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ASSESSMENT OF DAMAGE TOLERANCE REQUIREMENTS AND ANALYSES - TASKS II AND IV REPORT

Volume IV - Raw Test Data

M. LEVY

Fairchild Industries
Fairchild Republic Company
Farmingdale, N.Y. 11735

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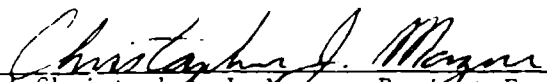
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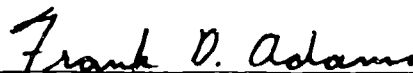
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LT Christopher J. Mazur, Project Engineer
Fatigue, Fracture & Reliab Group
Structural Integrity Branch



FRANK D. ADAMS, Chief
Structural Integrity Branch
Structures and Dynamics Division

FOR THE COMMANDER



ROGER J. HEGSTROM, Colonel, USAF
Chief, Structures and Dynamics Division

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Structural test program of typical aircraft structural configurations was conducted to assess the current Air Force damage tolerance design requirements defined in MIL-A-83444. The specimens, made of 2024-T3XX and 7075-T6XX, were subjected to randomized flight-by-flight spectra, representative of fighter/trainer and bomber/cargo type loading spectra, respectively, and to constant amplitude loading spectrum. A total of seventy-two (72) specimens were tested. The test results were correlated with analytical predictions using crack growth and crack initiation methods. As a result of this study, recommendation is provided to the validity of MIL-A-83444, to develop guidelines for selection of critical crack locations, and to assess the state-of-the-art analytical capabilities in predicting crack growth and crack initiation time. This volume, Volume IV of a five volume report, presents the raw test data associated with Task II and IV of the program.					
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FOREWORD

This report is prepared by Fairchild Industries, Fairchild Republic Company for the United States Air Force under a research and development program entitled "Assessment of Damage Tolerance Requirements and Analyses," Contract No. 33615-82-C-3215. This program is being administered by the Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. Mr James L. Rudd (AFWAL/FIBEC) was the Air Force project engineer through December 1985. Subsequently, Mr Rudd was replaced by Lt Christopher Mazur. A. Kuo was the Program Manager and Principal Investigator through March 1985. Subsequently, Mr Kuo was replaced by Meir Levy for the completion of the program. The structural test program was performed at the University of Dayton Research Lab under the supervision of George Roth.

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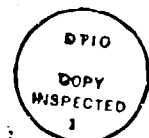


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1.0 INTRODUCTION

Eight major tasks listed below have been planned to achieve the program objectives. Namely, (a) assessing the validity of, and recommending improvements to MIL-A-83444, (b) developing guidelines for identifying the most critical initial primary damage locations for typical aircraft structures, and (c) assessing and improving the state-of-the-art analytical methods to satisfy the requirements of MIL-A-83444.

- Task I: Analytical Methods
- Task II: Basic Tests
- Task III: Analytical Predictions
- Task IV: Structural Tests
- Task V: Analytical/Experimental Correlations
- Task VI: Assessment of and Recommended Improvements to MIL-A-83444
- Task VII: Guidelines for Selecting Most Critical Initial Primary Damage Location
- Task VIII: Assessment of and Improvements to Damage Tolerance Analyses

The purpose of this report is to present the Test Data obtained from the Basic Test Program (Task II) and the Structural Test Program (Task IV). The test data will be correlated with Analytical Predictions (Ref. Volume III), to assess the state-of-the-art capability in predicting crack growth and crack initiation of specimens representative of typical aircraft structure.

The Basic Test Program included sixty (60) tensile specimens used to establish static allowables for the material used during the Structural Test Program. It also included eighty (80) crack initiation specimens to evaluate fatigue initiation allowables used during the analytical prediction of crack initiation. The fracture toughness allowables for the material form used, were evaluated using twenty (20) center crack tension 'CCT' type specimens. These specimens provided fracture toughness and fracture resistance curves (R-curves) for the

material used during the Structural Test Program. Constant amplitude crack growth rates were also evaluated using sixty four (64) 'CCT' specimens.

The material selected for the entire program was 7075-T6XX and 2024-T3XX to represent typical bomber and fighter wing material, respectively. The loading spectra chosen were the 'AMAVS' randomized loading spectrum to represent a bomber/cargo type aircraft and the 'A-10A' loading spectrum to represent a fighter/trainer type aircraft (Ref. Appendix A). An additional loading spectrum was constant amplitude. This spectrum was determined based on its equivalence in damage to the A-10A flight spectrum. Both the 'AMAVS' and the 'A-10A' loading spectra contained marker band loadings applied at predetermined intervals. Verification of the 'AMAVS' marker band loading was established prior to the structural test via simple coupon tests.

The Structural Test Program included thirty-six (36) lap-joint specimens, and thirty-six (36) stinger reinforced specimens. The purpose of the Structural Test Program was to evaluate the analytical methods capabilities in predicting crack initiation and crack growth of structural configuration typical to those found in aircraft construction.

2.0 TENSILE TESTS PROGRAM

The purpose of the tensile test program was to establish the material acceptability and to provide the static allowables of the material selected. The parameters evaluated included yield, ultimate allowables, and percentage elongation. The tests were performed in two grain directions, namely, longitudinal and transverse directions. The testing set-up and requirements were in accordance with ASTM standard E-8.

2.1 TEST SPECIMENS

Sixty (60) specimens were fabricated and tested. The material selected to represent attack/fighter/trainer aircraft was 2024-T3XX aluminum alloy. Four (4) product forms were selected:

<u>MATERIAL</u>	<u>PRODUCT FORM</u>	<u>THICKNESS (IN)</u>
2024-T3	Sheet	0.090, 0.190
2024-T351	Plate	0.250
2024-T3511	Extruded Tee	0.190
2024-T3511	Extruded Angle	0.250

The material selected to represent bomber/transport/cargo aircraft is 7075-T6XX aluminum alloy which is used in the wing structure of aircraft such as C-5A, DC-8 and the B-52. Four (4) product forms were selected:

<u>MATERIAL</u>	<u>PRODUCT FORM</u>	<u>THICKNESS (IN)</u>
7075-T6	Sheet	0.160
7075-T651	Plate	0.312, 0.400
7075-T6511	Extruded Tee	0.312
7075-T6511	Extruded Angle	0.312

2.2 TEST ENVIRONMENT

The tensile specimens were tested in controlled lab air environments. They were fabricated by FRC and tested by the Dickson Testing Co., located at South Gate, California.

