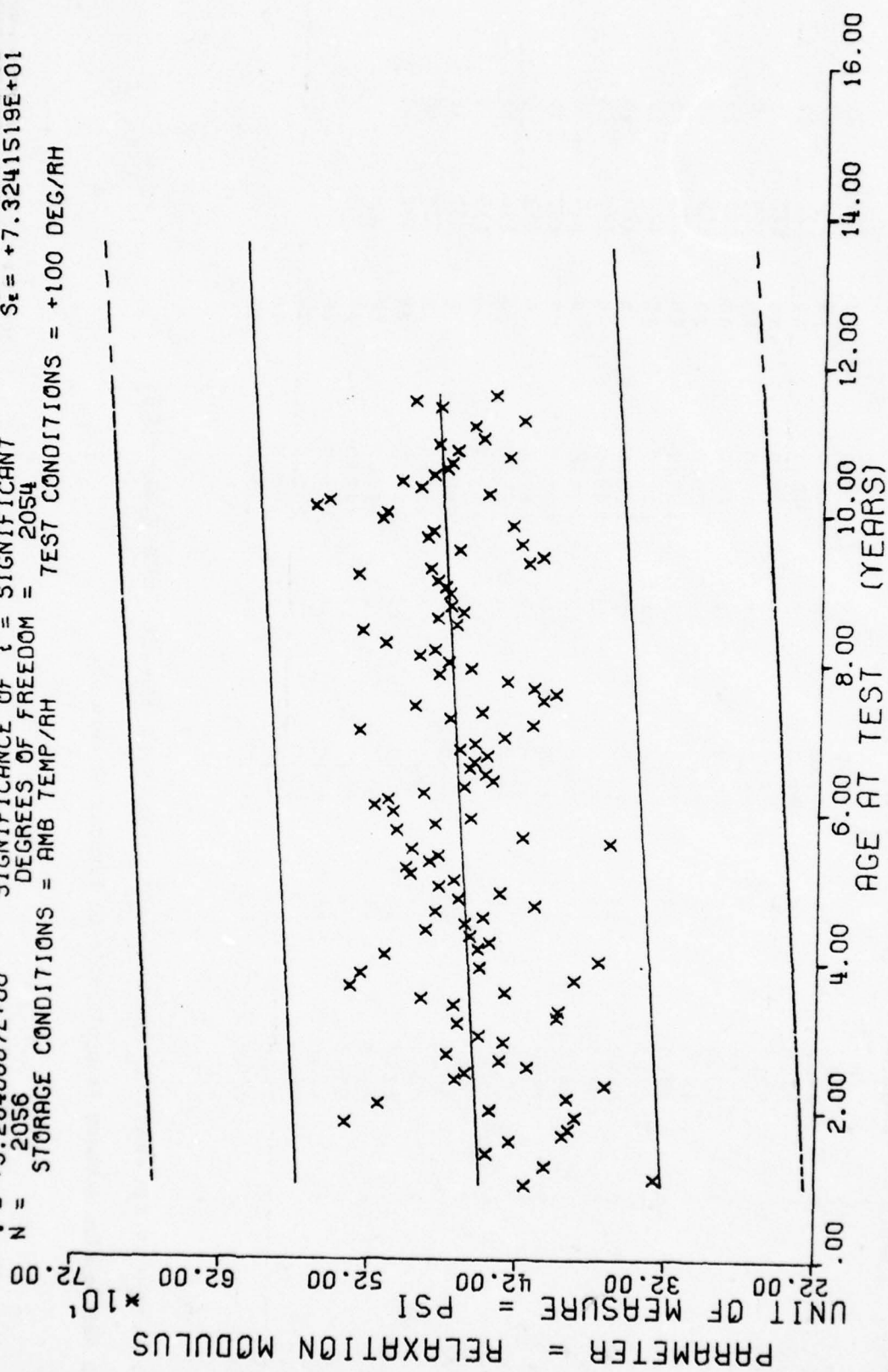
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	3	43.0	9	68.0	12	93.0	15
13.0	3	44.0	3	69.0	24	94.0	15
15.0	6	45.0	9	70.0	27	95.0	21
17.0	15	46.0	6	71.0	48	96.0	48
19.0	6	47.0	9	72.0	42	97.0	45
20.0	3	48.0	3	73.0	21	98.0	48
21.0	9	49.0	6	74.0	36	99.0	33
22.0	6	50.0	27	75.0	24	100.0	15
23.0	3	51.0	57	76.0	26	101.0	15
24.0	6	52.0	45	77.0	30	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	24	107.0	5
30.0	9	57.0	31	82.0	15	108.0	12
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	6	115.0	15
40.0	9	65.0	9	90.0	15	116.0	30
41.0	12	66.0	12	91.0	12	117.0	18
42.0	6	67.0	3	92.0	18	118.0	15

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

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

$Y = ((+4.4255907E+02) + (+2.6764281E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2054
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = +100 DEG/RH

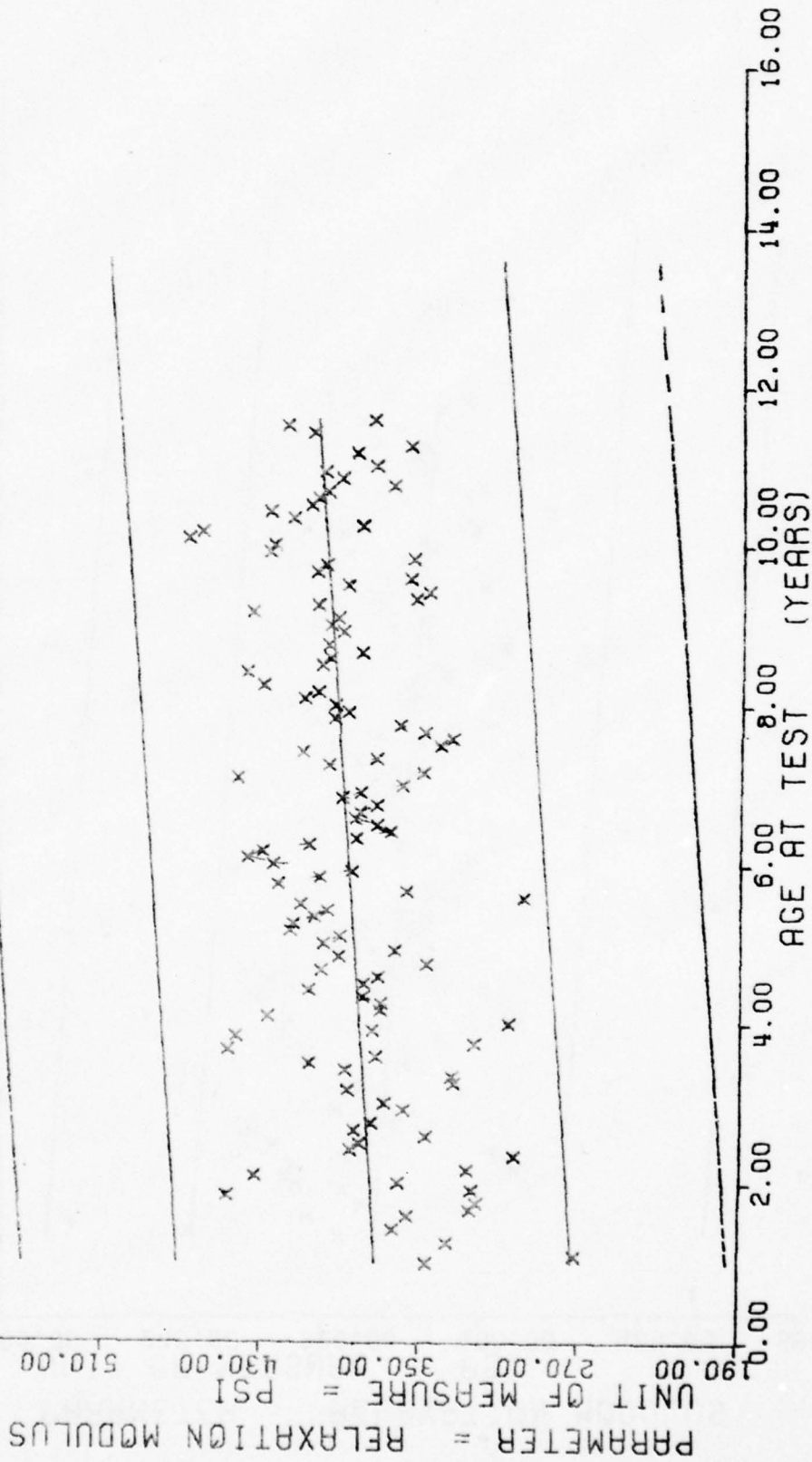
F = +2.7921361E+01
 R = +1.1580735E-01
 t = +5.2840667E+00
 N = 2056



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 100 DEG F, 7PH-1011

Figure 42

$\gamma = ((+3.6957644E+02) + (+2.4854791E-01) * X)$
 F = +3.6748699E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.3260929E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +6.0620705E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2055 DEGREES OF FREEDOM = 2053
 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

Figure 43

Y = ((+3.4510121E+02) + (+2.5189756E-01) * X)
 F = +4.3364566E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.4382490E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +6.5851778E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2055 DEGREES OF FREEDOM = 2053
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH

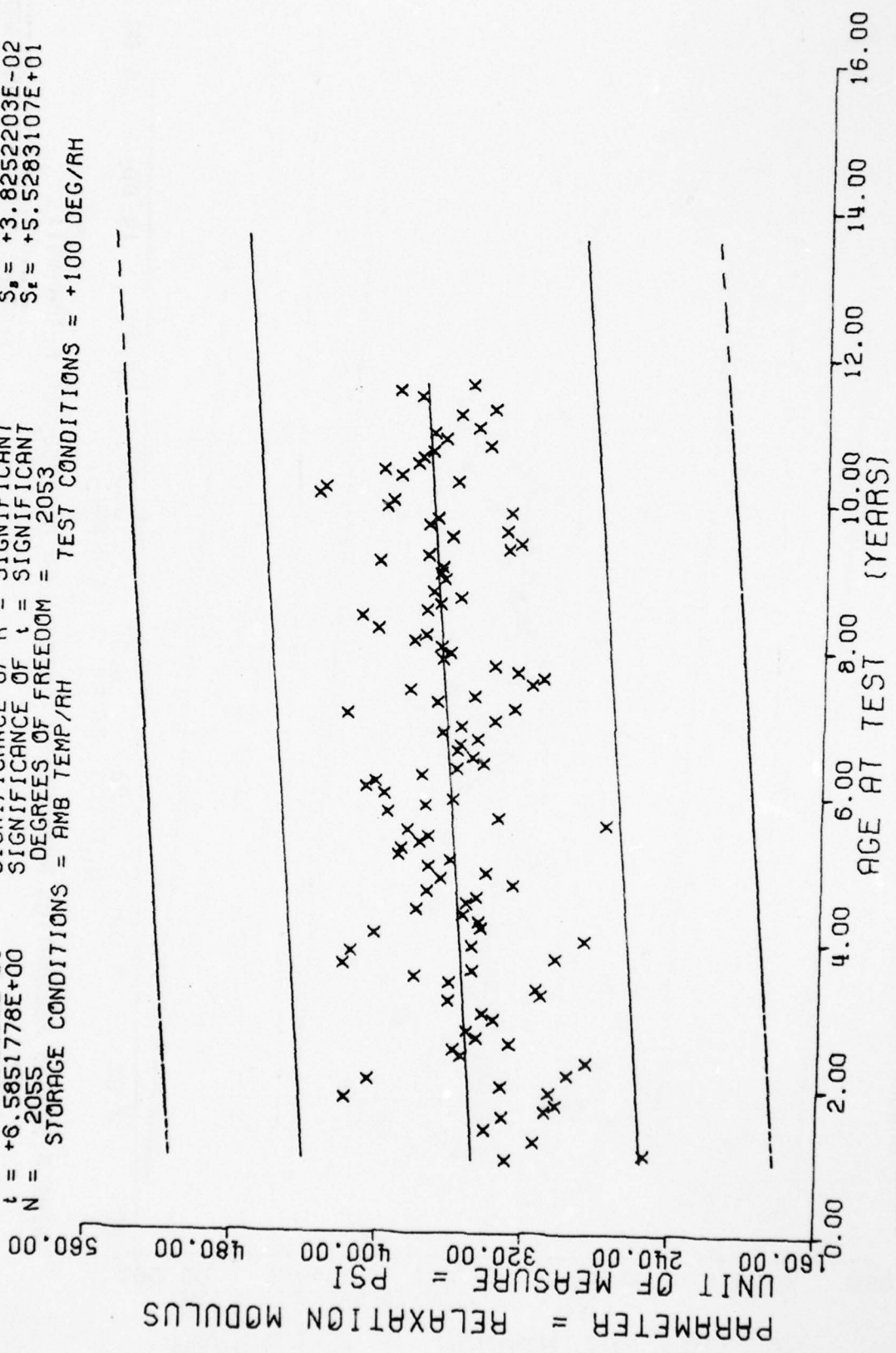
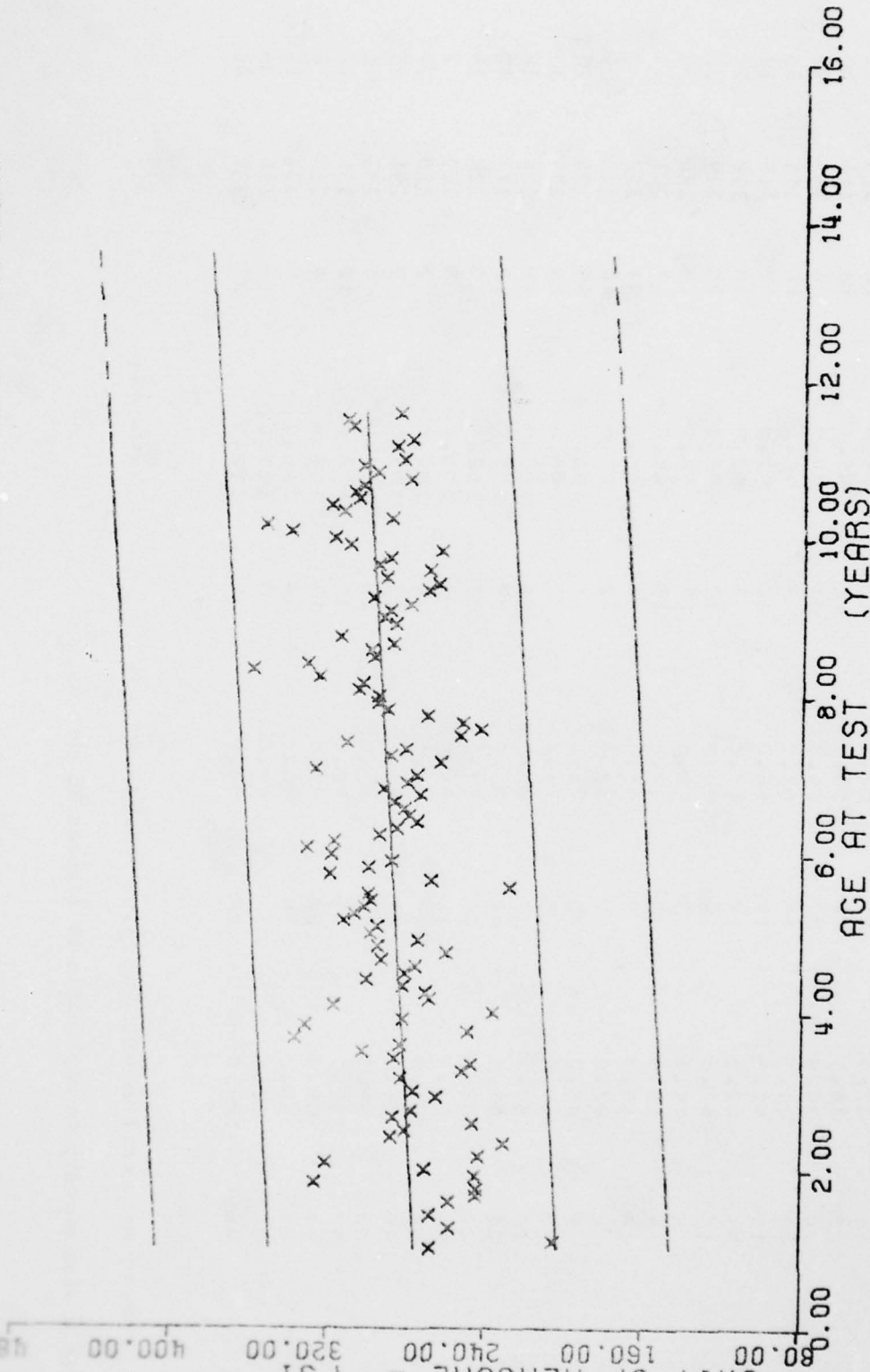


Figure 44

$Y = ((+2.7345440E+02) + (+2.1605828E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT $W = +4.4220135E+01$
 SIGNIFICANCE OF R = SIGNIFICANT $S_b = +3.0231059E-02$
 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +4.3690735E+01$
 N = 2055
 STORAGE CONDITIONS = AMB TEMP/RH
 DEGREES OF FREEDOM = 2053
 TEST CONDITIONS = +100 DEG/RH

PARAMETER = RELAXATION MODULUS

UNIT OF MEASURE = PSI



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

Figure 45

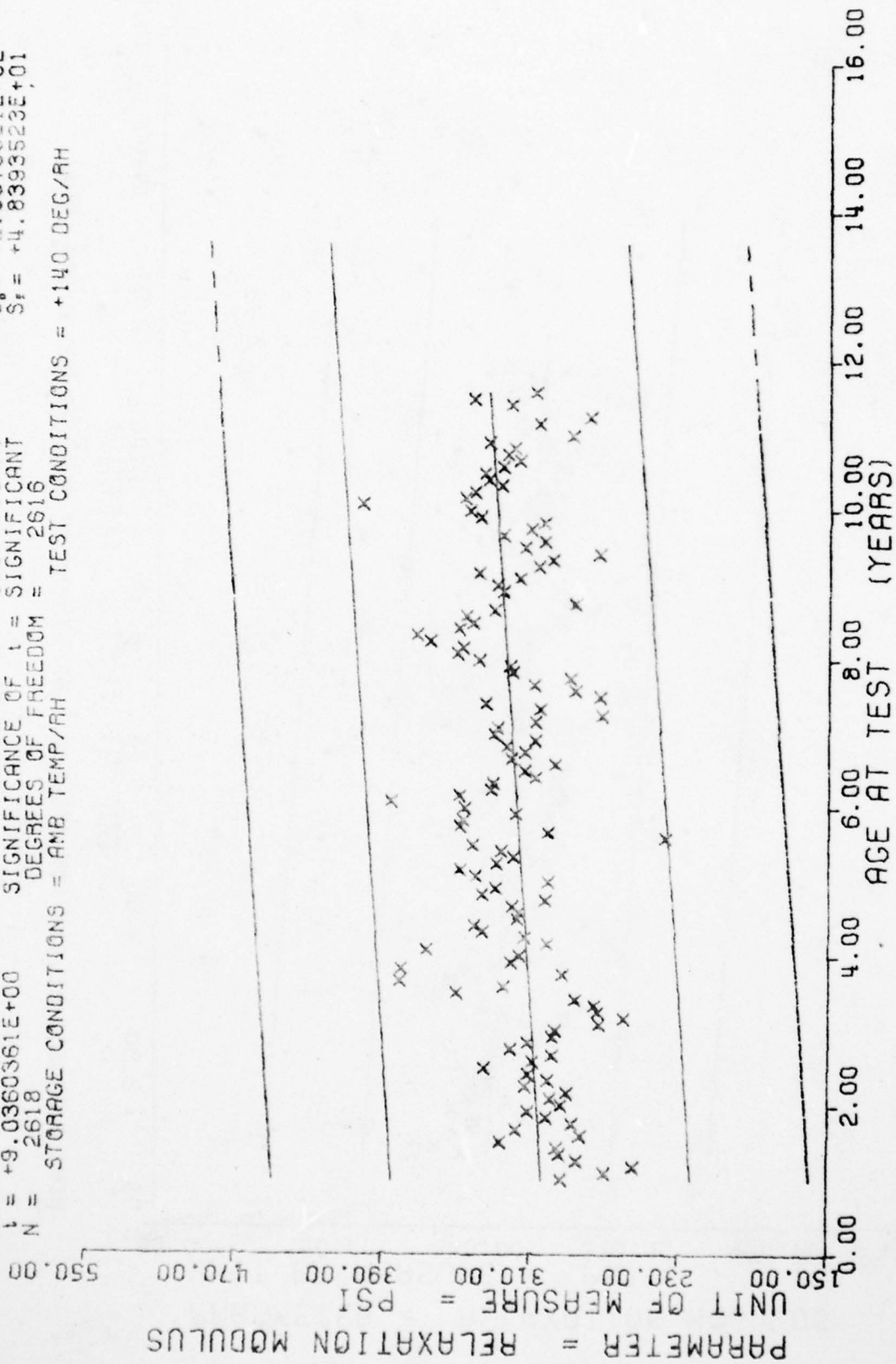
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	12	37.0	18	62.0	48	87.0	12
13.0	27	38.0	12	63.0	21	88.0	12
14.0	6	39.0	27	64.0	33	89.0	6
15.0	27	40.0	18	65.0	9	90.0	12
16.0	18	41.0	18	66.0	12	91.0	15
17.0	20	42.0	12	67.0	7	92.0	15
18.0	10	43.0	9	68.0	12	93.0	15
19.0	6	44.0	3	69.0	27	94.0	18
20.0	6	45.0	7	70.0	15	95.0	17
21.0	18	46.0	6	71.0	54	96.0	51
22.0	6	47.0	9	72.0	42	97.0	44
23.0	9	48.0	6	73.0	21	98.0	45
24.0	23	49.0	6	74.0	32	99.0	33
25.0	30	50.0	27	75.0	24	100.0	18
26.0	30	51.0	60	76.0	30	101.0	12
27.0	21	52.0	54	77.0	30	102.0	5
28.0	27	53.0	12	78.0	33	103.0	9
29.0	48	54.0	27	79.0	14	104.0	3
30.0	45	55.0	27	80.0	17	105.0	7
31.0	33	56.0	24	81.0	18	107.0	6
32.0	57	57.0	33	82.0	15	108.0	12
33.0	27	58.0	24	83.0	12	109.0	6
34.0	57	59.0	9	84.0	9	110.0	9
35.0	20	60.0	17	85.0	3	111.0	3
36.0	45	61.0	24	86.0	9	112.0	21

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

This sample size summary is applicable to figures 46 thru 49.