2.3 TEST RESULTS

The tensile properties of sixty (60) coupons are presented in Table 2-1 and 2-2 for 2024-T3XX and 7075-T6XX aluminum alloys, respectively. The raw test data were processed in accordance with ASTM Standard E-8. All the tensile properties, except those marked with asterisks, met the requirements given by the Federal Specifications QQ-A-200/11D, 3D and QQ-A-250/12E, 4E. Those data marked with asterisks are below the A-Allowable specified in MIL-HDBK-5D. The corresponding A-Allowable is given in parenthesis. A comparison shows that the largest deviation is 4% below the A-Allowables.

TABLE 2-1. TENSILE PROPERTIES OF 2024-T3XX

PRODUCT FORM/ MATERIAL	DIRECTION	YIELD STRENGTH (ksi)	ULTIMATE STRENGTH (ksi)	ELONGATION (%)	YOUNG'S MODULUS (ksi)
0.19 Sheet (2024-T3)	Longitudinal	53.1	67.7	15.5	10,900
		52.9	66.3	13.5	11,000
		53.3	68.1	13.5	10,300
	Transverse	45.0	66.9	18.0	11,000
		44.7	67.2	18.0	11,000
		45.3	67.4	18.0	11,000
0.09" Sheet (2024-T3)	Longitudinal	52.8	68.9	17.5	11,900
		52.9	69.1	17.5	11,000
		53.0	68.9	16.0	11,400
	Transverse	47.5	67.7	21.0	10,600
		38.4*(40)	67.5	17.5	9,400
		41.7	67.3	19.0	10,600
0.25" Plate (2024-T351 Plate)	Longitudinal	51.2	70.2	20.5	10,800
		51.0	69.9	21.0	10,300
		51.0	69.9	19.0	10,400
	Transverse	45.3	67.0	18.5	11,000
		45.6	67.1	19.0	10,700
		45.3	67.0	19.0	11,400
0.19" Tee (2024-T3311 Extrusion)	Longitudinal	53.5	67.8	17.5	11,400
		53.1	67.6	18.5	11,200
		53.2	66.8	17.5	10,400
	Transverse	50.8	53.6*(54)	-	11,200
		50.4	66.9	8.0	9,800
		50.4	67.2	7.0	11,200
0.25" Angle (2024-T3511 Extrusion)	Longitudinal	47.9	62.7	22.5	11,200
		47.7	62.2	21.0	11,300
		47.2	61.9	20.5	10,800
	Transverse	44.8	55.3*(56)	10.0	11,700
		41.7	53.9*(56)	12.0	10,700
		43.2	67.5	10.0	8,400

*Below A-Allowable

TABLE 2-2. TENSILE PROPERTIES OF 7075-T6XX

PRODUCT FORM/ MATERIAL	DIRECTION	YIELD STRENGTH (ksi)	ULTIMATE STRENGTH (ksi)	ELONGATION (%)	YOUNG'S MODULUS (ksi)
0.31" Plate (7075-T651 Plate)	Longitudinal	77.6	82.7	13.5	10,200
		78.1	82.7	13.0	10,200
		78.1	82.7	14.0	9,800
	Transverse	75.3	84.0	12.5	9,900
		75.9	84.5	11.5	9,700
		75.1	83.9	14.5	10,900
	Longitudinal	76.5	81.5	15.0	10,600
		77.3	82.2	15.0	10,100
		77.8	81.0	15.0	10,400
0.16" Sheet (7075-T6 Sheet)	Transverse	74.0	84.1	13.5	11,000
		73.8	84.3	13.0	10,700
		73.8	84.4	13.5	10,700
	Longitudinal	77.2	79.7	15.0	11,100
		77.7	79.4	13.5	11,100
		76.7	79.7	13.0	11,100
	Transverse	73.2	79.6	11.5	10,500
		72.0	79.5	11.5	10,800
		72.7	79.2	11.5	10,800
0.4" Plate (7075-T651 Plate)	Longitudinal	78.6	86.0	13.5	10,400
		79.1	86.3	12.5	11,400
		79.1	86.3	12.5	10,900
	Transverse	71.3	77.1*(78)	9.0	10,300
		69.2	76.3*(78)	10.0	10,200
		68.8	76.5*(78)	9.0	10,300
	Longitudinal	82.4	89.0	12.5	10,500
		83.7	90.3	11.5	10,000
		81.9	88.3	11.5	10,800
0.31" Angle (7075-T6511 Extrusion)	Transverse	76.6	85.5	7.0	11,100
		77.8	85.3	13.0	9,700
		77.2	84.9	13.0	9,900

*Below A Allowable

3.0 CRACK INITIATION TEST PROGRAM

The purpose of the crack initiation test program was to provide fatigue initiation allowables of the product form used during the structural test program. The initiation allowables were fit into the strain energy density equation given by:

$$S_{\max} = S_f N^m \quad 3.1$$

where;

$$\begin{aligned} S_{\max} &= \text{the maximum strain energy density} \\ &= (\sigma_{\max} K)^2 / 2E \end{aligned}$$

N = number of cycles to fatigue failure

K = stress severity factor

S_f, m = coefficient obtained from test

The coefficients S_f and m were determined from specimens without interference fit fasteners, clamp-up and faying surface sealant (Group A, Table 3-1). Additional coupon tests using one or more of the above three parameters (Group B, C, D, Table 3-1) provided data which accounts for their presence.

Equation 3.1 together with the Damage Index ' d_1 ' (Equation 3.2) provided the data needed to predict crack initiation at the edge of a hole.

$$d_1 = C_1 - C_2 S_{\max} \quad 3.2$$

The Damage Index coefficients C_1, C_2 are found to be functions of material, and they were evaluated for 2024-T3XX and 7075-T6XX aluminum alloys.

3.1 TEST SPECIMENS

The specimen configurations, selected for this task are shown in Figures 3-1 through 3-4. They included 'one hole' specimens with and without load transfer, and 'two hole' slotted specimens with and without load transfer. The

latter specimen type was designed to simulate cracked joints, with the crack extended between two fastener holes. The amount of load transfer varied between 10% and 50%. Hi-Lok type attachments were installed with interference fit according to FRC specifications, or with clearance fit. Another two parameters evaluated were the degree of Hi-Loks clamp-up and the presence of a sealant at the faying surfaces. The two materials selected for this task were 2024-T3XX and 7075-T6XX plates to represent wing primary structure for fighter and bomber type aircraft, respectively. Each set of specimens were fabricated from one plate as shown in Figure 3-5.

3.2 TEST ENVIRONMENT

The crack initiation specimens were tested in a controlled lab-air environment. The testing was conducted at FRC testing laboratories located in Farmingdale, NY. The loading frequency was 3-5 Hz.

3.3 TEST DESCRIPTION

The test specimens were subjected to constant amplitude spectra with a stress ratio of $R=0.0$. The maximum stress varied between 9.50 ksi and 34.0 ksi, depending on the specimen configuration and material. The four groups of tests shown in Table 3-1 display an increasing complexity in test parameters from Group A to Group D. Group A test specimens did not have interference-fit fasteners, clamp-up, or sealant. The results from this group of tests are to be used for determining the coefficients in Equation 3.1. Group B test specimens have interference-fit fasteners, but no clamp-up or sealant. The results from this group of tests were to be used for determining the coefficient α . Group C test specimens have interference-fit fasteners with standard clamp-up. The results from this group of tests were to be used for determining the coefficient β . Group D test specimens have interference-fit fasteners with standard clamp-up and sealant. The results from this group were to be used for determining the coefficient γ . However, due to the relative few number of specimens tested and the scatter in test results, it was not possible to make definite conclusions concerning the effect of each variable. Therefore, a multiplication factor was obtained in terms of $\alpha\beta\gamma$.

3.4 TEST RESULTS

The crack initiation test results are summarized in Tables 3-2 through 3-5 for 2024-T3 and 7075-T651 specimens respectively. The tables include the following parameters:

σ_r	= Remote stress (= load divided by gross area).
k_t	= Theoretical stress concentration factor.
k_N	= Neuber stress concentration factor.
S	= Maximum strain density (= $1/2 (\sigma_{\max} k)^2/E$)
N_t	= Experimental number of cycles to failure.
N_{tp}	= Predicted number of cycles to failure.
N_g	= Predicted number of cycles to failure for $\sigma_0 = 0.050$ in.
d_i	= Damage index.

The Group A test data, which were obtained from those specimens without interference, clamp-up, or sealant, are plotted on Figures 3-6 and 3-7 as maximum strain energy density (S) versus cycles (N). The data points are curvefitted into the following two equations.

$$S_{\max} = 10.4261 N^{-0.3660} \quad \text{for 2024-T3} \quad 3.3$$

$$S_{\max} = 20.4257 N^{-0.4515} \quad \text{for 7075-T651} \quad 3.4$$

The Groups B, C and D test data were originally intended to obtain empirical constants α , β and γ which would account for the effect of interference, clamp-up, and sealant in the calculation of the stress severity factor, k , defined in Equation 3.5.

$$k = \alpha \beta \gamma k_N \quad 3.5$$

However, the Groups B, C and D test data, as shown in Figures 3-8 and 3-9, indicate that a distinction among α , β and γ cannot be made on the specimens representing production quality. Therefore, the product $\alpha \beta \gamma$ is utilized to account for the combined effect of interference, clamp-up and sealant. In Figures 3-8 and 3-9, a line representing the lower bound of test data is drawn

to be parallel to the line representing Group A test data. The product $\alpha\beta\gamma$ was determined by comparing the two lines shown in Figures 3-8 and 3-9. The product $\alpha\beta\gamma$ so obtained is presented below.

$$\alpha\beta\gamma = 0.8503 \text{ for } 2024-T3 \quad 3.6$$

$$\alpha\beta\gamma = 0.8126 \text{ for } 7075-T651 \quad 3.7$$

It should be mentioned that the product $\alpha\beta\gamma$ are conservative because they were determined from the lower bound of test data.

The total fatigue life, N_{tp} , of the various specimens were predicted using Equations 3.3 and 3.4. The crack growth life, N_g , was also predicted, using the "DAMGRO" computer program. The initial flaw for each specimen was an 0.050 inch circular corner flaw. The life required to initiate an 0.050 inch circular corner crack is defined as $(N_{tp} - N_g)$.

The Damage Index d_i vs. S of Group A and Groups B, C, D are shown in Figures 3-10 and 3-11 for 2024-T3 material, and have the following form:

$$d_i = 1.0 - 0.629 S \quad \text{Group A} \quad 3.8$$

$$d_i = 1.0 - 0.540 S \quad \text{Groups B, C and D} \quad 3.9$$

The Damage Index for Group A and Groups B, C, D for 7075-T651 are shown in Figures 3-12 and 3-13 respectively, and have the form:

$$d_i = 0.873 - 0.795 S \quad \text{Group A} \quad 3.10$$

$$d_i = 0.958 - 0.619 S \quad \text{Groups B, C and D} \quad 3.11$$

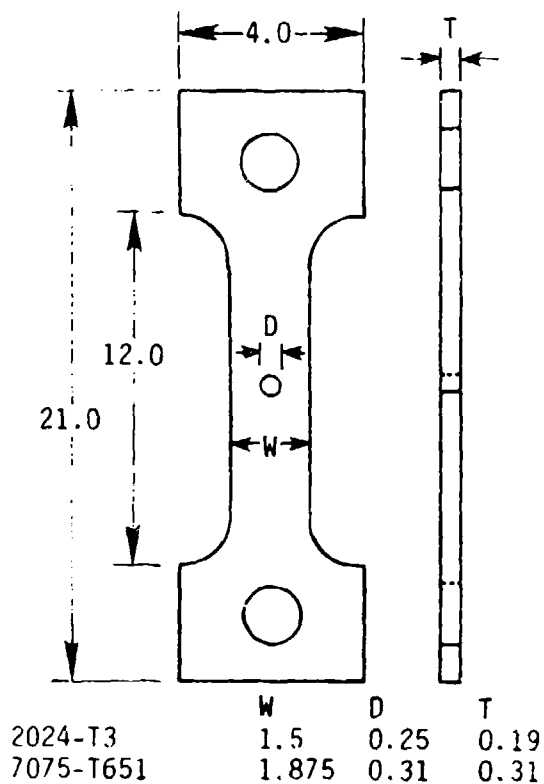


Figure 3-1. Crack Initiation One Hole Specimen

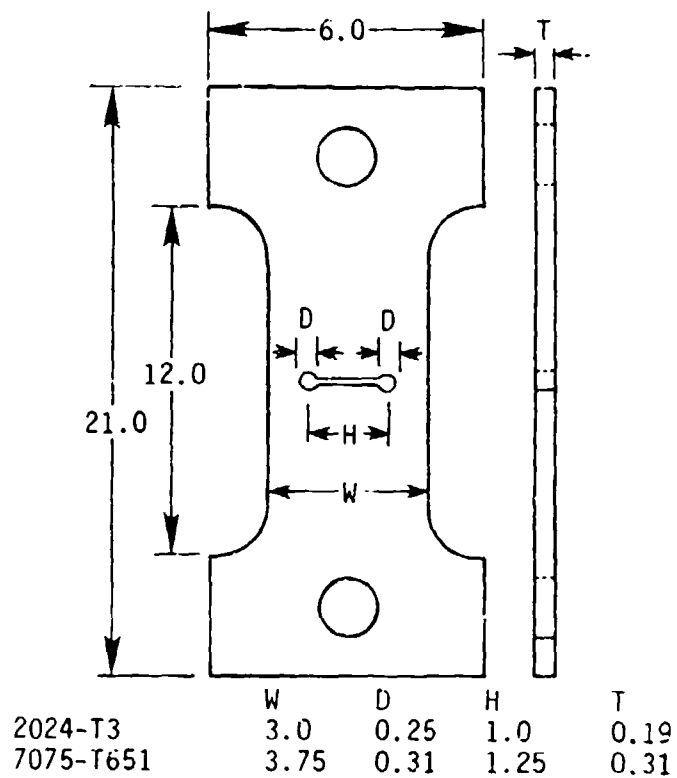


Figure 3-2. Crack Initiation Two Hole Specimen

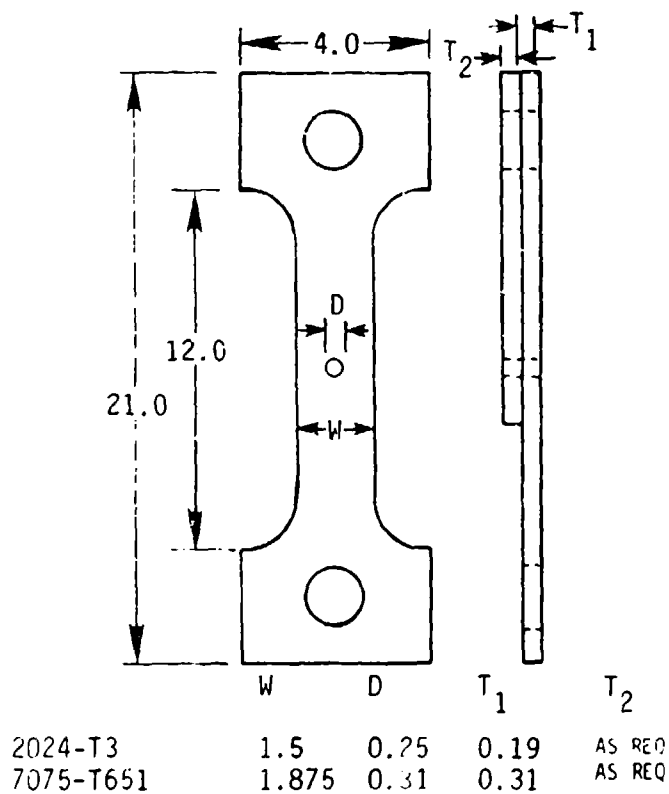


Figure 3-3. Crack Initiation One-Hole Load-Transfer Specimen

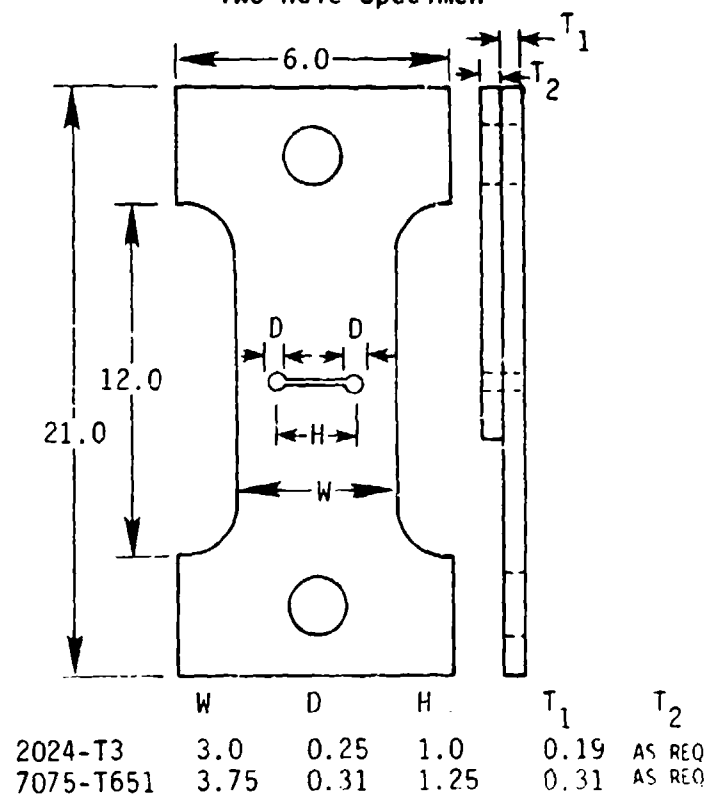
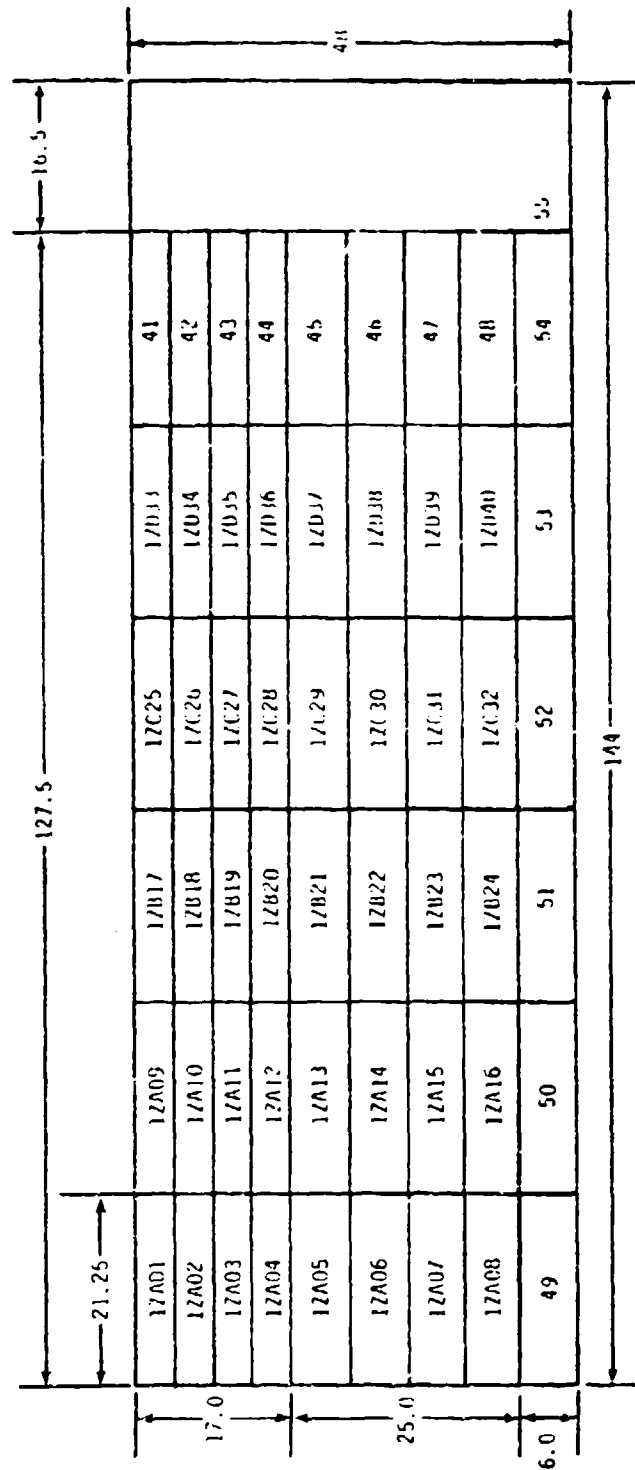


Figure 3-4. Crack Initiation Two-Hole Load-Transfer Specimen



Z = 2 for 2024-13
 Z = 7 for 7075-1651

Figure 3-5. Arrangement of Crack Initiation Specimens from a Single Plate

TABLE 3-1. CRACK INITIATION TEST PLAN

		STRESS (KSI)	LOAD TRANSFER	HOLE CONDITION			CLAMP-UP	SEALANT	SPECIMEN ID
				OPEN HOLE	FILLED HOLE				
					INTERFERENCE	CLEARANCE			