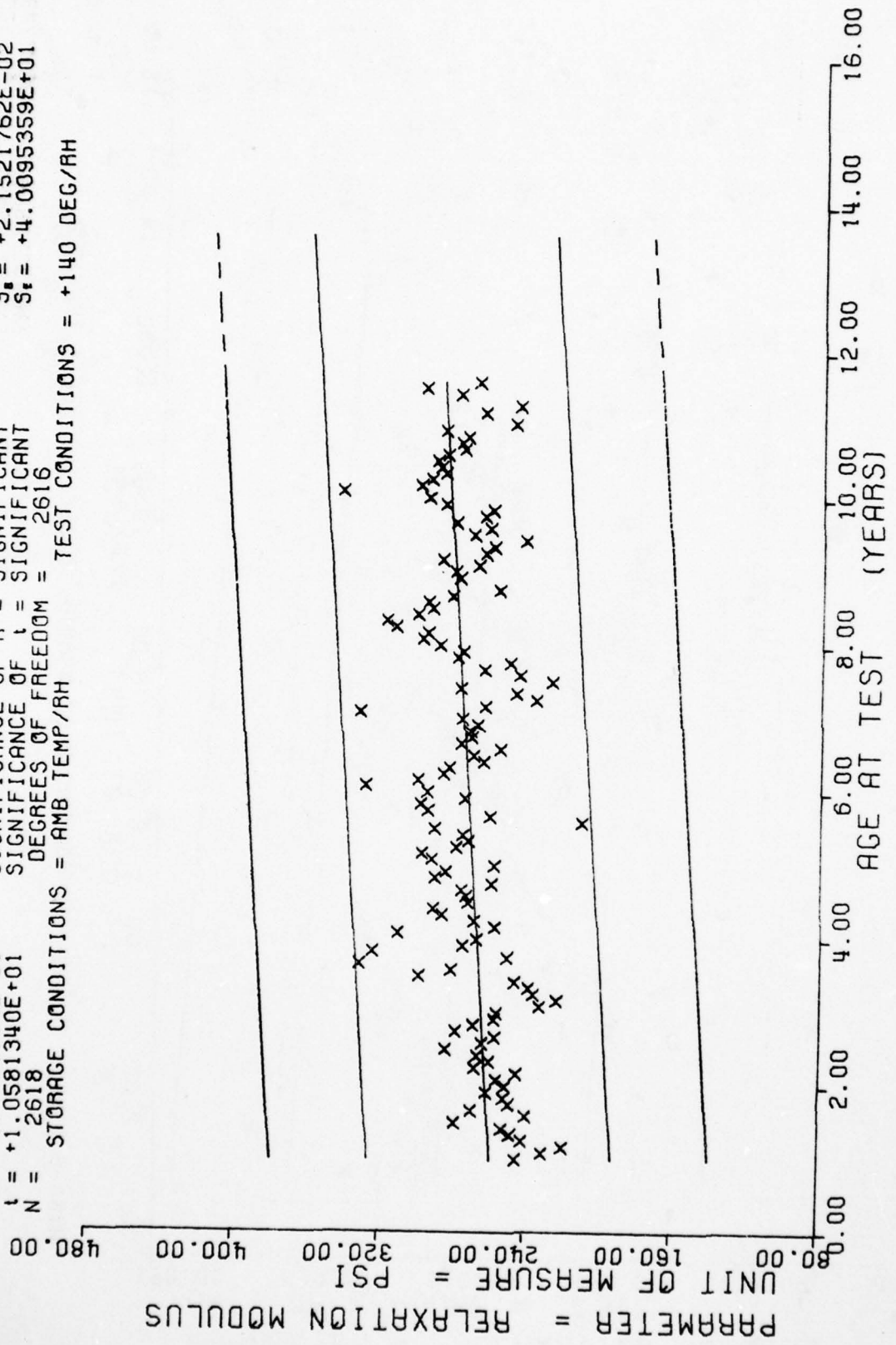
F = +8.1649948E+01
 R = +1.7397432E-01
 S = +9.0360361E+00
 N = 2618
 STORAGE CONDITIONS = AMB TEMP/AH
 Y = ((+3.0131365E+02) + (+2.3471936E-01) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF S = SIGNIFICANT
 DEGREES OF FREEDOM = 2616
 TEST CONDITIONS = +140 DEG/AH



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

Figure 46

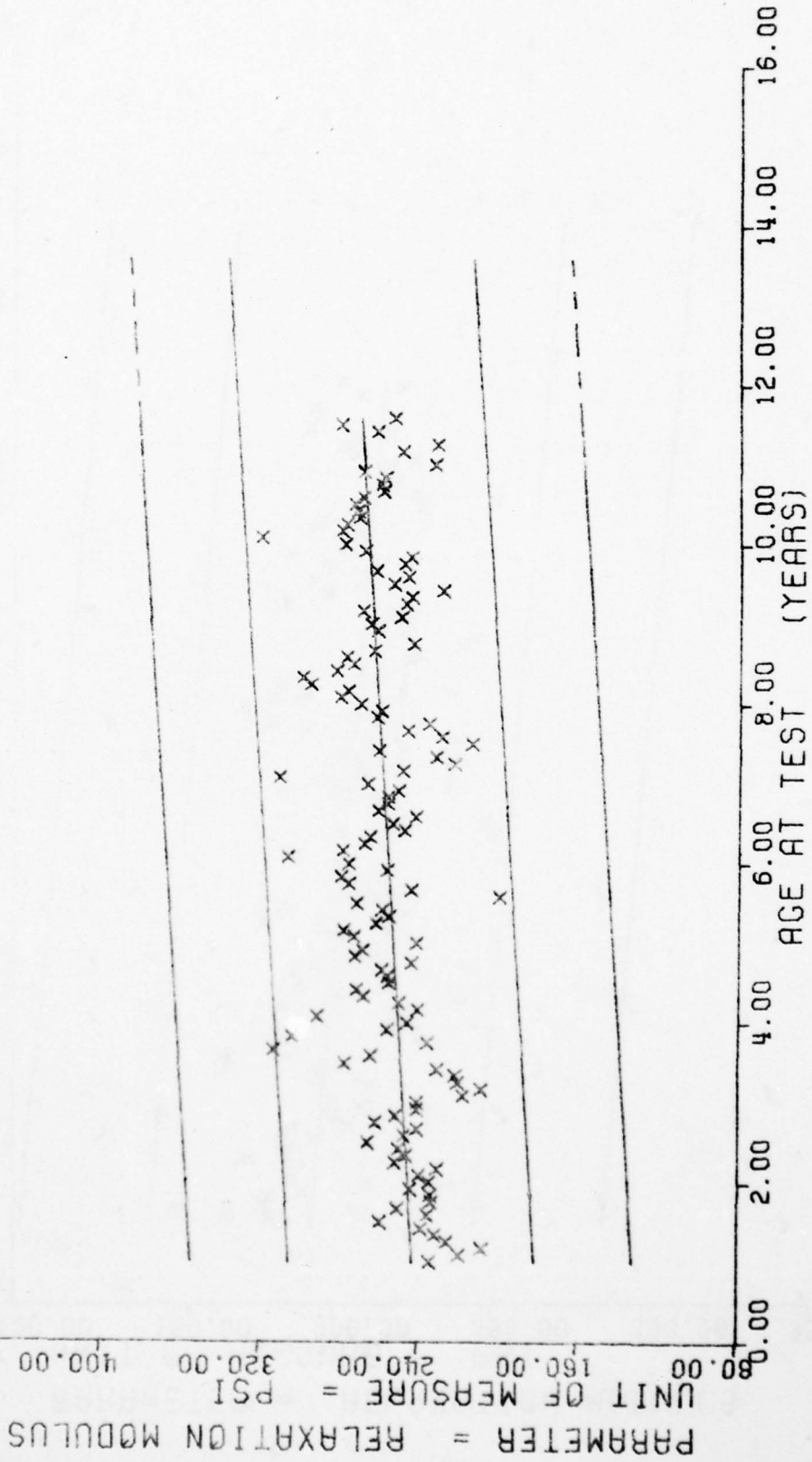
F = +1.1196476E+02
 R = +2.0259154E-01
 t = +1.0581340E+01
 N = 2618
 STORAGE CONDITIONS = AMB TEMP/RH
 Y = ((+2.5662984E+02) + (+2.2772909E-01) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2616
 TEST CONDITIONS = +140 DEG/RH
 $\sigma_r = +4.0936586E+01$
 $S_b = +2.1521762E-02$
 $S_f = +4.0095359E+01$



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

Figure 47

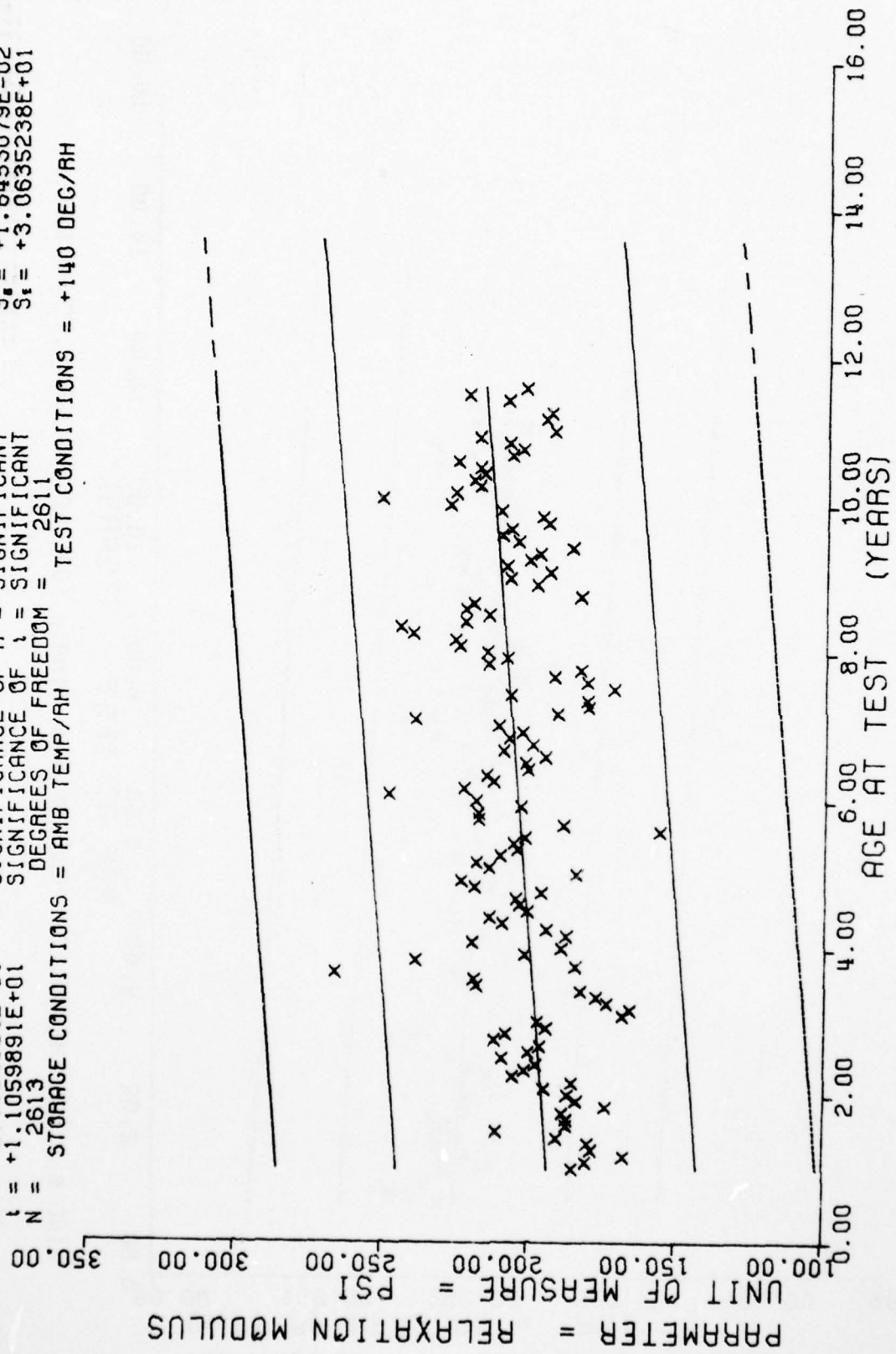
F = +1.1777147E+02) + (+2.4081516E+02) * X)
 R = +2.0755775E-01 SIGNIFICANCE OF F = SIGNIFICANT
 t = +1.0852256E+01 SIGNIFICANCE OF R = SIGNIFICANT
 N = 2618 DEGREES OF FREEDOM = 2616
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +140 DEG/RH



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

Figure 48

$Y = ((+1.9143799E+02) + (+1.8196928E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 $S_1 = +3.1338630E+01$
 $S_2 = +1.6453079E-02$
 $S_3 = +3.0635238E+01$
 $N = 2613$
 STORAGE CONDITIONS = AMB TEMP/140 DEGS OF FREEDOM = 2611
 TEST CONDITIONS = +140 DEG/RH



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
12.0	12	37.0	18	62.0	46	87.0	15	113	48
13.0	24	38.0	12	63.0	21	88.0	27	114	36
14.0	12	39.0	27	64.0	30	89.0	21	115	12
15.0	24	40.0	18	65.0	12	90.0	21	116	33
16.0	18	41.0	18	66.0	12	91.0	15	117	18
17.0	33	42.0	12	67.0	3	92.0	15	118	14
18.0	18	43.0	9	68.0	12	93.0	15	119	15
19.0	9	44.0	3	69.0	18	94.0	17	120	23
20.0	6	45.0	6	70.0	20	95.0	18	121	6
21.0	18	46.0	3	71.0	30	96.0	51	122	3
22.0	9	47.0	12	72.0	48	97.0	45	123	9
23.0	9	48.0	6	73.0	24	98.0	48	124	15
24.0	30	49.0	6	74.0	30	99.0	33	125	15
25.0	35	50.0	27	75.0	27	100.0	17	126	18
26.0	24	51.0	51	76.0	33	101.0	12	127	12
27.0	24	52.0	53	77.0	24	102.0	6	128	12
28.0	26	53.0	15	78.0	39	103.0	9	129	6
29.0	50	54.0	27	79.0	15	104.0	3	130	21
30.0	42	55.0	27	80.0	18	105.0	6	131	42
31.0	33	56.0	24	81.0	21	107.0	6	132	9
32.0	54	57.0	36	82.0	12	108.0	12	134	15
33.0	30	58.0	24	83.0	15	109.0	6	135	6
34.0	51	59.0	9	84.0	9	110.0	6	137	12
35.0	27	60.0	15	85.0	3	111.0	3	138	54
36.0	51	61.0	24	86.0	12	112.0	24	139	44

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

This sample size summary is applicable to figures 50 thru 53.

F = +1.3739060E+02
 R = +2.2273394E-01
 t = +1.1721373E+01
 N = 2634
 STORAGE CONDITIONS = AMB TEMP/RH
 Y = ((+2.4199441E+02) + (+2.2679559E-01) * X)
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2632
 TEST CONDITIONS = +180 DEG/RH
 $\sigma_r = +3.6882139E+01$
 $S_b = +1.9348891E-02$
 $S_r = +3.5962463E+01$

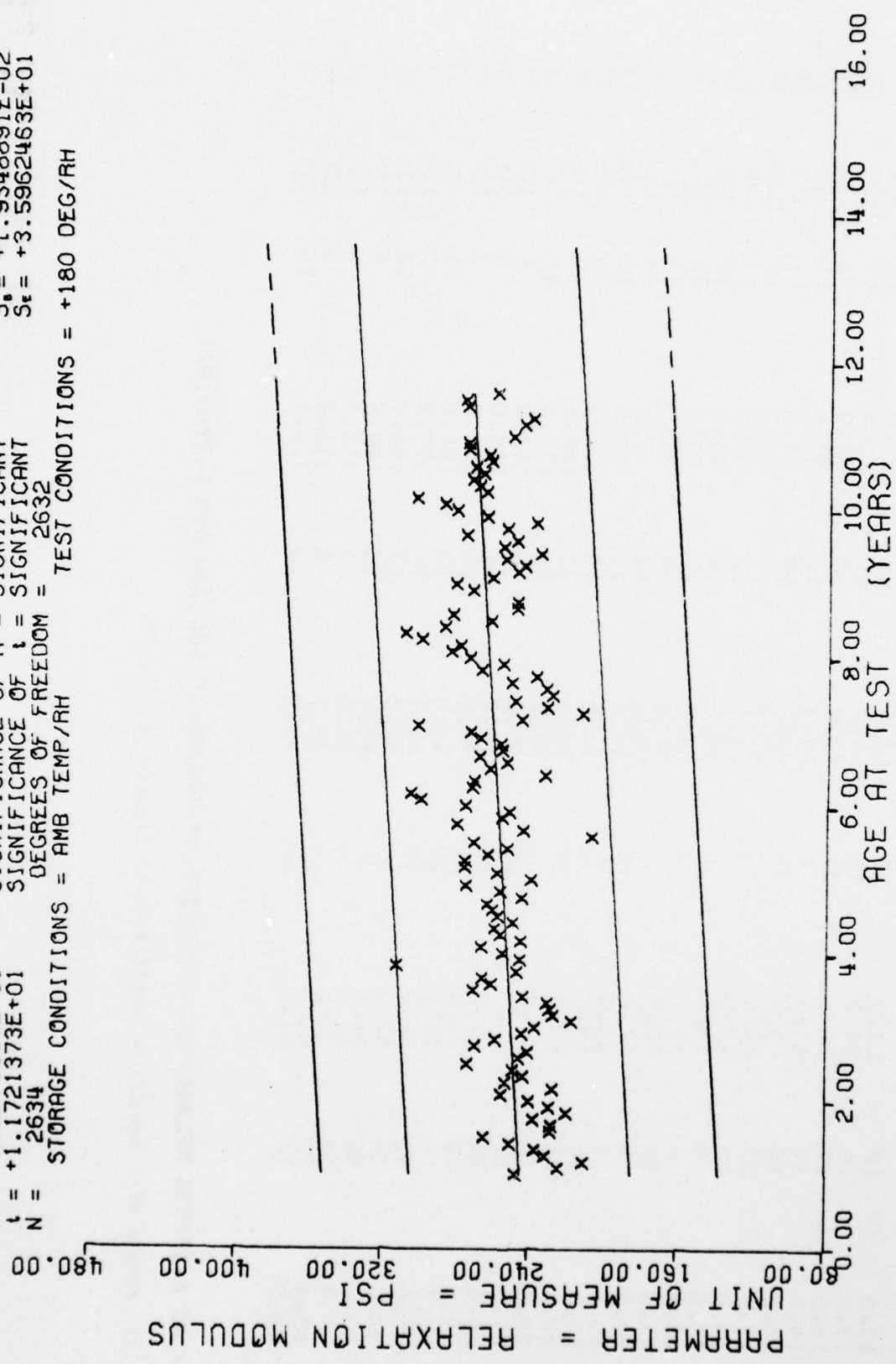
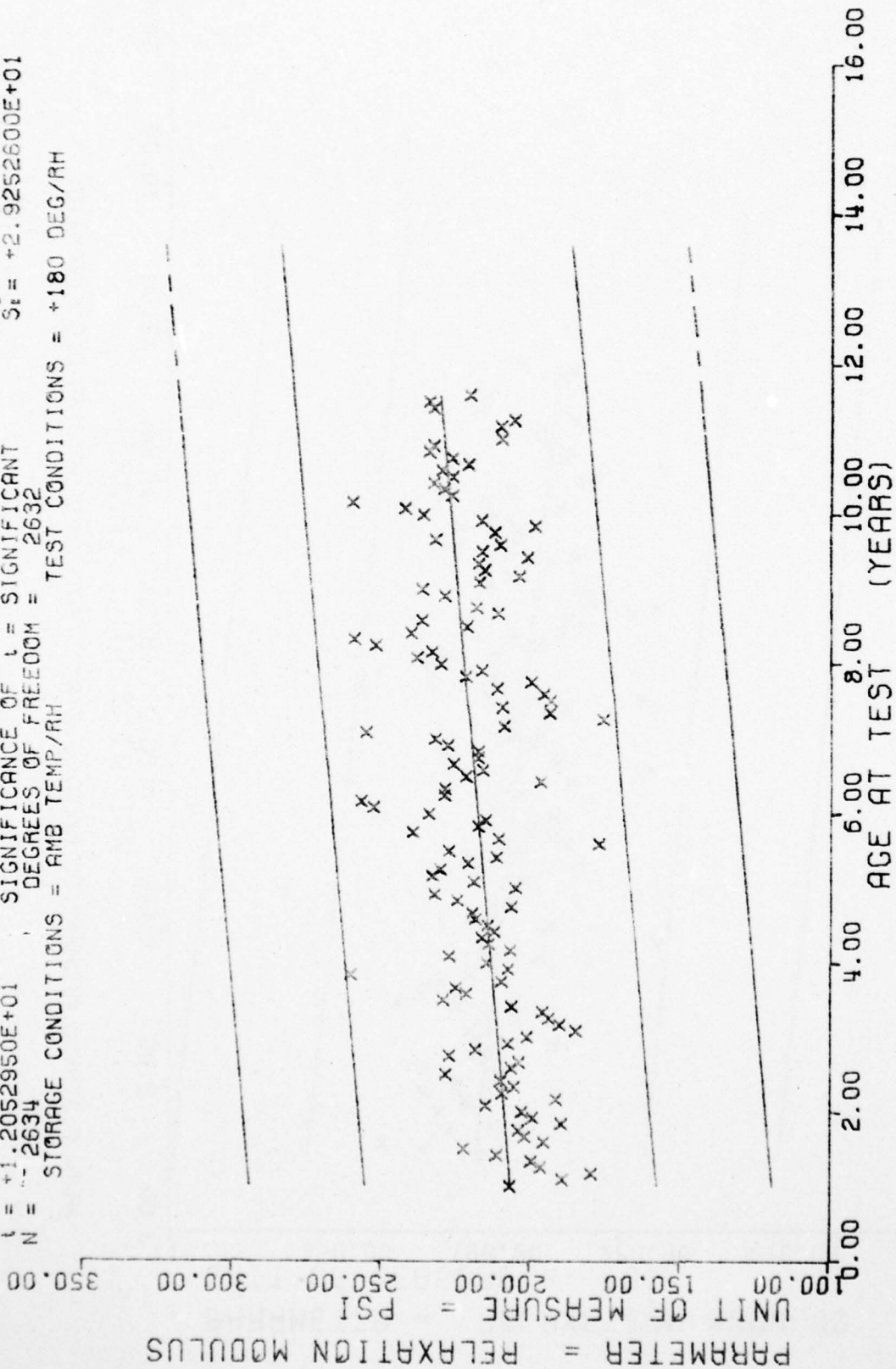