GROUP A	FIGURE 3-1	34	NONE	X			NO	NO	1ZA01, 1ZA02
	FIGURE 3-1	23	NONE	X			NO	NO	1ZA03, 1ZA04
	FIGURE 3-2	16	NONE	X			NO	NO	1ZA05, 1ZA06
	FIGURE 3-2	20	NONE	X			NO	NO	1ZA07, 1ZA08
	FIGURE 3-3	31	10%			X	NO	NO	1ZA09, 1ZA10
	FIGURE 3-3	26	50%			X	NO	NO	1ZA11, 1ZA12
	FIGURE 3-4	23	10%			X	NO	NO	1ZA13, 1ZA14
	FIGURE 3-4	14	50%			X	NO	NO	1ZA15, 1ZA16
GROUP B	FIGURE 3-1	34	NONE		X		NO	NO	1ZB17, 1ZB18
	FIGURE 3-2	18	NONE		X		NO	NO	1ZB21, 1ZB22
	FIGURE 3-3	28	30%		X		NO	NO	1ZB19, 1ZB20
	FIGURE 3-4	23	30%		X		NO	NO	1ZB23, 1ZB24
GROUP C	FIGURE 3-3	34	10%		X		YES	NO	1ZC25, 1ZC26
	FIGURE 3-3	28	50%		X		YES	NO	1ZC27, 1ZC28
	FIGURE 3-4	23	10%		X		YES	NO	1ZC29, 1ZC30
	FIGURE 3-4	18	50%		X		YES	NO	1ZC31, 1ZC32
GROUP D	FIGURE 3-3	34	30%		X		YES	YES	1ZD33, 1ZD34
	FIGURE 3-3	28	30%		X		YES	YES	1ZD35, 1ZD36
	FIGURE 3-4	23	50%		X		YES	YES	1ZD37, 1ZD38
	FIGURE 3-4	18	50%		X		YES	YES	1ZD39, 1ZD40