FIG 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 180 DEG F, TPH-1011

Figure 50

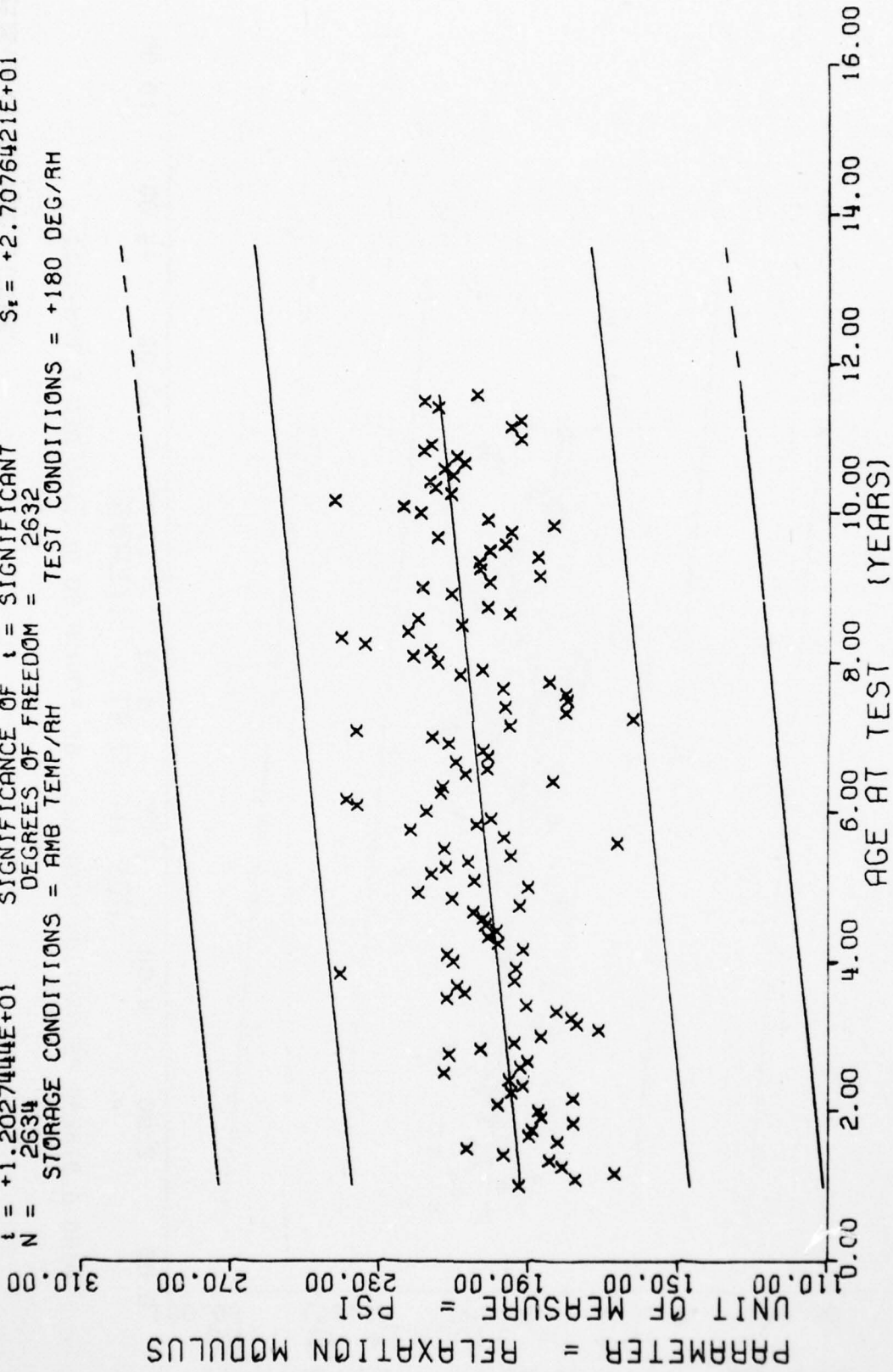
$Y = ((+2.0434977E+02) + (+1.8969877E-01) * X)$
 F = +1.4527362E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_1 = +3.0043351E+01$
 R = +2.2870941E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +1.5738782E-02$
 t = +1.2052950E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +2.9252600E+01$
 N = 2634 DEGREES OF FREEDOM = 2632
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH



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

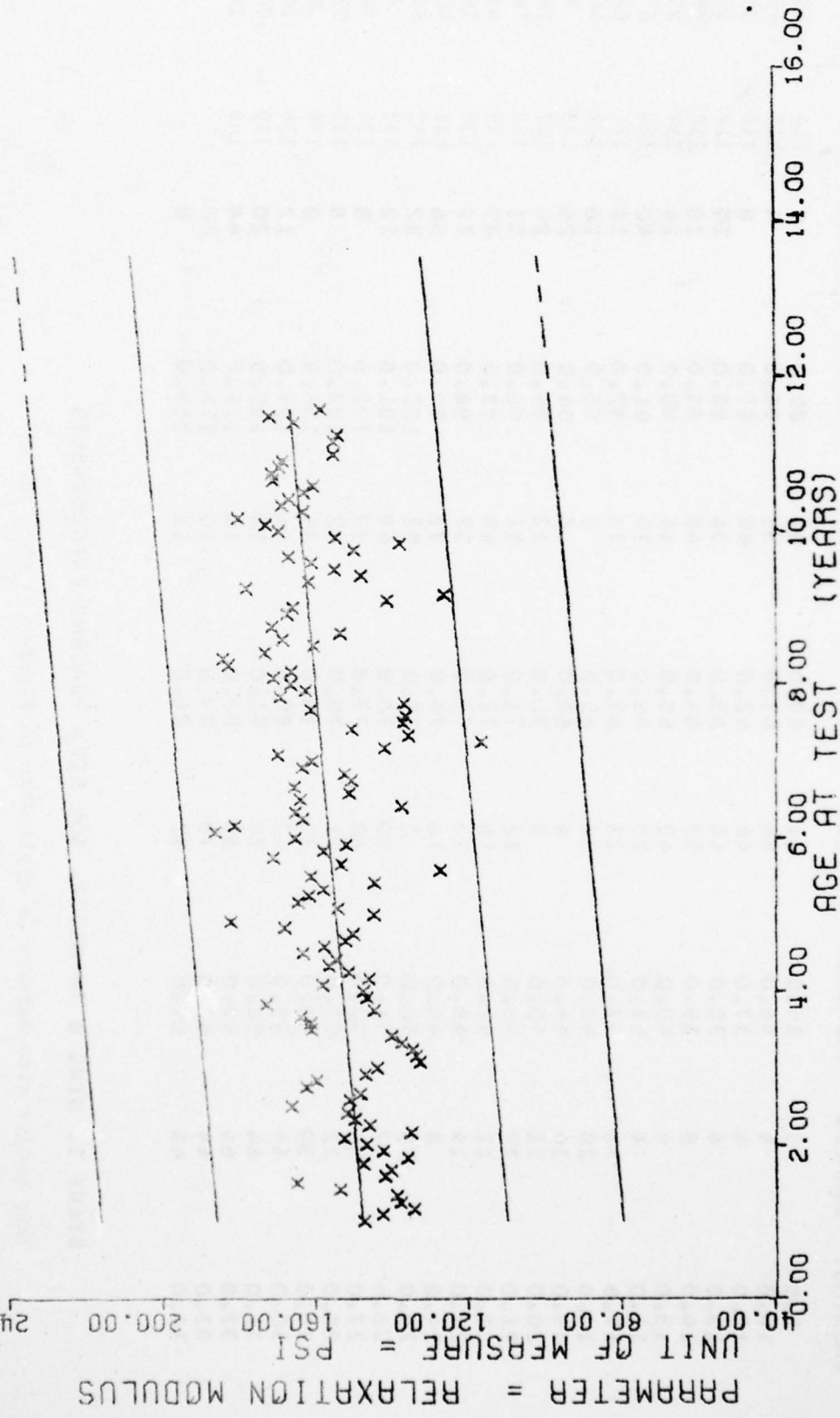
Figure 51

$Y = ((+1.9000372E+02) + (+1.7521500E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2632
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH
 F = +1.4465942E+02
 R = +2.2825067E-01
 t = +1.2027444E+01
 N = 2634
 G = +2.7805271E+01
 S₀ = +1.4567932E-02
 S_t = +2.7076421E+01



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

$Y = ((+1.4610226E+02) + (+1.4454718E-01) * X)$
 F = +1.3915878E+02 SIGNIFICANCE OF F = SIGNIFICANT
 R = +2.2409110E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +1.1796558E+01 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2634 DEGREES OF FREEDOM = 2632
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 180 DEG F, 7PH-1011

Figure 53

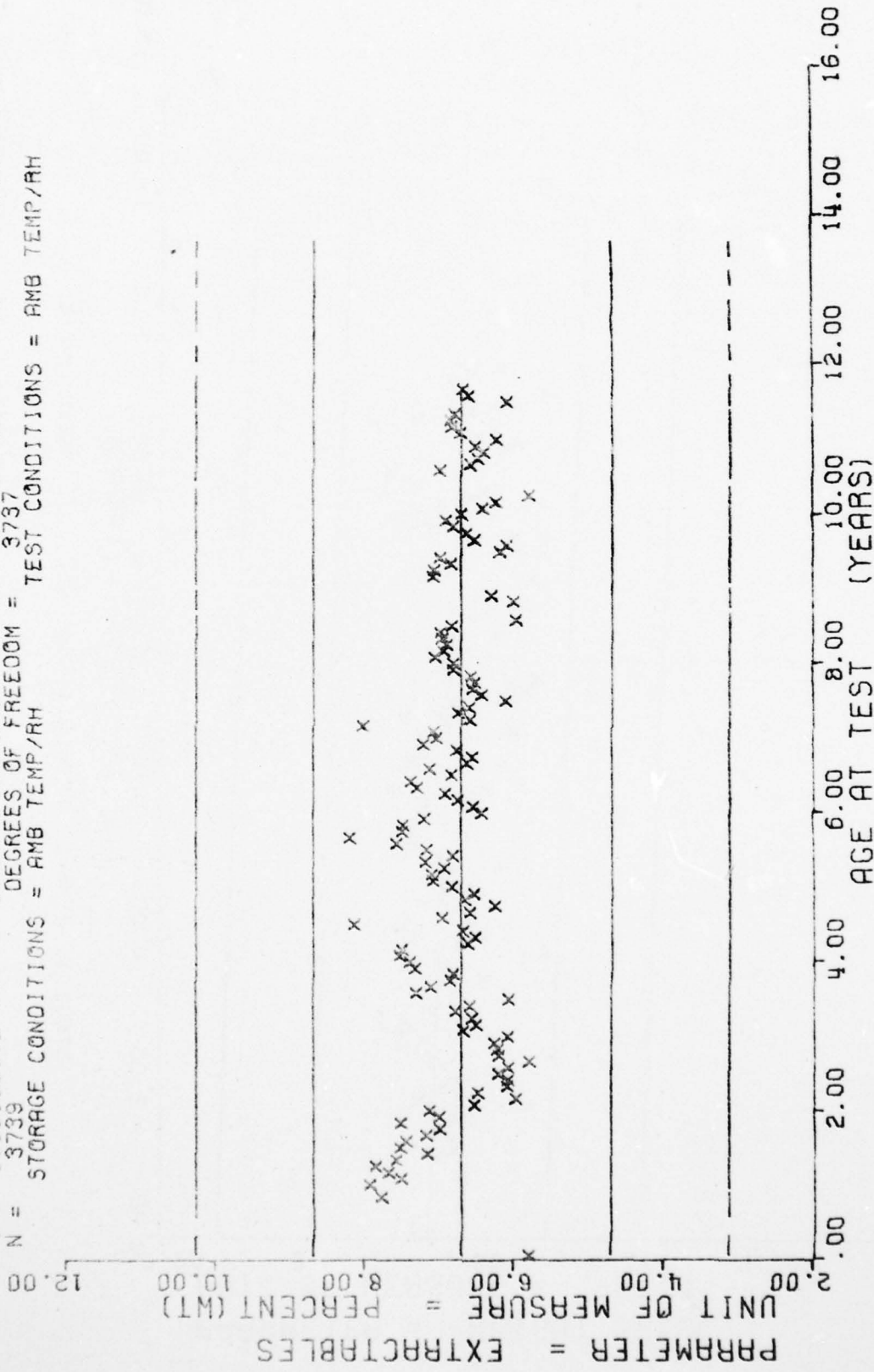
*** SAMPLE SIZE SUMMARY ***

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
10.0	4	36.0	44	61.0	31	86.0	4
12.0	4	37.0	48	62.0	40	87.0	8
13.0	4	38.0	44	63.0	36	88.0	20
14.0	8	39.0	32	64.0	48	89.0	28
15.0	4	40.0	40	65.0	44	90.0	24
16.0	4	41.0	28	66.0	16	91.0	40
17.0	12	42.0	12	67.0	16	92.0	16
18.0	28	43.0	16	68.0	8	93.0	16
19.0	16	44.0	4	69.0	8	94.0	24
20.0	12	45.0	8	70.0	12	95.0	24
21.0	28	46.0	12	71.0	32	96.0	31
22.0	12	47.0	16	72.0	48	97.0	39
23.0	16	48.0	24	73.0	32	98.0	28
24.0	8	49.0	16	74.0	72	99.0	36
25.0	28	50.0	8	75.0	52	100.0	32
26.0	32	51.0	20	76.0	40	101.0	12
27.0	24	52.0	60	77.0	32	102.0	8
28.0	32	53.0	71	78.0	42	103.0	8
29.0	39	54.0	38	79.0	34	106.0	0
30.0	44	55.0	42	80.0	46	107.0	12
31.0	64	56.0	70	81.0	19	110.0	20
32.0	64	57.0	36	82.0	16	111.0	44
33.0	44	58.0	70	83.0	20	112.0	20
34.0	48	59.0	32	84.0	12	113.0	8

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

This sample size summary is applicable to figures 54 thru 56.

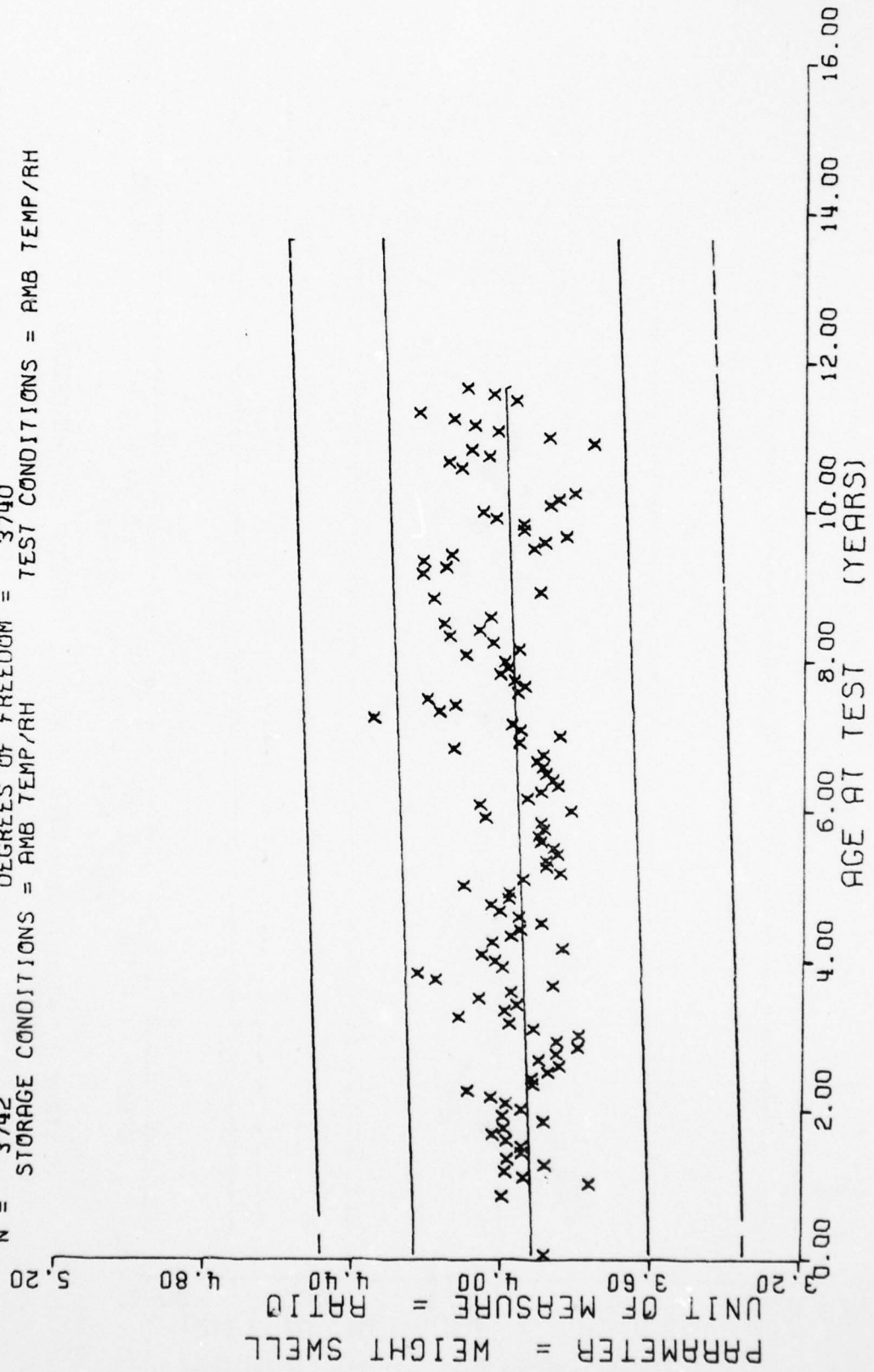
F = +7.9210013E-01
 R = -1.4557354E-02
 t = +8.9000007E-01
 N = 3739
 STORAGE CONDITIONS = AMB TEMP/RH
 Y = ((+6.7109620E+00) + (-4.7352170E-04) * X)
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 3737
 TEST CONDITIONS = AMB TEMP/RH
 S = +1.1863252E+00
 S_e = +5.3204681E-04
 S_e = +1.1863582E+00



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

Figure 54

$Y = ((+3.9196646E+00) + (+5.9426138E-04) * X)$
 F = +4.8917473E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.1362514E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +6.9941027E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 3742 DEGREES OF FREEDOM = 3740
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 55

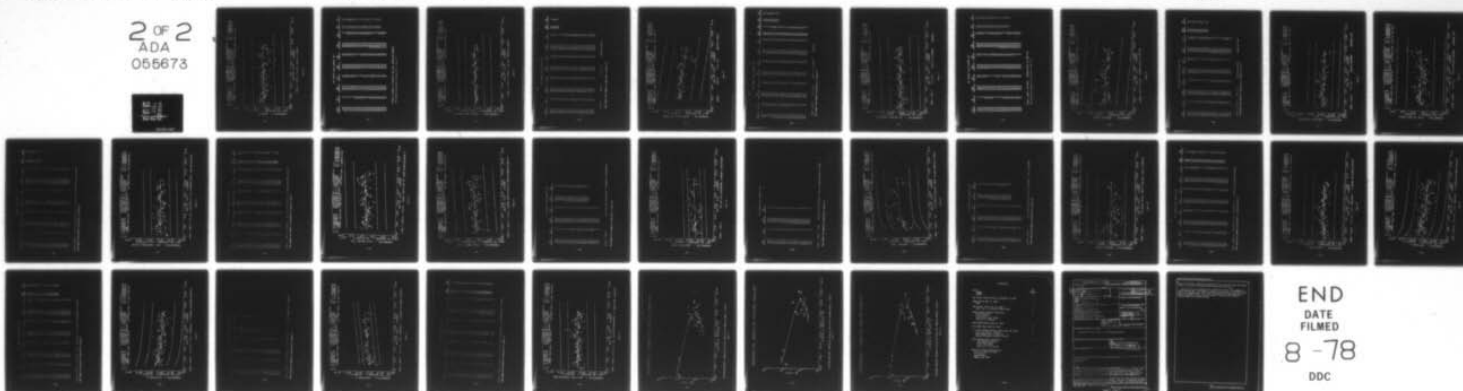
AD-A055 673

OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1, PHASE E,--ETC(U)
FEB 78 J A THOMPSON
MANCP-390(78)

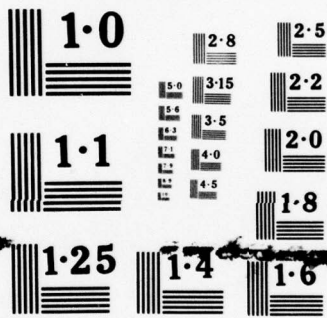
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2 OF 2
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065673

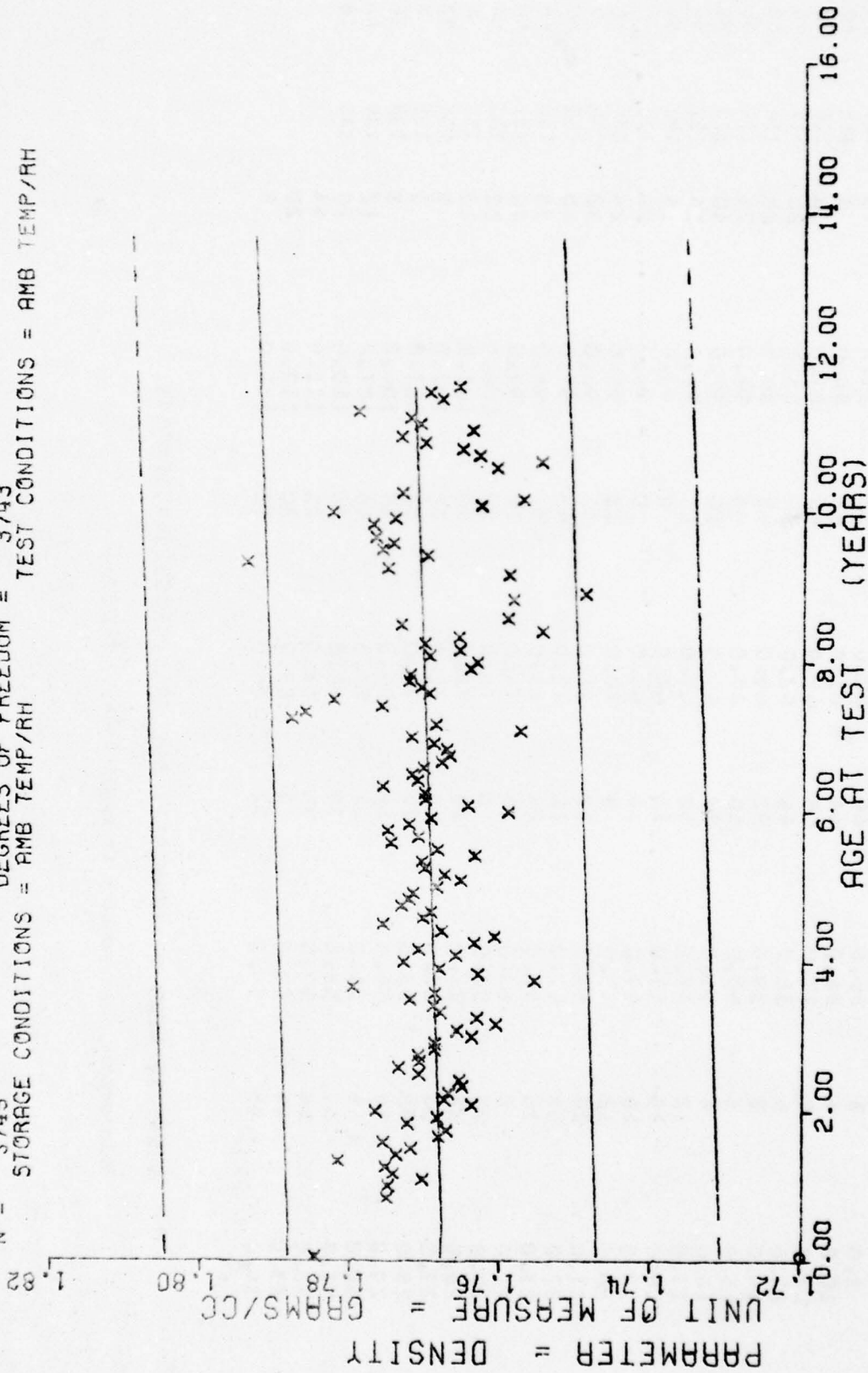


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NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

$Y = ((+1.7677829E+00) + (+2.9997894E-05) * X)$
 F = +2.9343742E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +8.8196656E-02 SIGNIFICANCE OF R = SIGNIFICANT
 t = +5.4169864E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 3745 DEGREES OF FREEDOM = 3743
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 56

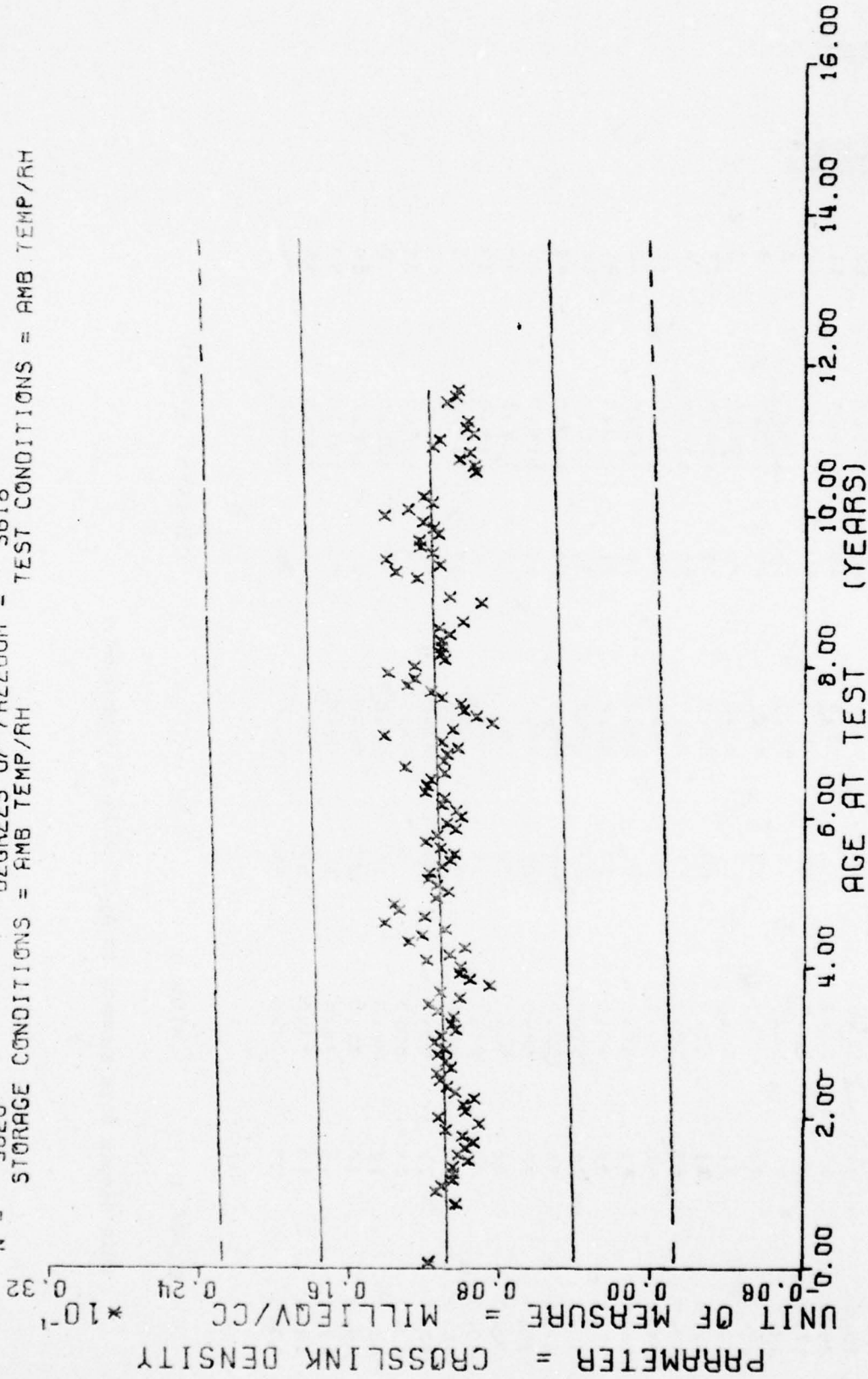
*** SAMPLE SIZE SUMMARY ***

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
10.0	4	36.0	44	61.0	32	86.0	4
12.0	4	37.0	48	62.0	40	87.0	8
13.0	4	38.0	44	63.0	36	88.0	20
14.0	8	39.0	32	64.0	48	89.0	28
15.0	4	40.0	40	65.0	44	90.0	24
16.0	4	41.0	28	66.0	16	91.0	40
17.0	12	42.0	12	67.0	16	92.0	16
18.0	28	43.0	16	68.0	8	93.0	16
19.0	16	44.0	4	69.0	8	94.0	24
20.0	12	45.0	8	70.0	12	95.0	24
21.0	28	46.0	12	71.0	32	96.0	32
22.0	12	47.0	16	72.0	48	97.0	40
23.0	16	48.0	24	73.0	32	98.0	28
24.0	8	49.0	16	74.0	72	99.0	36
25.0	28	50.0	8	75.0	52	100.0	32
26.0	32	51.0	20	76.0	40	101.0	12
27.0	24	52.0	60	77.0	32	102.0	8
28.0	32	53.0	72	78.0	42	103.0	8
29.0	39	54.0	14	79.0	34	106.0	8
30.0	44	55.0	42	80.0	46	107.0	12
31.0	64	56.0	70	81.0	20	110.0	20
32.0	64	57.0	36	82.0	16	111.0	44
33.0	44	58.0	70	83.0	20	112.0	20
34.0	48	59.0	32	84.0	12	113.0	8

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

This sample size summary is applicable to figure 57.

$Y = ((+1.0803856E-02) + (+9.1172697E-06) * X)$
 F = +2.3548581E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +4.0364630E-03$
 R = +8.0415416E-02 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +1.8786081E-06$
 t = +4.8526680E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +4.0239466E-03$
 N = 3620 DEGREES OF FREEDOM = 3618
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 57

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
24.0	19	50.0	14	75.0	45	100.0	27
25.0	64	51.0	45	76.0	40	101.0	12
26.0	22	52.0	72	77.0	40	102.0	11
27.0	29	53.0	42	78.0	69	103.0	3
28.0	34	54.0	36	79.0	14	104.0	3
29.0	59	55.0	28	80.0	45	105.0	3
30.0	31	56.0	62	81.0	76	106.0	3
31.0	51	57.0	69	82.0	17	109.0	27
32.0	67	58.0	51	83.0	29	110.0	30
33.0	56	59.0	22	84.0	10	111.0	14
34.0	61	60.0	20	85.0	18	112.0	22
35.0	36	61.0	27	86.0	21	113.0	98
36.0	26	62.0	63	87.0	30	114.0	44
37.0	34	63.0	55	88.0	20	115.0	48
38.0	26	64.0	62	89.0	40	116.0	45
39.0	33	65.0	22	90.0	45	117.0	98
40.0	20	66.0	10	91.0	30	118.0	23
41.0	9	67.0	33	92.0	17	119.0	63
42.0	21	68.0	20	93.0	13	120.0	69
43.0	24	69.0	5	94.0	28	121.0	36
44.0	10	70.0	15	95.0	30	122.0	6
46.0	10	71.0	28	96.0	41	130.0	54
47.0	15	72.0	15	97.0	83	131.0	90
48.0	13	73.0	57	98.0	64	132.0	15
49.0	25	74.0	45	99.0	38	134.0	24

STAGE 1 WING 6 TP-H 1011 CONSTANT STRAIN

This sample size summary is applicable to figure 58.

$Y = ((+2.6613823E+01) + (-2.6058555E-02) * X)$
 F = +3.8858820E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma = +2.7943834E+00$
 R = -3.1197338E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +1.3219210E-03$
 t = +1.9712640E+01 SIGNIFICANCE OF t = SIGNIFICANT $S_t = +2.6552864E+00$
 N = 3606 DEGREES OF FREEDOM = 3604 TEST CONDITIONS = AMB TEMP/RH
 STORAGE CONDITIONS = AMB TEMP/RH

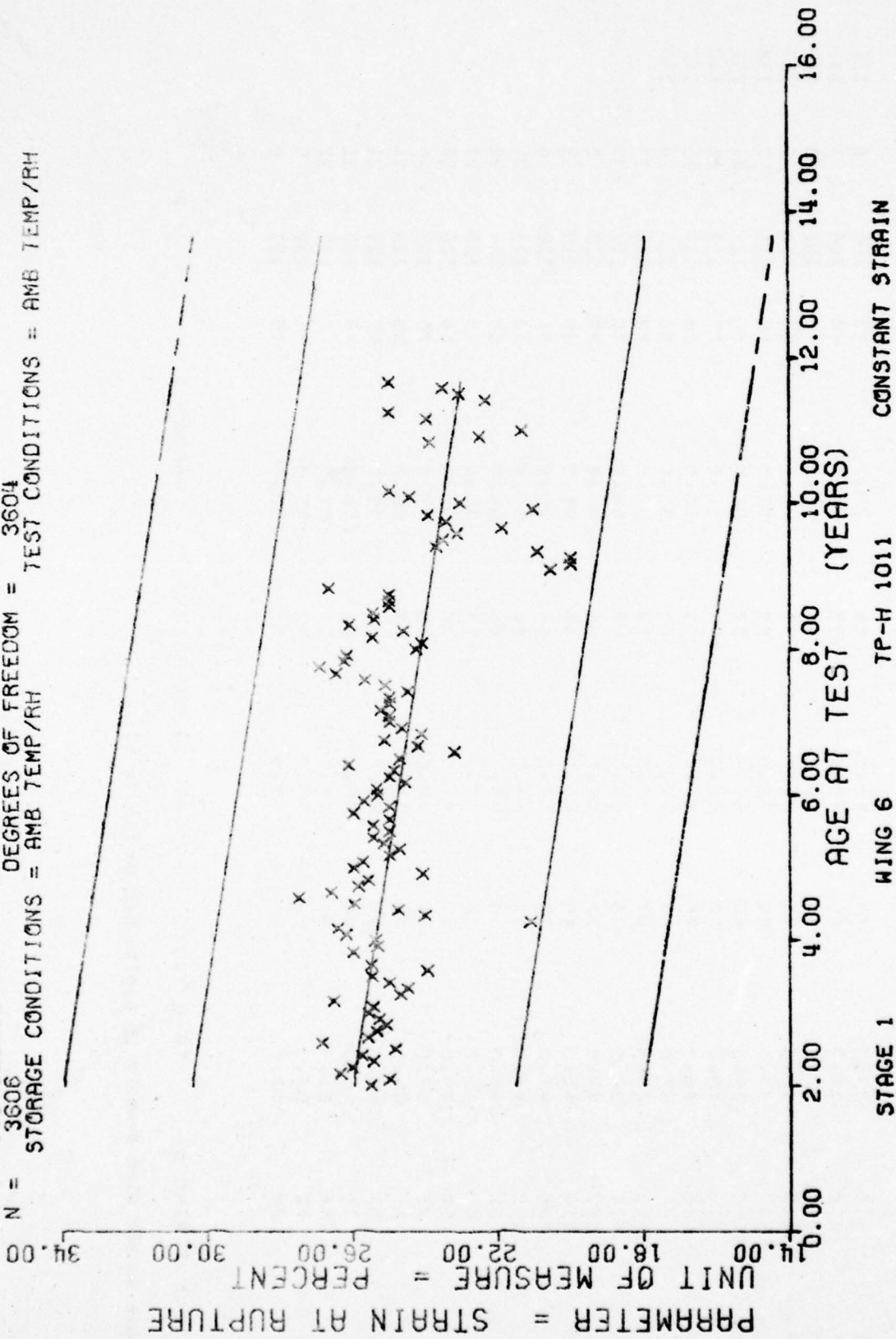


Figure 58

*** 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
4.0	66	29.0	39	54.0	54	79.0	43	104	6	134	18		
5.0	108	30.0	66	55.0	73	80.0	48	106	5	135	9		
6.0	126	31.0	59	56.0	48	81.0	72	107	9	136	21		
7.0	117	32.0	70	57.0	71	82.0	59	110	9	137	18		
8.0	117	33.0	59	58.0	47	83.0	14	111	12	138	52		
9.0	129	34.0	47	59.0	67	84.0	35	112	21	139	39		
10.0	114	35.0	52	60.0	70	85.0	17	113	45	140	9		
11.0	126	36.0	76	61.0	51	86.0	46	114	15	141	9		
12.0	93	37.0	32	62.0	60	87.0	30	115	6	144	18		
13.0	108	38.0	57	63.0	78	88.0	38	116	33				
14.0	110	39.0	40	64.0	58	89.0	30	117	33				
15.0	133	40.0	32	65.0	56	90.0	37	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	31	120	6				
18.0	108	43.0	31	68.0	94	93.0	32	123	21				
19.0	52	44.0	3	69.0	86	94.0	29	124	12				
20.0	27	45.0	35	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	24				
23.0	35	48.0	50	73.0	45	98.0	55	128	24				
24.0	57	49.0	28	74.0	91	99.0	49	129	24				
25.0	36	50.0	40	75.0	64	100.0	48	130	21				
26.0	66	51.0	91	76.0	71	101.0	8	131	32				
27.0	42	52.0	82	77.0	72	102.0	12	132	9				
28.0	36	53.0	24	78.0	69	103.0	16	133	9				

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

This sample size summary is applicable to figure 59

$Y = ((+6.4713903E+01) + (+8.1097981E-03) * X)$
 F = +1.0028202E+02 SIGNIFICANCE OF F = SIGNIFICANT $\sigma_y = +2.4143173E+00$
 R = +1.2315972E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +8.0983864E-04$
 U = +1.0014091E+01 SIGNIFICANCE OF U = SIGNIFICANT $S_t = +2.3961208E+00$
 N = 6513 DEGREES OF FREEDOM = 6511
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