NOTE: Z = 2 FOR 2024-T3

Z = 7 FOR 7075-T651

TABLE 3-2. CRACK INITIATION TEST RESULTS FOR 2024-T3XX

SPECIMEN ID	LOAD TRANSFER	INTER- FERENCE	CLAMP- UP	SEALANT	σ_{max} (KSI)	CYCLES TO FAILURE
12A01	Open Hole	No	No	No	34.0	11,405
12A02	↑	↑	↑	↑	34.0	11,046
12A03	↓	↓	↓	↓	28.0	20,462
12A04	↓	↓	↓	↓	28.0	21,451
12A05	↓	↓	↓	↓	16.0	8,736
12A06	↓	↓	↓	↓	16.0	7,008
12A07	↓	↓	↓	↓	20.0	3,485
12A08	Open Hole	↓	↓	↓	20.0	4,454
12A09	8.4%	↓	↓	↓	18.0	538,166*
12A10	8.4%	↓	↓	↓	18.0	37,956
12A11	29.2%	↓	↓	↓	32.0	4,110
12A12	29.2%	↓	↓	↓	32.0	13,188
12A13	4.1%	↓	↓	↓	25.0	1,128
12A14	4.1%	↓	↓	↓	25.0	1,774
12A15	32.8%	↓	↓	↓	20.0	3,791
12A16	32.8%	No	↓	↓	20.0	3,788
12A17	0	Yes	↓	↓	34.0	118,484
12A18	0	↑	↓	↓	34.0	49,616
12A19	0	↑	↓	↓	18.0	18,138
12A20	0	↑	↓	↓	18.0	11,002
12A21	24.8%	↑	↓	↓	16.0	91,857
12A22	24.8%	↑	↓	↓	16.0	77,439
12A23	26.7%	↑	↓	↓	20.0	8,226
12A24	26.7%	↑	No	↓	20.0	12,628
12A25	8.4%	↑	Yes	↓	34.0	22,435
12A26	8.4%	↑	↑	↓	34.0	15,653
12A27	29.2%	↑	↑	↓	24.0	111,843
12A28	29.2%	↑	↑	↓	24.0	32,102
12A29	9.1%	↑	↑	↓	22.0	5,037
12A30	9.1%	↑	↑	↓	22.0	55,559
12A31	32.8%	↑	↑	↓	20.0	29,085
12A32	32.8%	↑	↑	No	20.0	12,346
12A33	24.8%	↑	↑	Yes	34.0	22,834
12A34	24.8%	↑	↑	↑	34.0	9,598
12A35	24.8%	↑	↑	↑	20.0	129,826
12A36	24.8%	↑	↑	↑	20.0	336,088
12A37	32.8%	↑	↑	↑	14.0	207,655
12A38	32.8%	↑	↑	↑	14.0	105,117
12A39	32.8%	↓	↓	↓	20.0	43,974
12A40	32.8%	Yes	Yes	Yes	20.0	22,496

*Did not fail

TABLE 3-3. CRACK INITIATION TEST RESULTS FOR 7075-T6XX

SPECIMEN ID	LOAD TRANSFER	INTER-FERENCE	CLAMP-UP	SEALANT	σ_{max} (KSI)	CYCLES TO FAILURE
17A01	Open Hole	No	No	No	34.0	6,733
17A02	↑	↑	↑	↑	34.0	6,138
17A03	↓	↑	↑	↑	28.0	12,329
17A04	↓	↑	↑	↑	28.0	18,122
17A05	↓	↑	↑	↑	16.0	9,144
17A06	↓	↑	↑	↑	16.0	11,284
17A07	↓	↑	↑	↑	20.0	3,543
17A08	Open Hole	↑	↑	↑	20.0	1,583
17A09	8.4%	↑	↑	↑	18.0	110,033
17A10	8.4%	↑	↑	↑	18.0	51,746
17A11	29.2%	↑	↑	↑	32.0	4,577
17A12	29.2%	↑	↑	↑	32.0	2,913
17A13	4.1%	↑	↑	↑	25.0	1,087
17A14	4.1%	↑	↑	↑	25.0	958
17A15	32.8%	↓	↑	↑	20.0	24,795
17A16	32.8%	No	↑	↑	20.0	37,898
17A17	0	Yes	↑	↑	34.0	105,463*
17A18	0	↑	↑	↑	34.0	82,670
17A19	0	↑	↑	↑	18.0	94,630
17A20	0	↑	↑	↑	18.0	13,661
17A21	24.8%	↑	↑	↑	16.0	152,043
17A22	24.8%	↑	↑	↑	16.0	183,444
17A23	26.7%	↑	↓	↑	20.0	5,575
17A24	26.7%	↑	No	↑	20.0	4,140
17A25	8.4%	↑	Yes	↑	34.0	10,034
17A26	8.4%	↑	↑	↑	34.0	11,725
17A27	29.2%	↑	↑	↑	24.0	30,414
17A28	29.2%	↑	↑	↑	24.0	19,220
17A29	9.1%	↑	↑	↑	22.0	7,269
17A30	9.1%	↑	↑	↑	22.0	4,140
17A31	32.8%	↑	↑	↓	20.0	485,555
17A32	32.8%	↑	↑	No	20.0	101,265
17A33	24.8%	↑	↑	Yes	34.0	7,034
17A34	24.8%	↑	↑	↑	34.0	5,977
17A35	24.8%	↑	↑	↑	20.0	48,168
17A36	24.8%	↑	↑	↑	20.0	63,417
17A37	32.8%	↑	↑	↑	14.0	19,146
17A38	32.8%	↑	↑	↑	14.0	17,051
17A39	32.8%	↓	↓	↓	20.0	107,842
17A40	32.8%	Yes	Yes	Yes	20.0	101,266