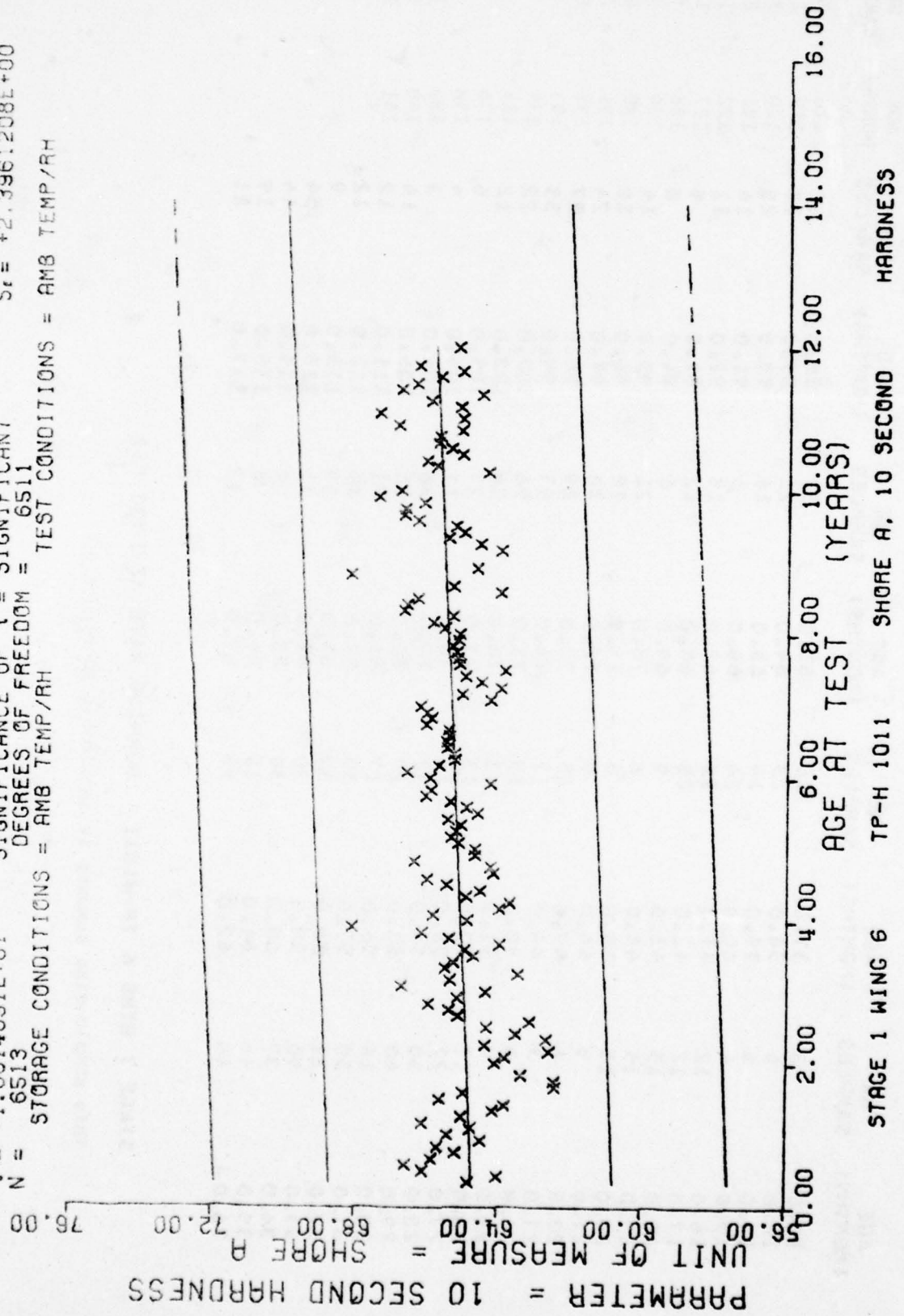


Figure 59

*** SAMPLE SIZE SUMMARY ***

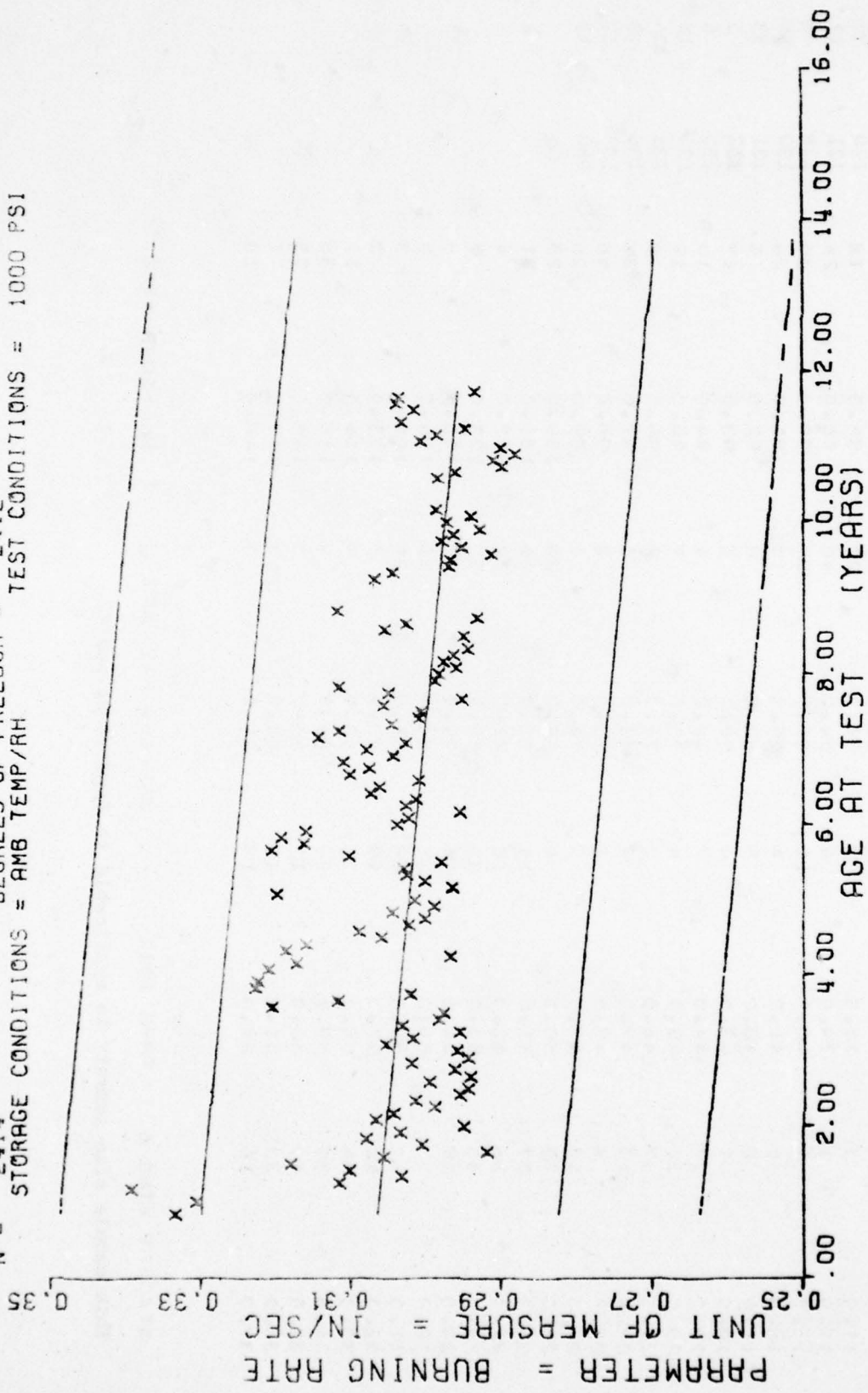
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
10.0	3	37.0	36	63.0	33	86.0	12	118	20
12.0	6	38.0	23	64.0	23	89.0	13	119	27
14.0	5	39.0	14	65.0	16	90.0	28	120	74
15.0	6	40.0	24	66.0	6	91.0	14	121	24
16.0	12	41.0	12	67.0	15	92.0	11	122	18
17.0	12	42.0	25	68.0	12	93.0	9	127	13
18.0	15	43.0	9	69.0	6	94.0	8	128	9
19.0	15	44.0	6	70.0	21	95.0	14	129	39
20.0	15	45.0	6	71.0	10	96.0	18	130	48
21.0	9	46.0	9	72.0	30	97.0	24	131	77
22.0	6	47.0	15	73.0	29	98.0	37	132	21
23.0	3	49.0	12	74.0	47	99.0	33	133	8
24.0	6	50.0	15	75.0	56	100.0	22	134	9
25.0	9	51.0	3	76.0	36	102.0	12	135	6
26.0	17	52.0	13	77.0	27	103.0	6	136	6
27.0	27	53.0	12	78.0	11	104.0	4	138	6
28.0	30	54.0	32	79.0	36	105.0	3	139	29
29.0	40	55.0	27	80.0	15	106.0	14	140	12
30.0	18	56.0	17	81.0	21	111.0	12	141	12
31.0	30	57.0	30	82.0	15	112.0	12		
32.0	31	58.0	39	83.0	15	113.0	9		
33.0	46	59.0	30	84.0	11	114.0	54		
34.0	32	60.0	38	85.0	6	115.0	44		
35.0	46	61.0	15	86.0	6	116.0	19		
36.0	46	62.0	40	87.0	12	117.0	21		

STAGE I WING 6 TP-H1011 BURNING RATE AT 1000 PSI

This sample size summary is applicable to figure 60

$Y = ((+3.0708320E-01) + (-8.3532398E-05) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2412
 STORAGE CONDITIONS = AMB TEMP/RH
 TEST CONDITIONS = 1000 PSI

F = +1.0907763E+02
 R = -2.0800546E-01
 t = +1.0444023E+01
 N = 2414



STAGE I WING 6 TP-H1011 BURNING RATE AT 1000 PSI

Figure 60

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
11.0	1	39.0	2	63.0	20	88.0	12	120	39
14.0	1	39.0	4	64.0	40	89.0	24	121	12
15.0	1	40.0	11	65.0	27	90.0	36	129	3
16.0	8	41.0	4	66.0	18	91.0	24	130	36
17.0	6	42.0	9	67.0	8	92.0	9	131	33
18.0	7	43.0	4	68.0	5	93.0	17	132	5
19.0	13	44.0	7	69.0	4	94.0	15	133	6
20.0	20	45.0	4	70.0	7	95.0	19	134	18
21.0	7	46.0	3	71.0	2	96.0	18	135	25
22.0	13	47.0	7	72.0	6	97.0	38	136	3
23.0	9	48.0	1	73.0	2	98.0	40	139	12
24.0	13	49.0	9	74.0	1	99.0	26	140	12
25.0	22	50.0	4	75.0	30	100.0	23		
26.0	27	51.0	14	76.0	26	101.0	21		
27.0	36	52.0	18	77.0	22	102.0	8		
28.0	33	53.0	35	78.0	13	103.0	6		
29.0	37	54.0	31	79.0	7	105.0	9		
30.0	24	55.0	25	80.0	21	106.0	6		
31.0	51	56.0	18	81.0	24	108.0	3		
32.0	42	57.0	19	82.0	7	113.0	3		
33.0	54	58.0	16	83.0	9	114.0	11		
34.0	39	59.0	24	84.0	9	115.0	56		
35.0	47	60.0	13	85.0	3	116.0	55		
36.0	32	61.0	10	86.0	3	117.0	7		
37.0	10	62.0	17	87.0	3	118.0	10		

STAGE 1 WING 6 TP-H 1C11 MAXIMUM PRESSURE PRESSURE TIME

This sample size summary is applicable to figures 61 and 62.

$Y = ((+3.6062694E+03) + (-2.2321184E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 1878
 N = 1880
 STORAGE CONDITIONS = AMB TEMP/AH
 TEST CONDITIONS = 500 PSI INT PRES

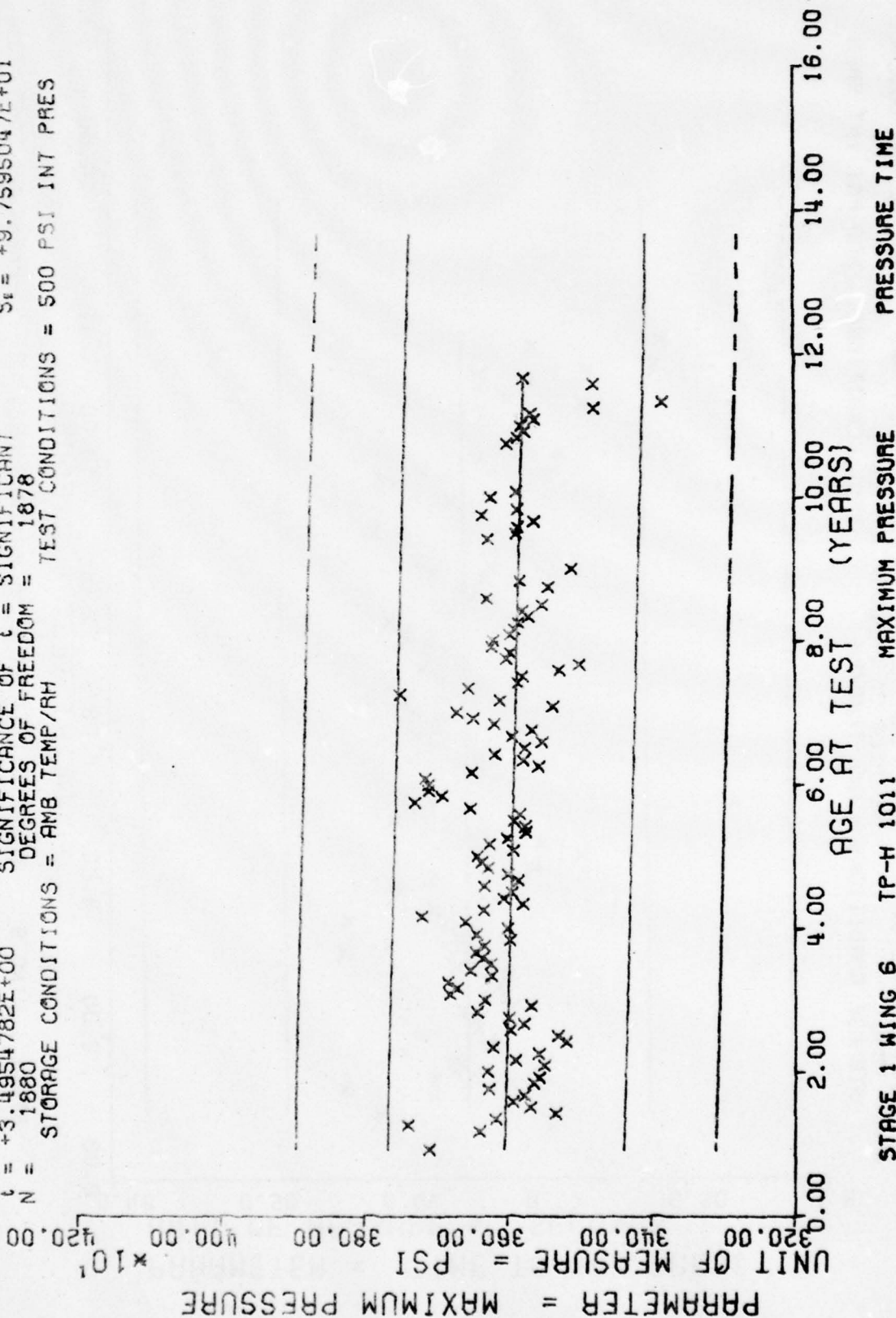
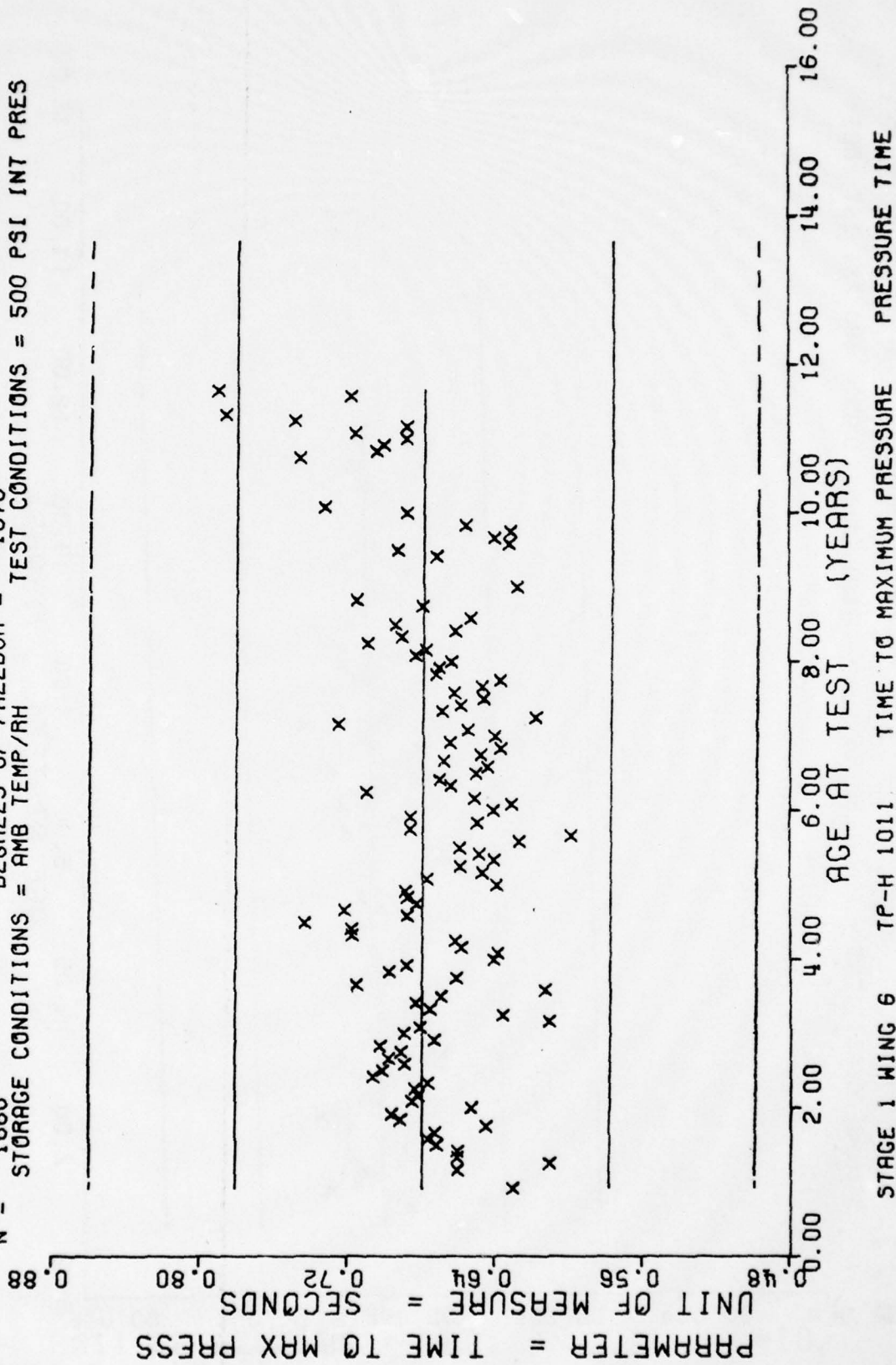


Figure 61

$Y = ((+6.7997529E-01) + (-3.3350394E-05) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_1 = +5.9993222E-02$
 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_0 = +3.9257007E-05$
 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_1 = +5.9997665E-02$
 N = 1880 DEGREES OF FREEDOM = 1878
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES



*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
7.0	7	35.0	2	60.0	6	86.0	2
8.0	6	36.0	14	61.0	3	88.0	3
9.0	3	37.0	6	62.0	5	89.0	4
10.0	5	38.0	3	64.0	5	90.0	7
11.0	1	39.0	2	65.0	5	91.0	8
13.0	2	40.0	3	66.0	6	92.0	3
15.0	3	41.0	3	67.0	9	93.0	14
16.0	2	42.0	3	68.0	3	94.0	6
17.0	3	43.0	4	69.0	5	95.0	5
18.0	2	44.0	3	70.0	6	96.0	2
20.0	2	45.0	2	71.0	4	97.0	6
21.0	2	46.0	1	72.0	3	98.0	2
22.0	1	47.0	5	73.0	4	100.0	1
23.0	6	48.0	5	74.0	1	101.0	2
24.0	3	49.0	2	75.0	3	102.0	3
25.0	3	50.0	4	76.0	10	103.0	1
26.0	1	51.0	2	77.0	10	104.0	2
27.0	3	52.0	4	78.0	12	105.0	3
28.0	3	53.0	3	79.0	4	106.0	1
29.0	6	54.0	4	80.0	10	109.0	1
30.0	5	55.0	2	81.0	12	110.0	3
31.0	7	56.0	2	82.0	4	111.0	6
32.0	7	57.0	2	87.0	6	112.0	11
33.0	7	58.0	3	84.0	4	113.0	4
34.0	11	59.0	6	85.0	2	114.0	2

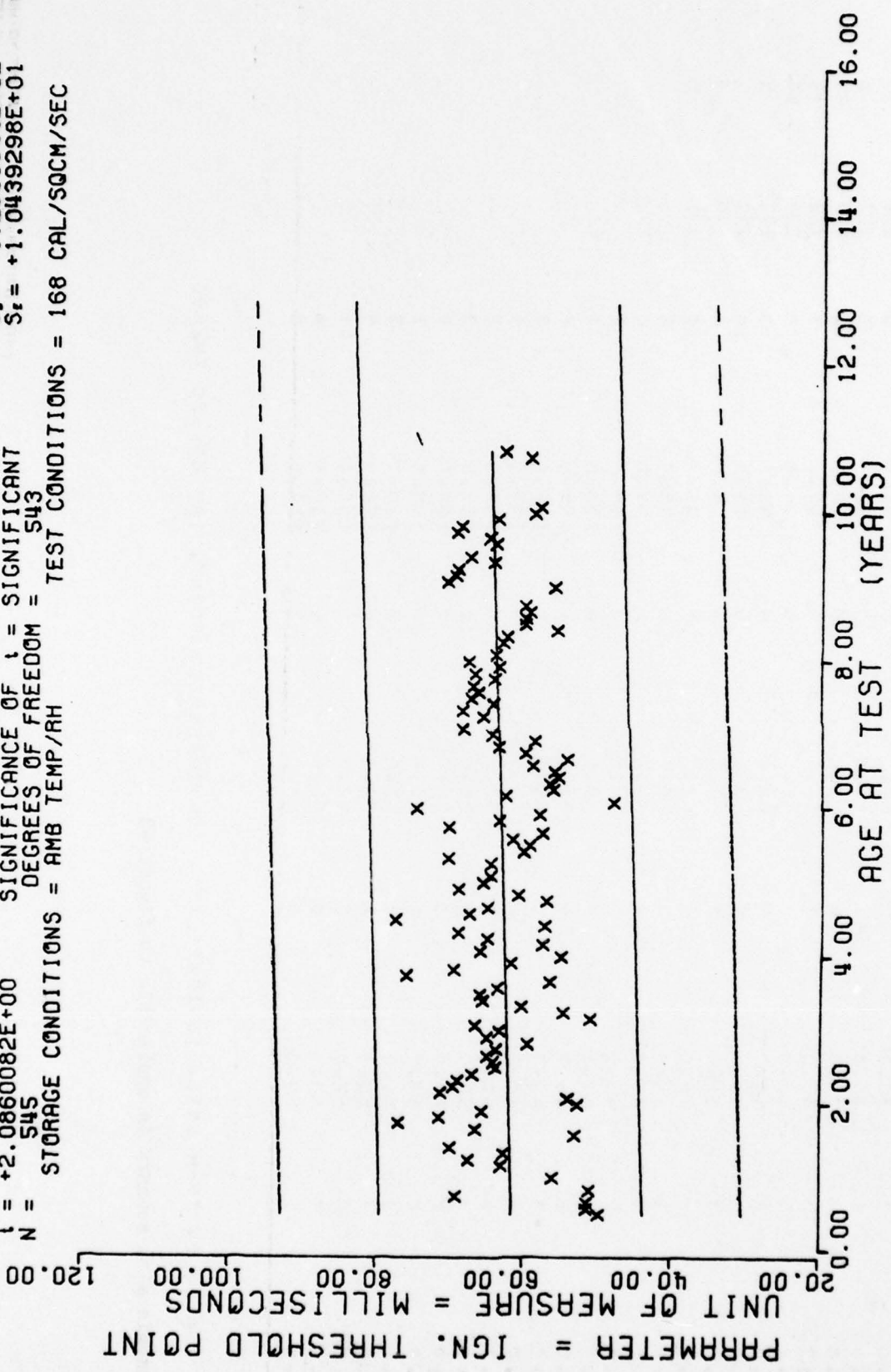
STAGE 1 WING 6, TP-H 1011, IGNITABILITY, IGN THRESHOLD POINT, 169 CAL/SC CM/SEC

This sample size summary is applicable to figure 63

$Y = ((+6.1387015E+01) + (+2.6979481E-02) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 543
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 168 CAL/SQCM/SEC

F = +4.3514306E+00
 R = +8.9162636E-02
 t = +2.0860082E+00
 N = 545

$\sigma_y = +1.0471406E+01$
 $S_x = +1.2933544E-02$
 $S_r = +1.0439298E+01$



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

Figure 63

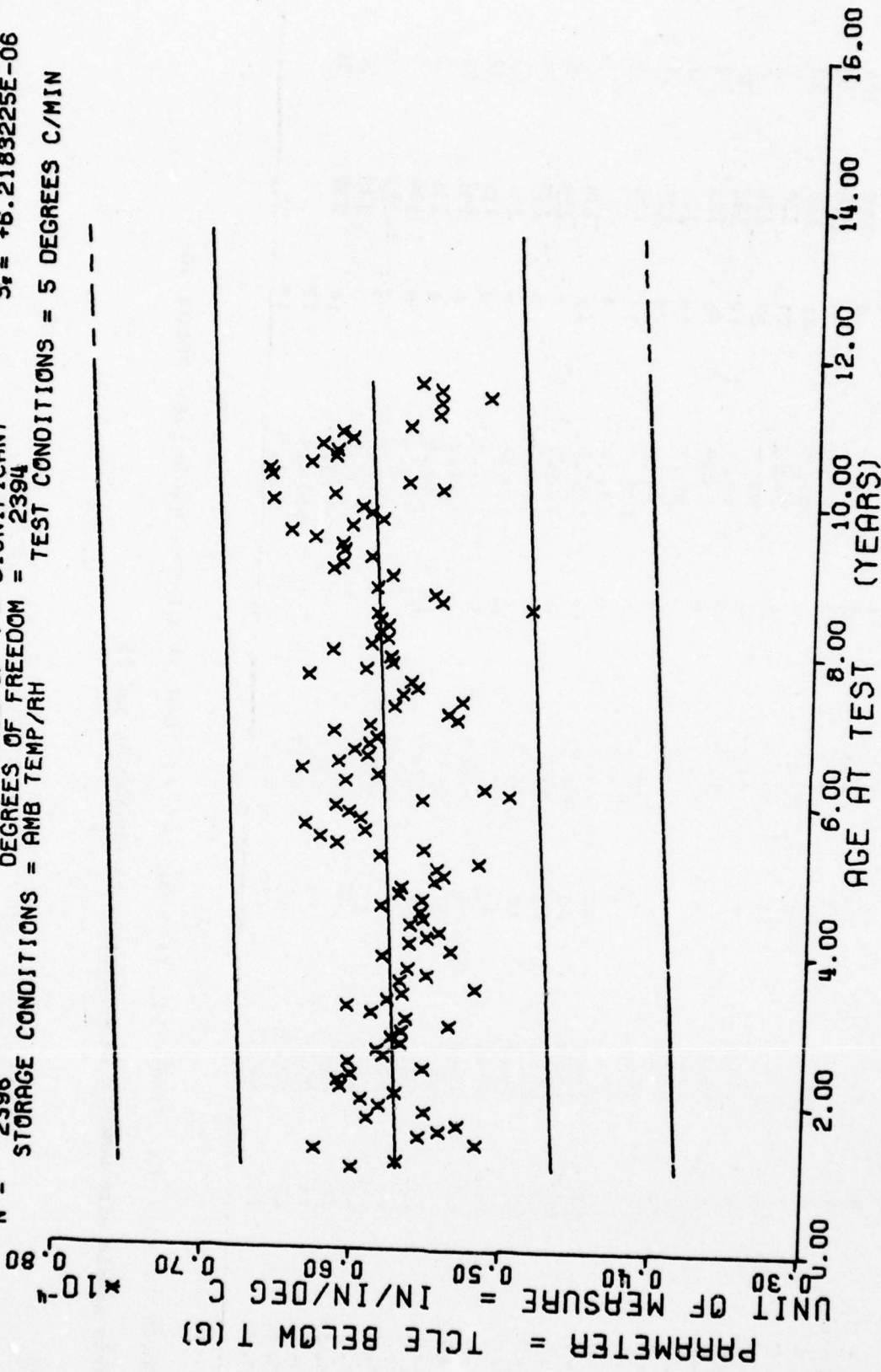
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	39.0	12	65.0	21	90.0	9
14.0	3	40.0	24	66.0	12	91.0	9
16.0	6	41.0	18	67.0	12	92.0	3
17.0	3	42.0	12	68.0	13	93.0	21
18.0	6	43.0	12	69.0	24	94.0	21
19.0	4	44.0	6	70.0	12	95.0	29
20.0	8	45.0	9	71.0	18	96.0	12
21.0	19	47.0	15	72.0	6	97.0	30
22.0	24	48.0	3	73.0	3	98.0	68
23.0	12	49.0	6	74.0	3	99.0	30
24.0	19	50.0	9	75.0	9	100.0	19
25.0	42	51.0	39	76.0	19	101.0	2
26.0	15	52.0	45	77.0	18	102.0	12
27.0	27	53.0	51	78.0	30	103.0	3
28.0	24	54.0	15	79.0	12	104.0	3
29.0	39	55.0	33	80.0	24	105.0	9
30.0	42	56.0	30	81.0	39	106.0	9
31.0	48	57.0	27	82.0	12	108.0	6
32.0	54	58.0	36	83.0	18	109.0	3
33.0	70	59.0	15	84.0	9	110.0	18
34.0	48	60.0	15	85.0	9	111.0	3
35.0	38	61.0	9	86.0	9	112.0	5
36.0	24	62.0	15	87.0	5	113.0	14
37.0	44	63.0	12	88.0	3	114.0	18
38.0	15	64.0	15	89.0	12	115.0	18

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

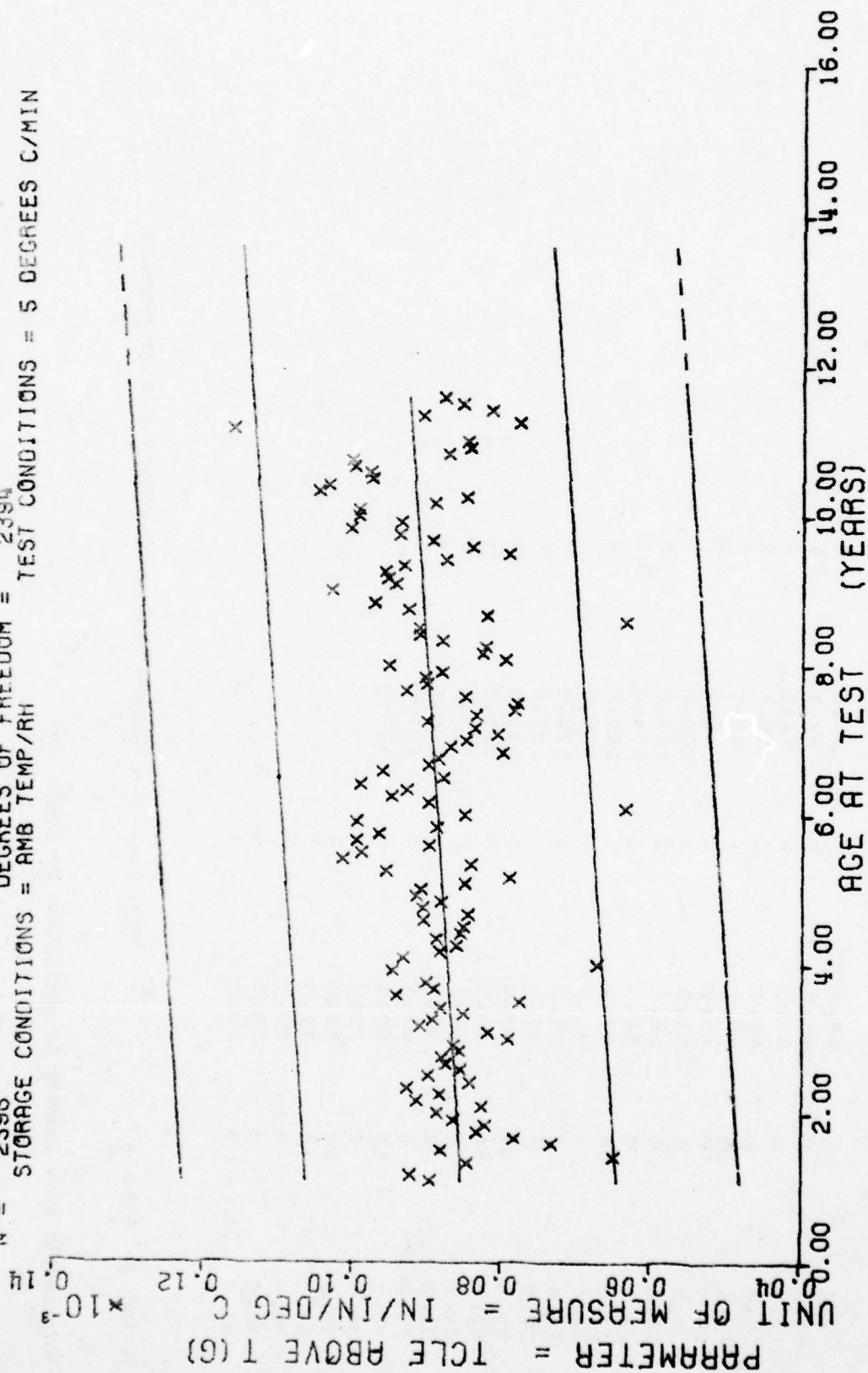
This sample size summary is applicable to figures 64 and 65.

$F = +5.1670717E+01$
 $R = +1.4535274E-01$
 $t = +7.1882346E+00$
 $N = 2396$
 STORAGE CONDITIONS = AMB TEMP/RH
 $Y = ((+5.6640406E-05) + (+2.4397844E-08) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2394
 TEST CONDITIONS = 5 DEGREES C/MIN
 $S_1 = +6.2837583E-06$
 $S_2 = +3.3941358E-09$
 $S_3 = +6.2183225E-06$



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

$Y = ((+8.4637033E-05) + (+5.8852219E-08) * X)$
 F = +7.4646450E+01 SIGNIFICANCE OF F = SIGNIFICANT
 R = +1.7389021E-01 SIGNIFICANCE OF R = SIGNIFICANT
 t = +8.6398177E+00 SIGNIFICANCE OF t = SIGNIFICANT
 N = 2396 DEGREES OF FREEDOM = 2394
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 5 DEGREES C/MIN



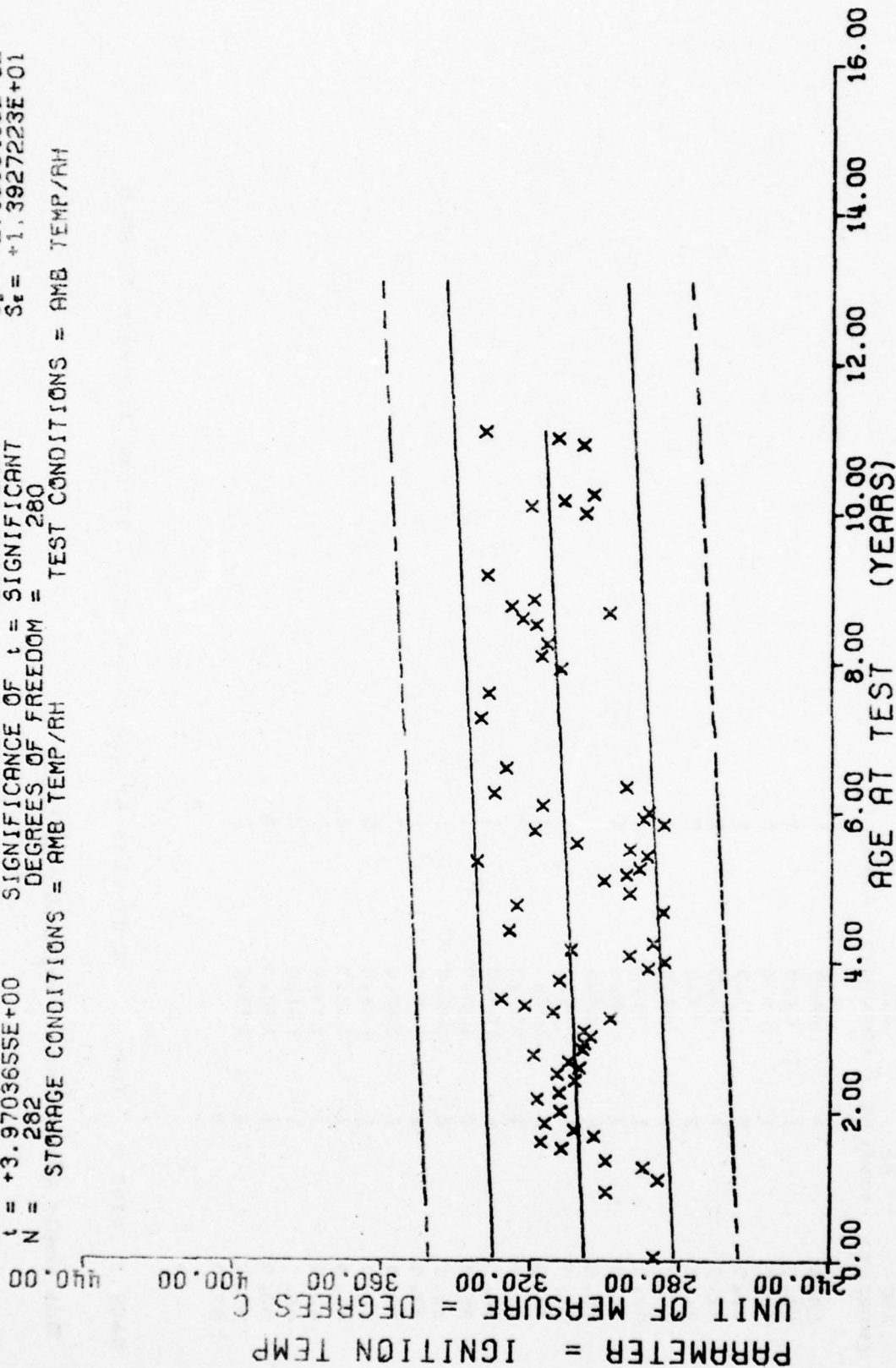
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	3	42.0	3	75.0	6
11.0	1	45.0	3	87.0	1
13.0	1	47.0	1	91.0	1
15.0	1	49.0	2	95.0	3
16.0	1	49.0	1	97.0	6
18.0	7	50.0	3	99.0	3
19.0	2	51.0	3	102.0	3
20.0	4	53.0	3	103.0	6
21.0	4	56.0	1	104.0	3
22.0	14	57.0	3	105.0	2
24.0	4	59.0	1	106.0	2
26.0	2	61.0	1	110.0	2
27.0	2	62.0	1	120.0	2
29.0	14	63.0	2	121.0	4
30.0	10	64.0	3	122.0	10
31.0	8	65.0	2	123.0	16
32.0	2	66.0	1	131.0	2
33.0	2	67.0	4	132.0	4
34.0	10	69.0	4	133.0	R
35.0	9	70.0	1		3
36.0	22	71.0	2		
37.0	12	72.0	1		
39.0	3	73.0	4		
40.0	3	75.0	2		
41.0	3	76.0	1		

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

This sample size summary is applicable to figure 66.

$Y = ((+3.0569501E+02) + (+8.6952751E-02) * X)$
 F = +1.5763802E+01 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +1.4288409E+01$
 R = +2.3086493E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_2 = +2.1900439E-02$
 t = +3.9703655E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_3 = +1.3927223E+01$
 N = 282 DEGREES OF FREEDOM = 280
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



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

Figure 66

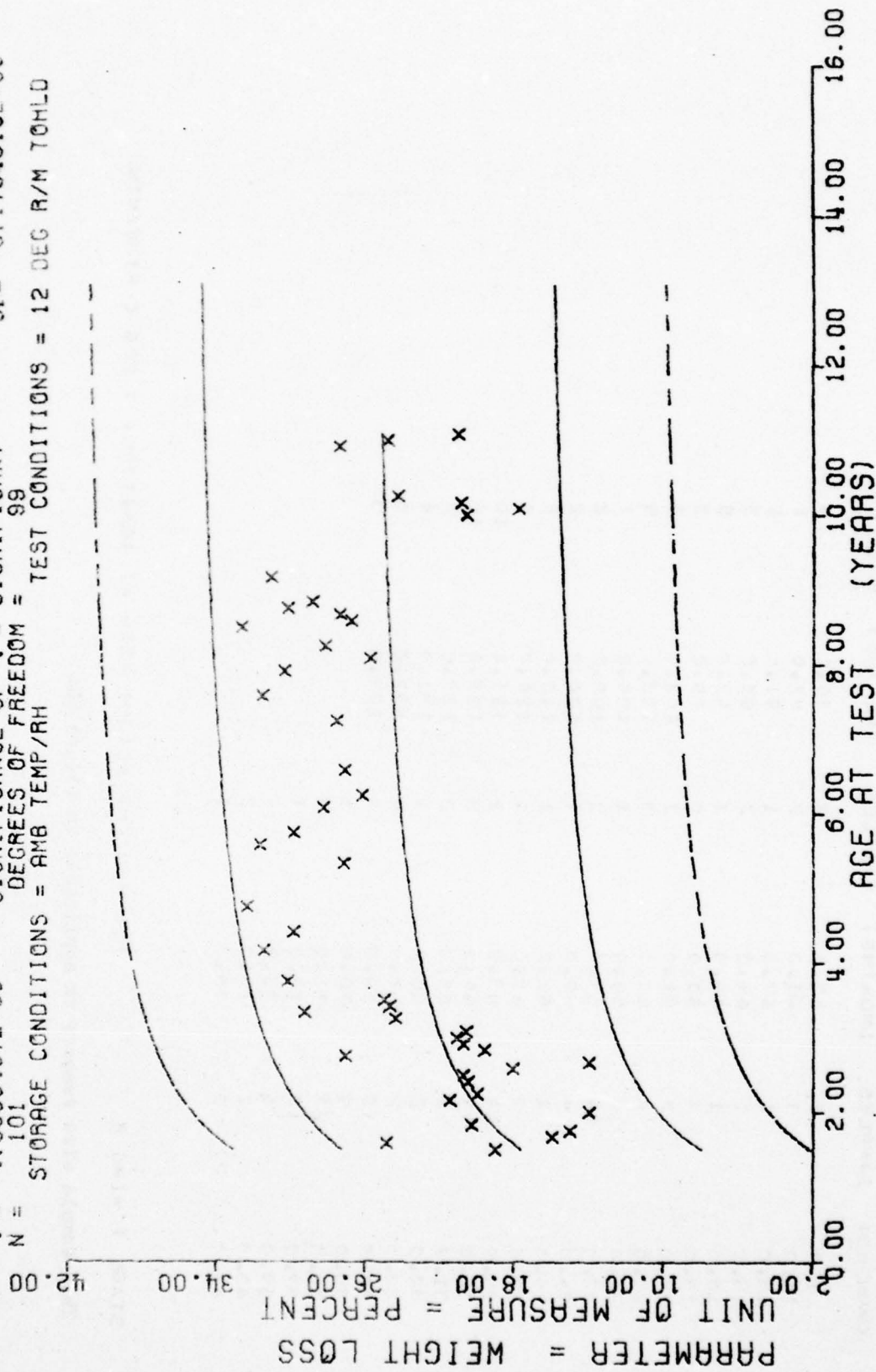
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
18.0	3	64.0	1
19.0	1	67.0	1
20.0	1	69.0	1
21.0	2	73.0	1
22.0	7	75.0	1
24.0	2	79.0	2
26.0	1	87.0	1
27.0	1	91.0	1
29.0	7	95.0	1
30.0	5	97.0	2
31.0	4	99.0	1
32.0	1	102.0	1
33.0	1	103.0	2
34.0	4	104.0	1
35.0	2	105.0	1
36.0	6	106.0	1
37.0	1	110.0	1
39.0	1	120.0	2
40.0	1	121.0	5
41.0	1	122.0	8
42.0	1	123.0	1
45.0	1	131.0	2
50.0	1	132.0	4
53.0	1	173.0	2
57.0	1		

SAGE I WING C TGA % WT LCSS AT 250 DEG C HOLD, 12 DEG RISE/MIN TO HOLD

This sample size summary is applicable to figure 67

$Y = ((+2.6348681E+01) + (-1.5658640E+02) / X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 $\sigma = +5.6283105E+00$
 SIGNIFICANCE OF R = SIGNIFICANT
 $S_e = +3.5591492E+01$
 SIGNIFICANCE OF t = SIGNIFICANT
 $S_t = +5.1734815E+00$
 DEGREES OF FREEDOM = 99
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG R/M TOLHD



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

Figure 67

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGF (MONTHS)	NR SAMPLES
1.0	3	42.0	3	79.0	6
11.0	1	45.0	2	87.0	1
13.0	1	47.0	1	91.0	1
15.0	1	48.0	2	95.0	3
16.0	1	49.0	1	97.0	5
18.0	7	50.0	2	99.0	2
19.0	2	51.0	3	102.0	3
20.0	4	53.0	3	103.0	5
21.0	4	56.0	1	104.0	1
22.0	14	57.0	3	105.0	2
24.0	4	59.0	1	106.0	2
25.0	2	61.0	1	110.0	2
27.0	2	62.0	1	120.0	4
29.0	14	63.0	2	121.0	10
30.0	10	64.0	3	122.0	16
31.0	8	65.0	2	123.0	2
32.0	2	66.0	1	131.0	4
33.0	2	67.0	4	132.0	8
34.0	10	69.0	4	133.0	3
35.0	9	70.0	1		
36.0	22	71.0	2		
37.0	12	72.0	1		
39.0	1	73.0	4		
40.0	2	75.0	2		
41.0	3	76.0	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.