*Did not fail

TABLE 3-4. SUMMARY OF CRACK INITIATION DATA FOR 2024-T3XX

GROUP	LOAD TRANSFER	HOLE CONDITION			CLAMP- UP	SEAL- ANT	Ksi σ_o	k_t	k_N	S	AVERAGE 2 SPECIMENS N_t TEST LIFE							
		OPEN HOLE	FILLED HOLE															
			INTER- FERENCE	CLEAR- ANCE														
A	None	X			No	No	34.0	3.1	2.48	0.33	11,225							
	None	X			No	No	28.0	3.1	2.48	0.23	20,956							
	None	X			No	No	16.0	6.47	4.85	0.28	7,872							
	None	X			No	No	20.0	6.47	4.85	0.44	3,970							
	8.4%			X	No	No	18.0	3.4	2.70	0.11	*							
	29.2%			X	No	No	32.0	4.38	3.39	0.55	8,649							
	9.1%			X	No	No	25.0	6.96	5.2	0.79	1,451							
	32.8%			X	No	No	20.0	8.00	5.93	0.66	3,790							
B	None		X		No	No	34.0	3.1	2.48	0.33	84,050							
	None		X		No	No	18.0	6.47	4.85	0.36	14,570							
	24.8%		X		No	No	16.0	4.0	3.11	0.11	84,648							
	26.7%		X		No	No	20.0	7.71	5.73	0.61	10,427							
C	8.4%		X		Yes	No	34.0	2.4	2.70	0.39	19,044							
	29.2%		X		Yes	No	24.0	4.38	3.39	0.31	71,972							
	9.1%		X		Yes	No	22.0	6.96	5.2	0.61	30,313							
	32.8%		X		Yes	No	20.0	8.00	5.93	0.66	20,715							
D	24.8%		X		Yes	Yes	34.0	4.0	3.11	0.52	16,216							
	24.8%		X		Yes	Yes	20.0	4.0	3.11	0.18	232,957							
	32.8%		X		Yes	Yes	14.0	8.0	5.93	0.32	156,386							
	32.8%		X		Yes	Yes	20.0	8.0	5.93	0.66	32,235							

*ONE SPECIMEN DID NOT FAIL

TABLE 3-5. SUMMARY OF CRACK INITIATION DATA FOR 7075-T6XX

GROUP	LOAD TRANSFER	HOLE CONDITION			CLAMP- UP	SEAL- ANT	ksi σ_o	k_t	k_N	S	AVERAGE 2 SPECIMENS N_t TEST LIFE							
		OPEN HOLE	FILLED HOLE															
			INTER- FERENCE	CLEAR- ANCE														
A	None	X			No	No	34.0	3.1	2.58	0.38	6,085							
	None	X			No	No	28.0	3.1	2.58	0.26	15,225							
	None	X			No	No	16.0	6.47	5.12	0.33	10,214							
	None	X			No	No	20.0	6.47	5.12	0.52	2,563							
	8.4%			X	No	No	18.0	3.4	2.81	0.13	80,890							
	29.2%			X	No	No	32.0	4.38	3.55	0.64	3,745							
	9.1%			X	No	No	25.0	6.96	5.48	0.93	1,022							
	32.8%			X	No	No	9.5	8.00	6.27	0.17	31,346							
B	None		X		No	No	34.0	3.1	2.48	0.38	94,066							
	None		X		No	No	18.0	6.47	5.12	0.42	91,936							
	24.8%		X		No	No	16.0	4.0	3.26	0.13	118,926							
	26.7%		X		No	No	20.0	7.71	6.05	0.72	6,421							
C	8.4%		X		Yes	No	34.0	3.4	2.81	0.45	11,784							
	29.2%		X		Yes	No	24.0	4.38	3.55	0.36	22,922							
	9.1%		X		Yes	No	22.0	6.96	5.48	0.72	13,840							
	32.8%		X		Yes	No	9.5	8.00	6.27	0.17	374,502							
D	24.8%		X		Yes	Yes	34.0	4.0	3.26	0.61	7,982							
	24.8%		X		Yes	Yes	20.0	4.0	3.26	0.21	51,427							
	32.8%		X		Yes	Yes	14.0	8.00	6.27	0.38	25,328							
	32.8%		X		Yes	Yes	9.5	8.00	6.27	0.17	225,088							