$Y = ((+3.2911180E+01) + (-8.6883617E-06) * X)$ * X)
 F = +5.2704324E-07 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma^2 = +7.5000465E+00$
 R = -4.4181579E-05 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_e = +1.1967812E-02$
 t = +7.2597744E-04 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_k = +7.51392226E+00$
 N = 272 DEGREES OF FREEDOM = 270
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 9 DEG C RISE/MIN

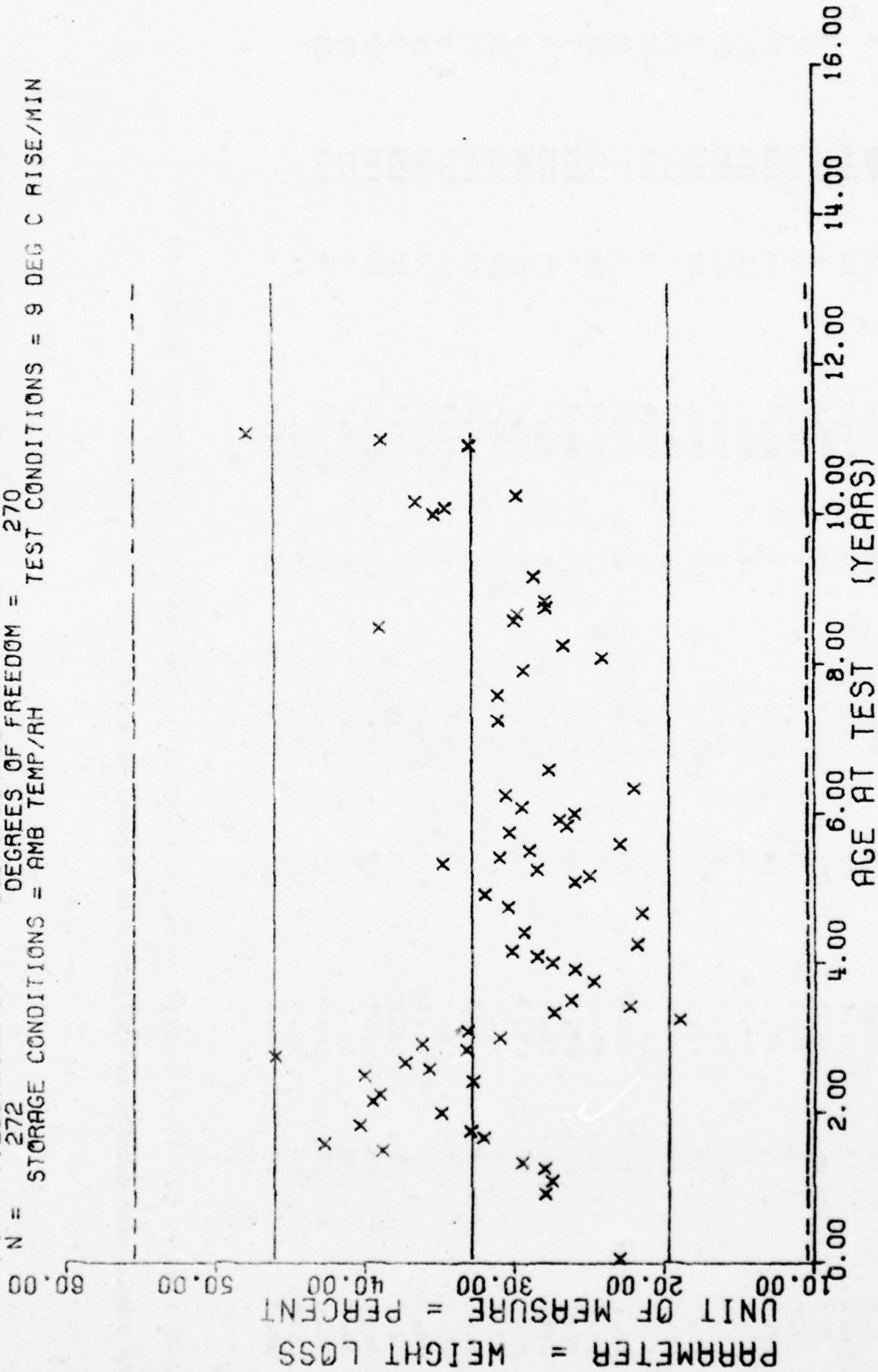


Figure 68

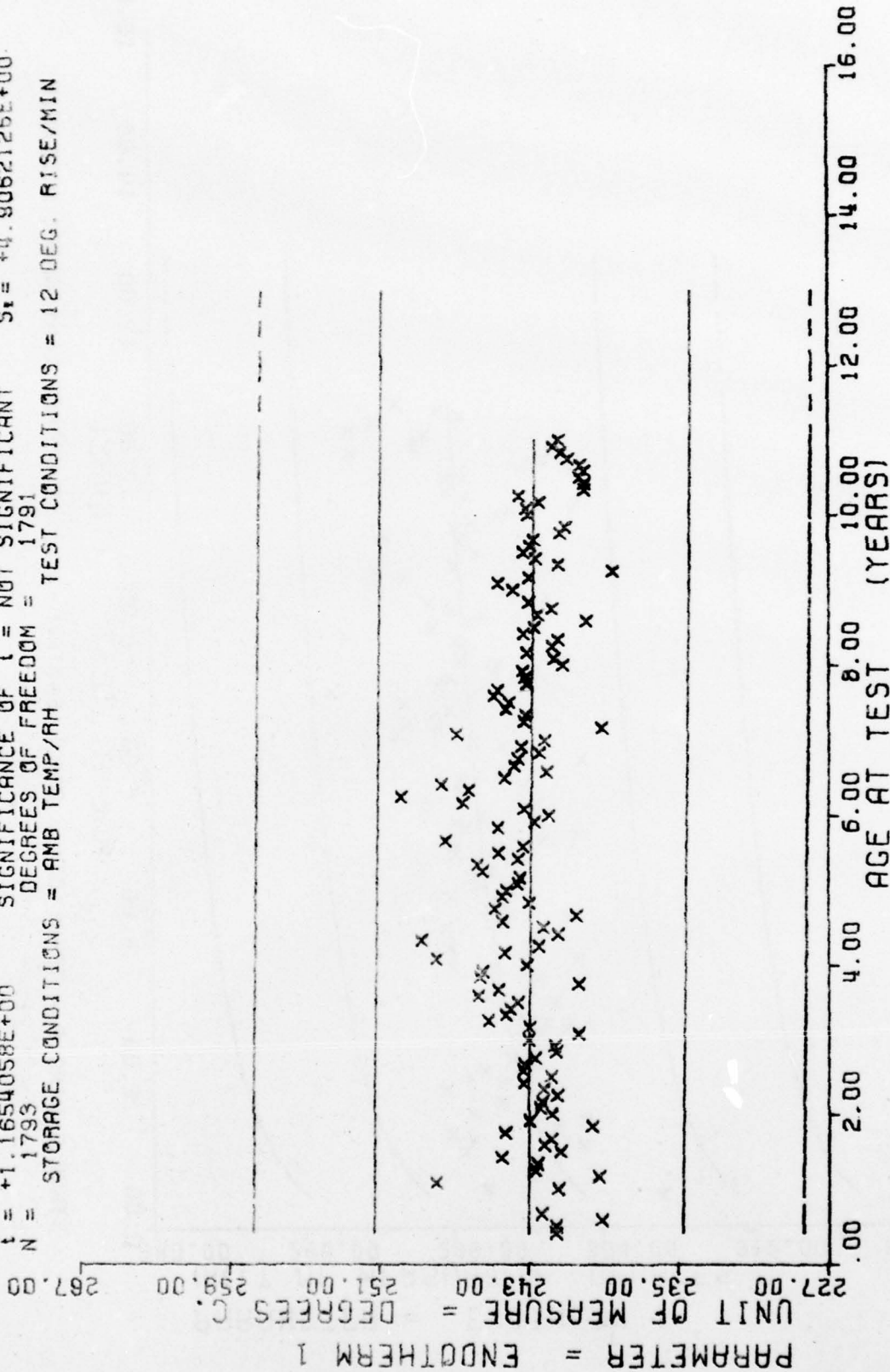
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
5.0	6	33.0	19	58.0	14	83.0	26
6.0	27	34.0	33	59.0	9	84.0	12
7.0	11	35.0	21	60.0	17	85.0	8
8.0	6	36.0	29	61.0	8	86.0	12
12.0	9	37.0	18	62.0	8	87.0	15
13.0	3	38.0	6	63.0	12	88.0	12
14.0	15	39.0	5	64.0	5	89.0	23
15.0	7	40.0	15	65.0	10	90.0	27
16.0	26	41.0	2	66.0	9	91.0	9
17.0	14	42.0	8	67.0	16	92.0	9
18.0	70	43.0	12	68.0	6	93.0	9
19.0	10	44.0	3	69.0	12	94.0	4
20.0	11	45.0	6	70.0	12	94.0	11
21.0	24	46.0	6	71.0	19	95.0	3
22.0	16	47.0	14	72.0	20	96.0	25
23.0	13	48.0	14	73.0	16	97.0	31
24.0	9	49.0	5	74.0	14	98.0	28
25.0	27	50.0	5	74.0	9	99.0	23
26.0	20	51.0	3	75.0	9	100.0	14
27.0	21	52.0	2	76.0	8	101.0	7
28.0	25	53.0	5	77.0	7	102.0	10
29.0	20	54.0	13	78.0	16	103.0	12
30.0	29	55.0	8	79.0	24	104.0	2
31.0	28	56.0	15	80.0	30	105.0	8
32.0	20	57.0	11	81.0	23	106.0	11
			12	82.0	18	108.0	6

STAGE 1 WING 6. TP-H 1011. DTA. ENDOTHERM 1. 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figures 69 and 70.

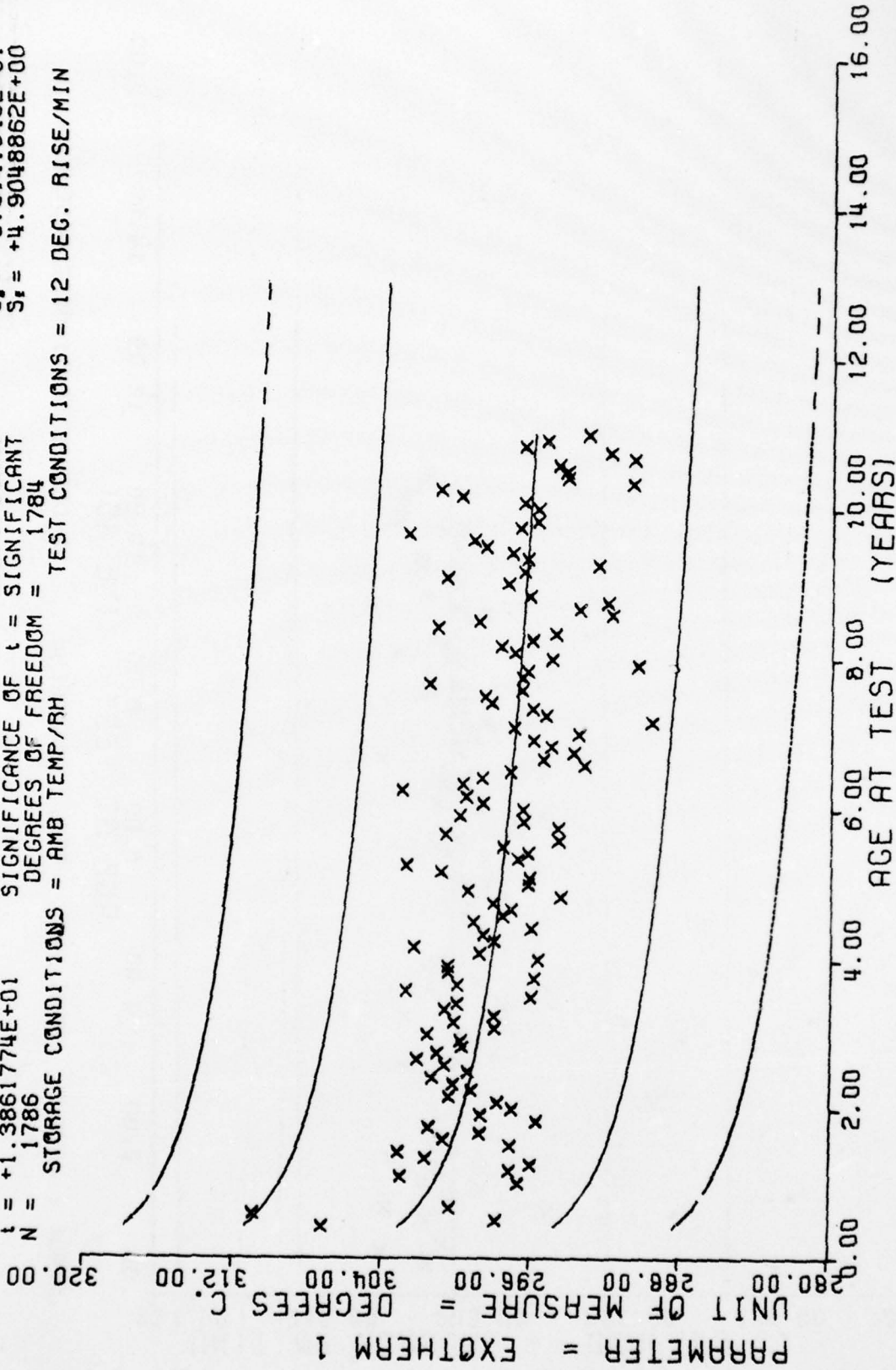
$Y = ((+2.4310486E+02) + (-3.5808125E-03) * X)$ * X)
 F = +1.3581707E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_f = +4.9067029E+00$
 R = -2.7527373E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_e = +3.0725884E-03$
 t = +1.1654058E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_t = +4.8062126E+00$
 N = 1798 DEGREES OF FREEDOM = 1791
 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

$F = +1.9214879E+02$
 $R = -3.1182362E-01$
 $t = +1.3861774E+01$
 $N = 1786$
 STORAGE CONDITIONS = AMB TEMP/RH
 $Y = ((+3.0652786E+02) + (-5.0097907E+00) * LOG (X))$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 1784
 TEST CONDITIONS = 12 DEG. RISE/MIN



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

Figure 70

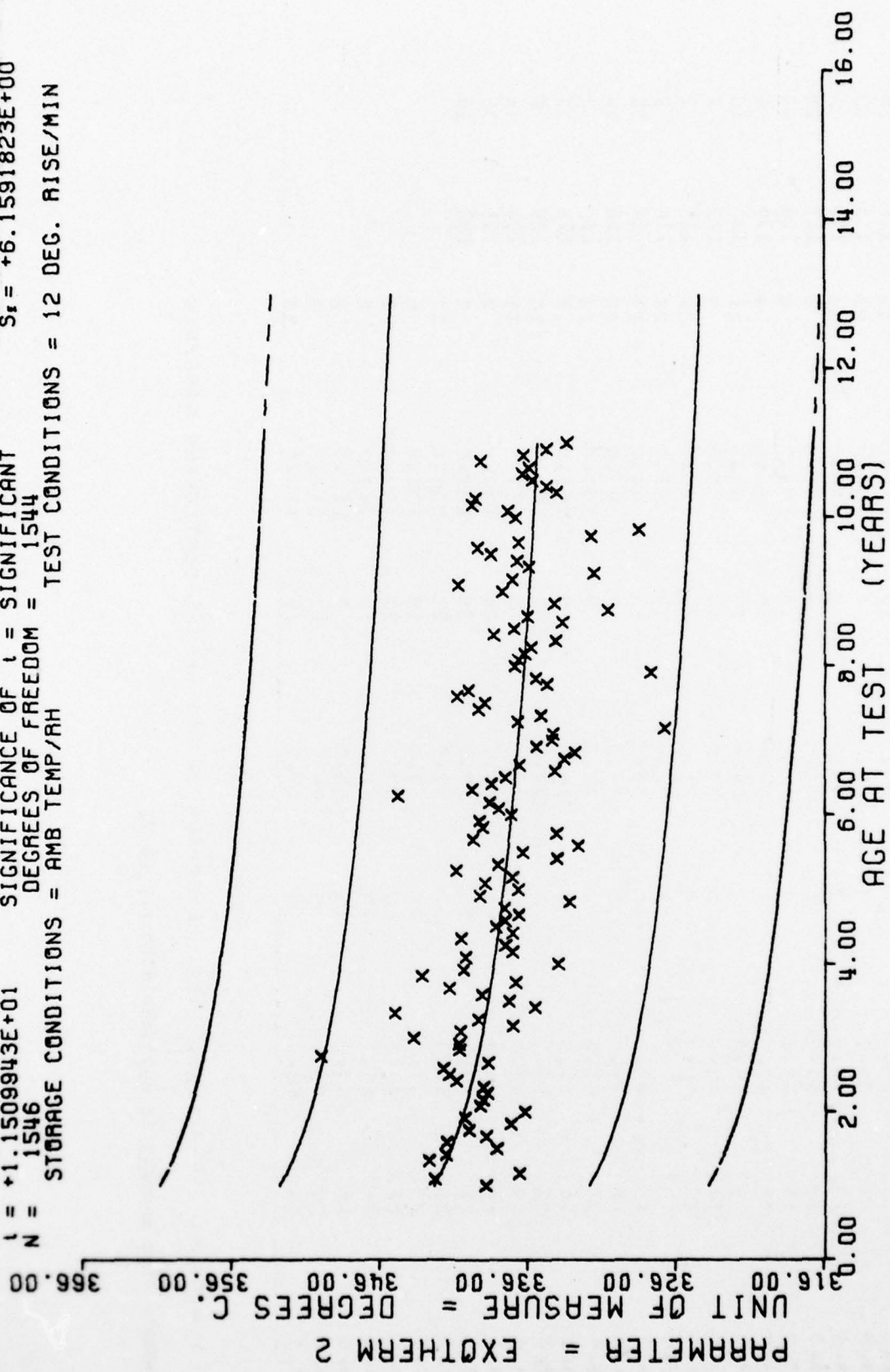
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	7	39.0	4	67.0	12	88.0	12
13.0	3	39.0	7	64.0	4	89.0	23
14.0	7	40.0	13	65.0	9	90.0	26
16.0	19	41.0	2	66.0	9	91.0	9
17.0	14	42.0	8	67.0	16	92.0	9
18.0	18	43.0	10	68.0	6	93.0	9
19.0	4	44.0	3	69.0	12	94.0	11
20.0	11	45.0	6	70.0	12	95.0	3
21.0	22	46.0	6	71.0	20	96.0	22
22.0	13	47.0	14	72.0	14	97.0	24
23.0	10	48.0	14	73.0	14	98.0	27
24.0	9	49.0	5	74.0	9	99.0	22
25.0	20	50.0	3	75.0	9	100.0	12
26.0	16	51.0	2	76.0	8	101.0	7
27.0	12	52.0	4	77.0	7	102.0	10
28.0	19	53.0	11	78.0	15	103.0	11
29.0	18	54.0	7	79.0	24	104.0	2
30.0	22	55.0	15	80.0	30	105.0	7
31.0	21	56.0	10	81.0	23	106.0	11
32.0	20	57.0	11	82.0	18	108.0	6
33.0	11	58.0	14	83.0	22	109.0	9
34.0	26	59.0	9	84.0	12	110.0	2
35.0	18	60.0	15	85.0	7	111.0	2
36.0	24	61.0	8	86.0	12	112.0	6
37.0	14	62.0	8	87.0	15	113.0	33

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

This sample size summary is applicable to figure 71

$Y = ((+3.4977086E+02) + (-6.8635529E+00) * LOG (X))$
 $F = +1.3247880E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -2.8110862E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $L = +1.1509943E+01$ SIGNIFICANCE OF L = SIGNIFICANT
 $N = 1546$ DEGREES OF FREEDOM = 1544
 STORAGE CONDITIONS = AMB TEMP/4H TEST CONDITIONS = 12 DEG. RISE/MIN



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

Figure 71

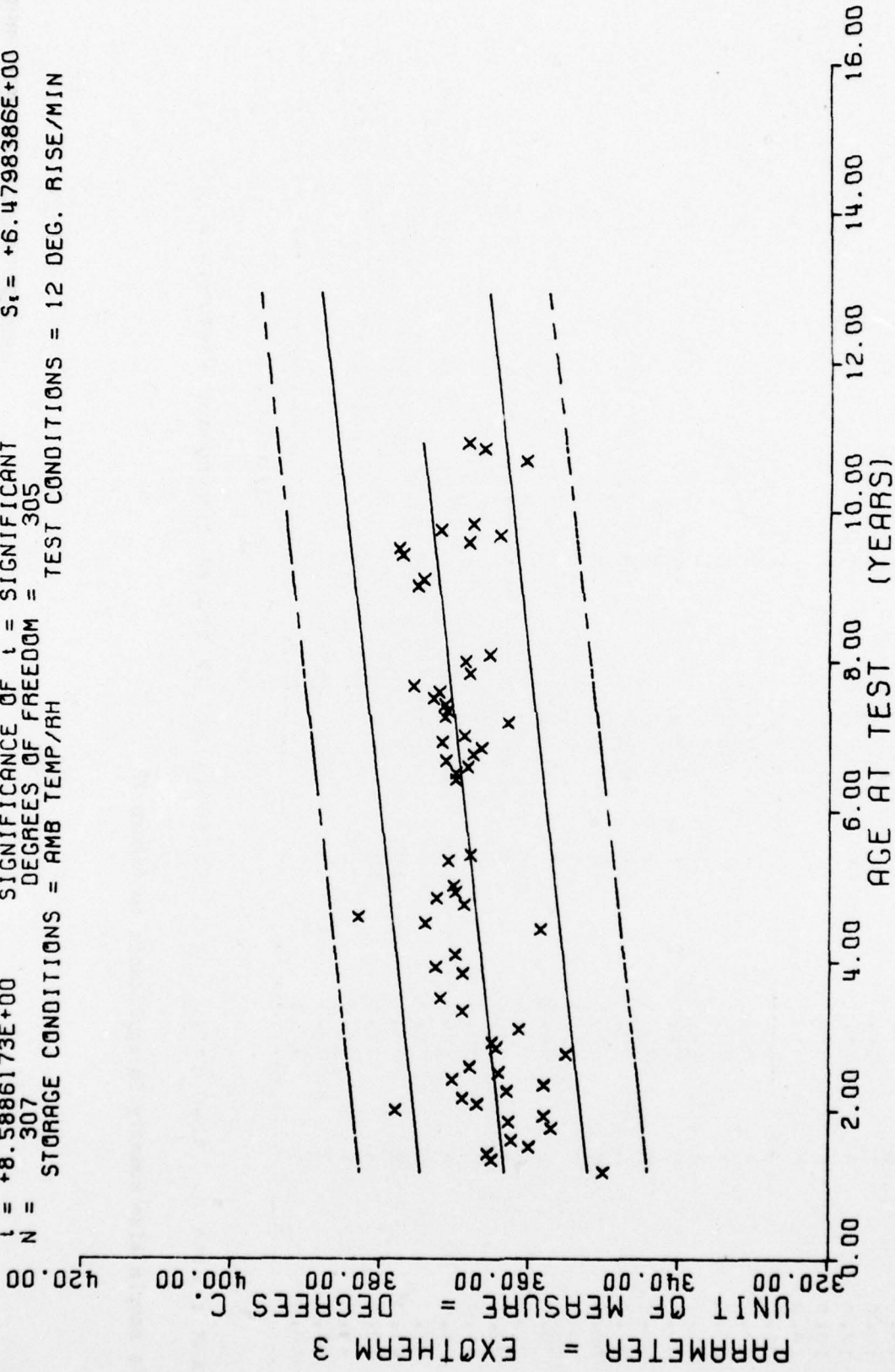
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
14.0	3	53.0	2	56.0	6
16.0	2	54.0	1	57.0	3
17.0	6	55.0	1	108.0	3
18.0	5	57.0	5	109.0	4
19.0	6	58.0	2	113.0	11
21.0	3	59.0	6	114.0	21
22.0	4	60.0	4	115.0	8
23.0	1	64.0	2	116.0	2
24.0	1	65.0	2	117.0	1
25.0	1	77.0	1	118.0	3
26.0	2	78.0	3	123.0	2
27.0	4	79.0	18	130.0	3
28.0	3	80.0	12	131.0	4
29.0	2	81.0	2		
30.0	5	82.0	7		
31.0	4	83.0	9		
33.0	4	84.0	7		
34.0	5	86.0	1		
35.0	4	87.0	6		
37.0	3	88.0	8		
40.0	5	89.0	16		
42.0	3	90.0	12		
43.0	2	91.0	2		
45.0	2	92.0	5		
49.0	1	94.0	2		

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

This sample size summary is applicable to figure 72

$Y = ((+3.6197398E+02) + (+9.5829204E-02) * X)$
 F = +7.3764347E+01 SIGNIFICANCE OF F = SIGNIFICANT $G_1 = +7.2092157E+00$
 R = +4.4130485E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_1 = +1.1157698E-02$
 t = +8.5886173E+00 SIGNIFICANCE OF t = SIGNIFICANT $S_2 = +6.4798386E+00$
 N = 307 DEGREES OF FREEDOM = 305
 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

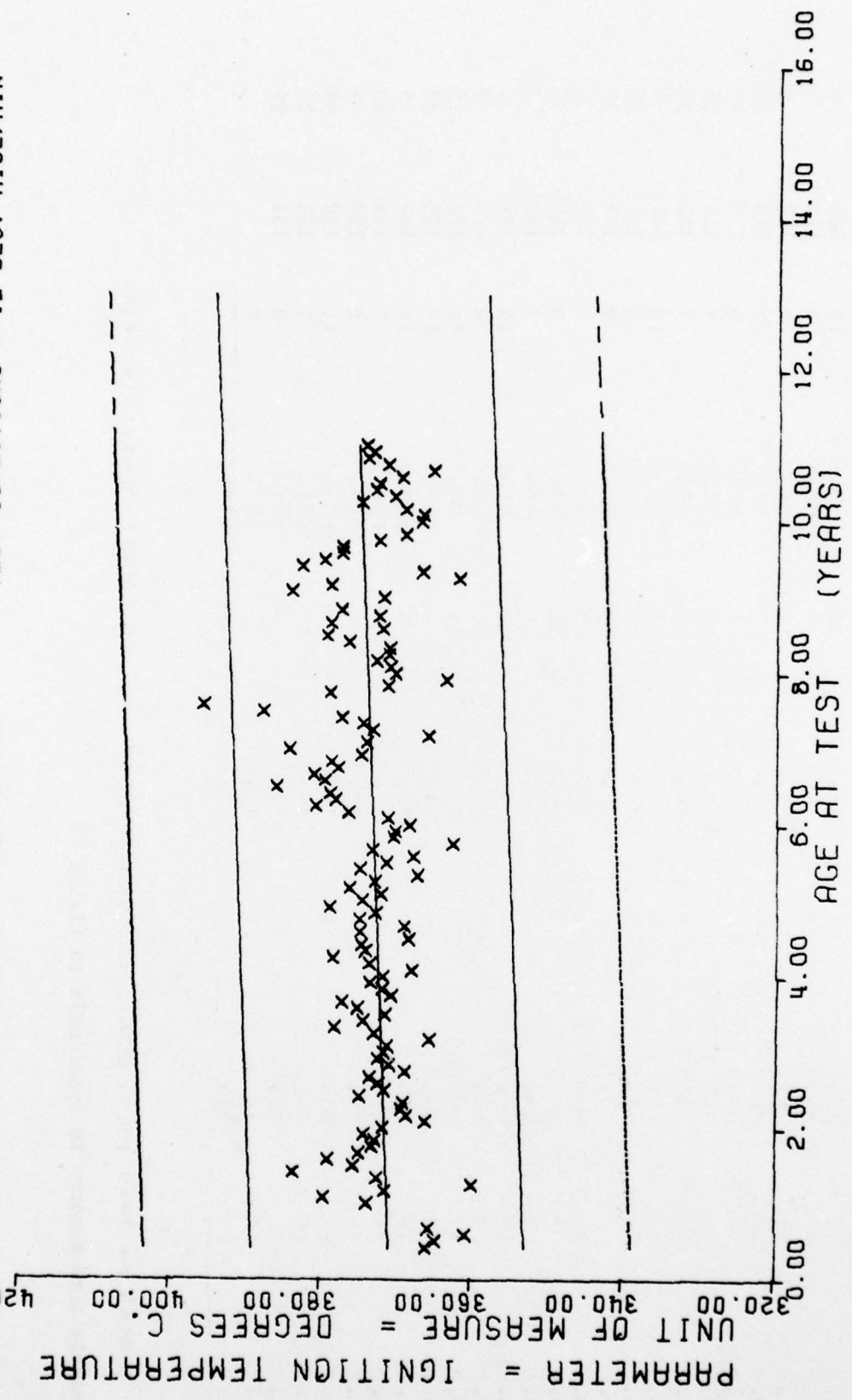
STAGE 1 WING 6 [175] SUMMARY WEE

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
5.0	6	33.0	15	59.0	12	83.0	18	109	5
6.0	77	34.0	23	59.0	3	84.0	7	110	2
7.0	11	35.0	18	60.0	12	85.0	8	111	2
8.0	9	36.0	26	61.0	7	86.0	11	112	10
12.0	6	37.0	14	62.0	6	87.0	5	113	27
13.0	7	38.0	3	63.0	12	88.0	5	114	35
14.0	14	39.0	5	64.0	7	89.0	7	115	21
15.0	7	40.0	10	65.0	3	90.0	18	116	6
16.0	21	41.0	2	66.0	4	91.0	5	117	12
17.0	12	42.0	5	67.0	13	92.0	7	118	37
18.0	22	43.0	11	68.0	6	93.0	9	120	4
19.0	4	44.0	3	69.0	12	94.0	9	121	10
20.0	2	45.0	5	70.0	19	95.0	3	122	7
21.0	12	46.0	4	71.0	20	96.0	19	123	2
22.0	7	47.0	11	72.0	16	97.0	24	124	3
23.0	12	48.0	13	73.0	14	98.0	26	125	15
24.0	7	49.0	4	74.0	9	99.0	17	126	15
25.0	22	50.0	3	75.0	9	100.0	14	127	3
26.0	18	51.0	2	76.0	6	101.0	7	128	13
27.0	18	52.0	5	77.0	6	102.0	8	129	9
28.0	22	53.0	11	78.0	13	103.0	11	130	48
29.0	15	54.0	8	79.0	7	104.0	1	131	31
30.0	20	55.0	15	80.0	19	105.0	5	132	16
31.0	25	56.0	11	81.0	14	106.0	8		
32.0	20	57.0	7	82.0	11	107.0	3		

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

This sample size summary is applicable to figure 73

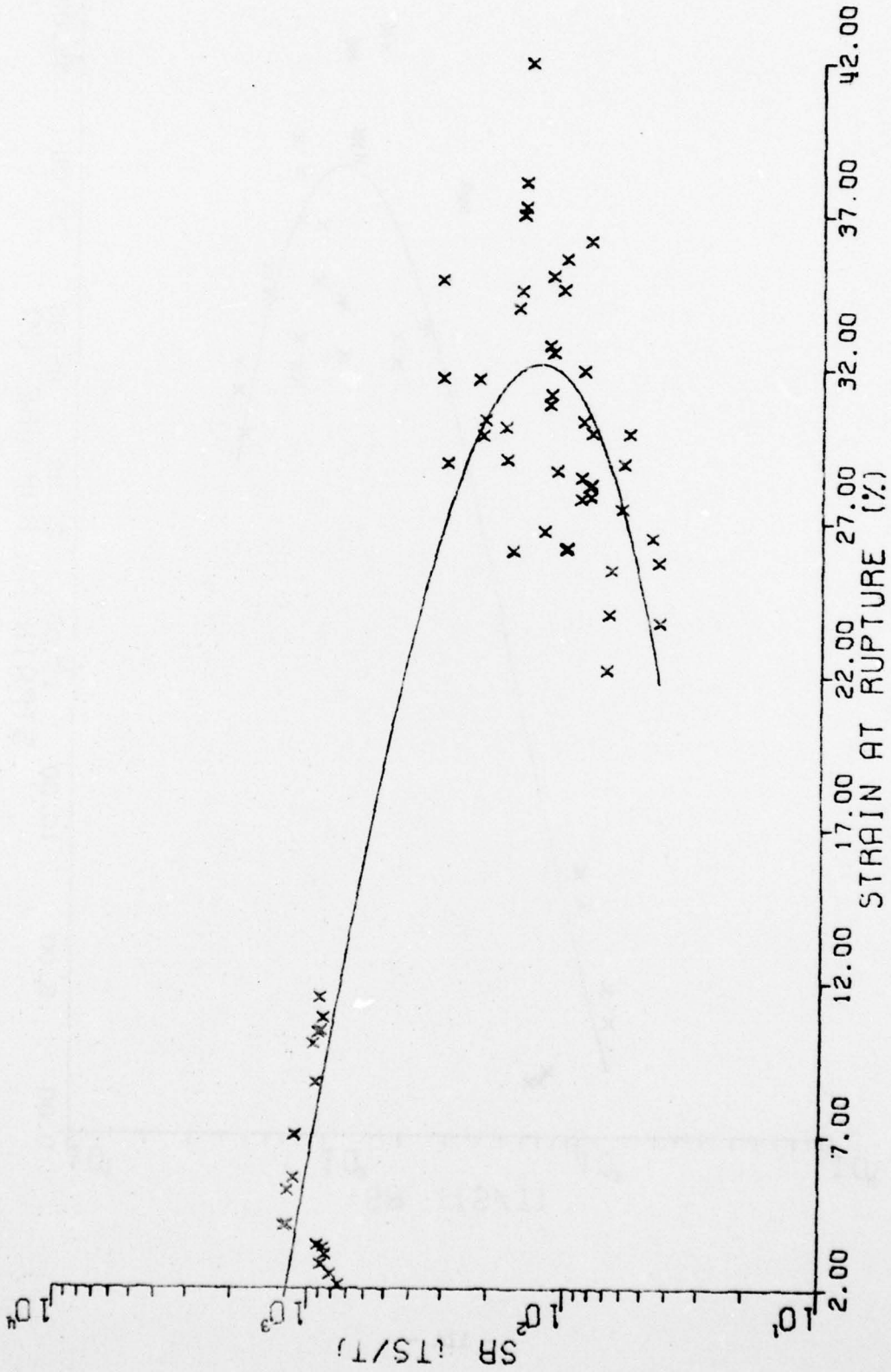
$Y = ((+3.7085238E+02) + (+3.5162150E-02) * X)$
 F = +2.2984337E+01 SIGNIFICANCE OF F = SIGNIFICANT $\sigma^2 = +1.0852302E+01$
 R = +1.2487329E-01 SIGNIFICANCE OF R = SIGNIFICANT $S_e = +7.3343128E-03$
 l = +4.7941983E+00 SIGNIFICANCE OF l = SIGNIFICANT $S_t = +1.0771068E+01$
 N = 1453 DEGREES OF FREEDOM = 1451
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 12 DEG. RISE/MIN



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

Figure 73

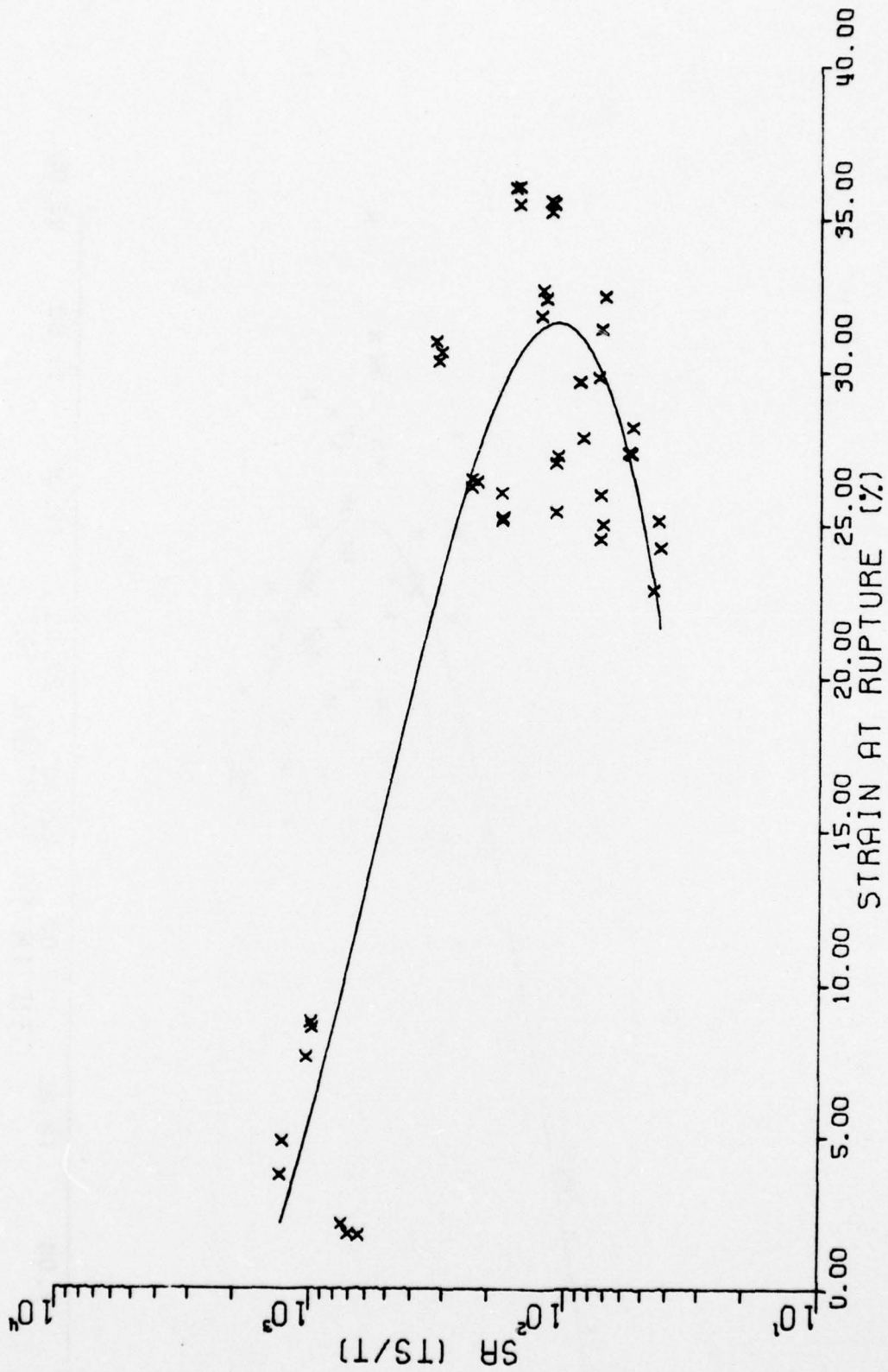
TEMPERATURE CORRECTED FAILURE ENVELOPE



FAILURE ENVELOPE (MOTOR/SN 0014022) BATCH NO. = 7960053 STAGE I, WING 6

Figure 74

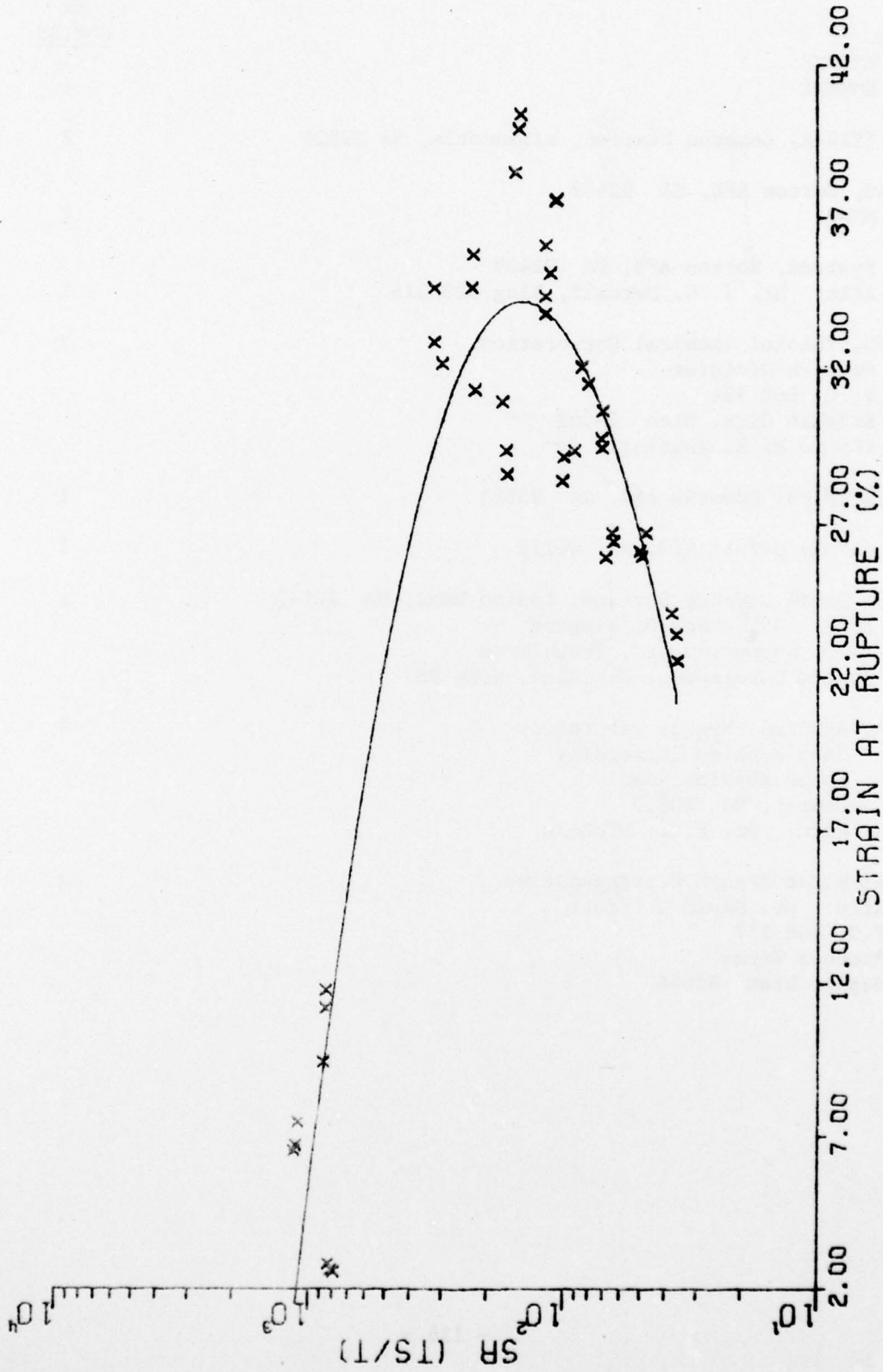
TEMPERATURE CORRECTED FAILURE ENVELOPE



FAILURE ENVELOPE (MOTOR/SN 0014146) BATCH NO.=7970286 STAGE I, WING 6

Figure 75

TEMPERATURE CORRECTED FAILURE ENVELOPE



FAILURE ENVELOPE (MOTOR/SN 0014173) BATCH NO. = 7980160 STAGE I, WING 6

Figure 76

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 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 (twelve and one half		

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✓ 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.