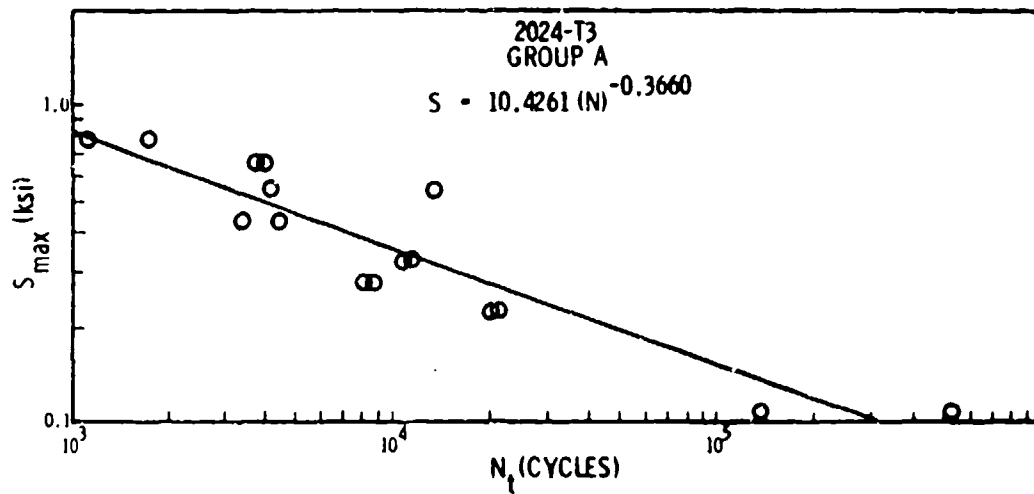


Figure 3-6. S vs N_f Data for 2024-T3 Group A Specimens

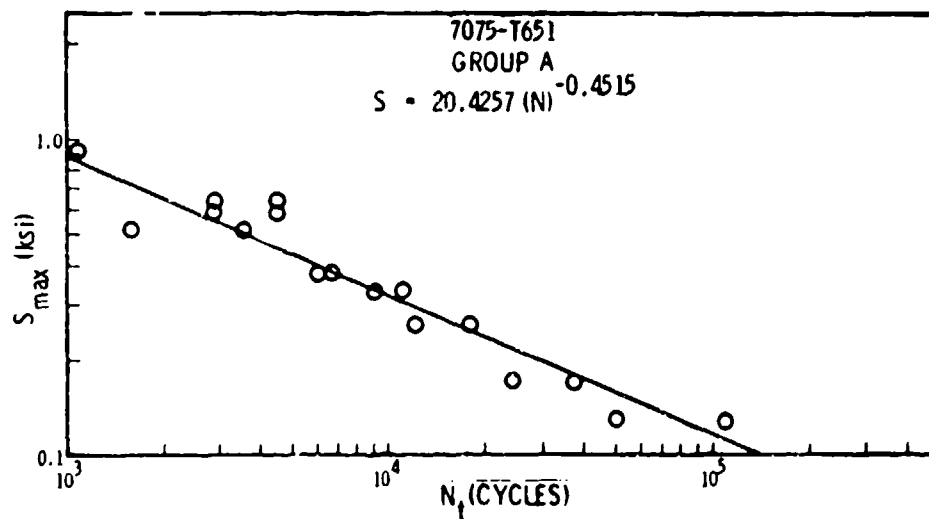


Figure 3-7. S vs N_f Data for 7075-T651 Group A Specimens

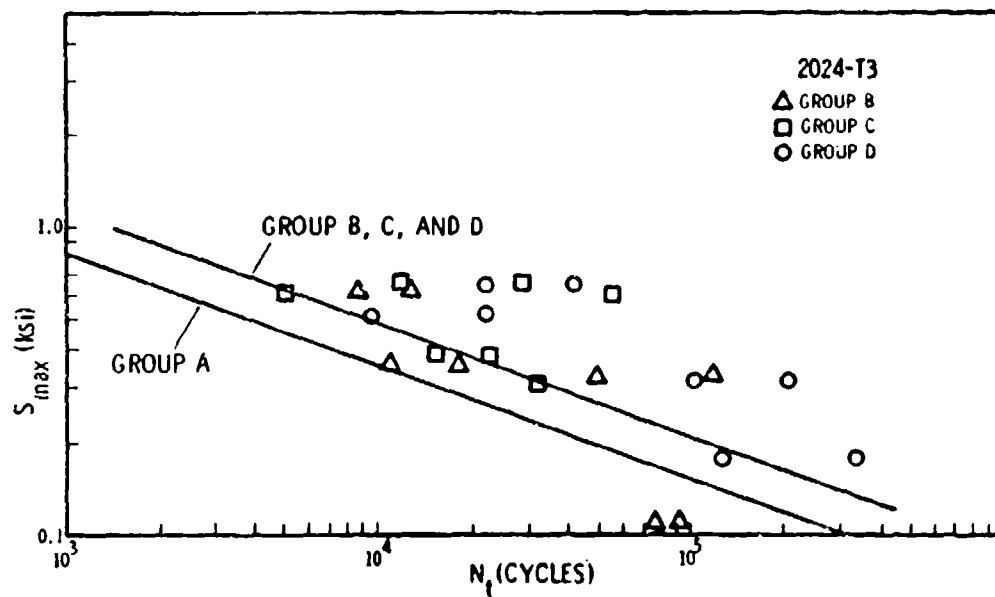


Figure 3-8. S vs N_f Data for 2024-T3 Groups B, C and D Specimens

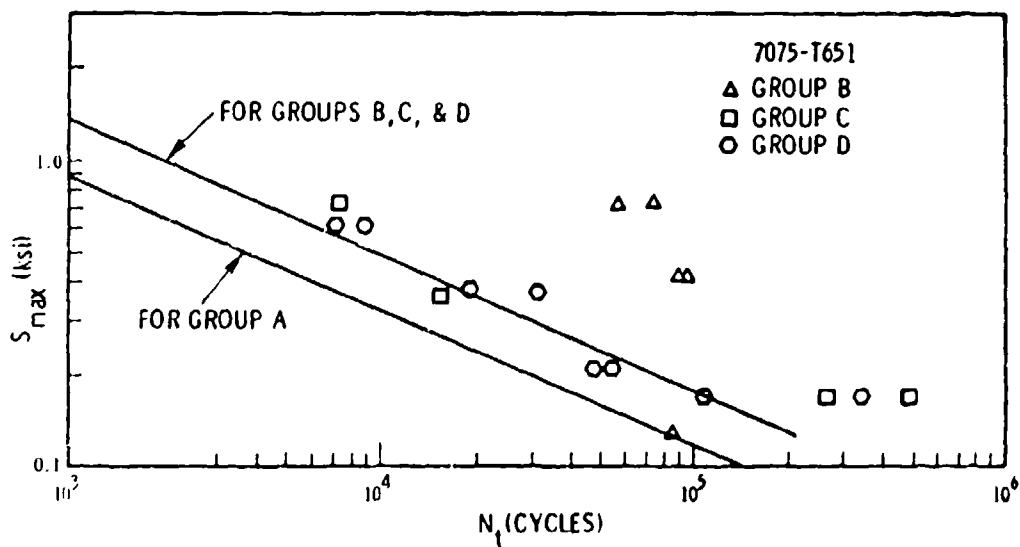


Figure 3-9. S vs N_f Data for 7075-T651 Groups B, C and D Specimens

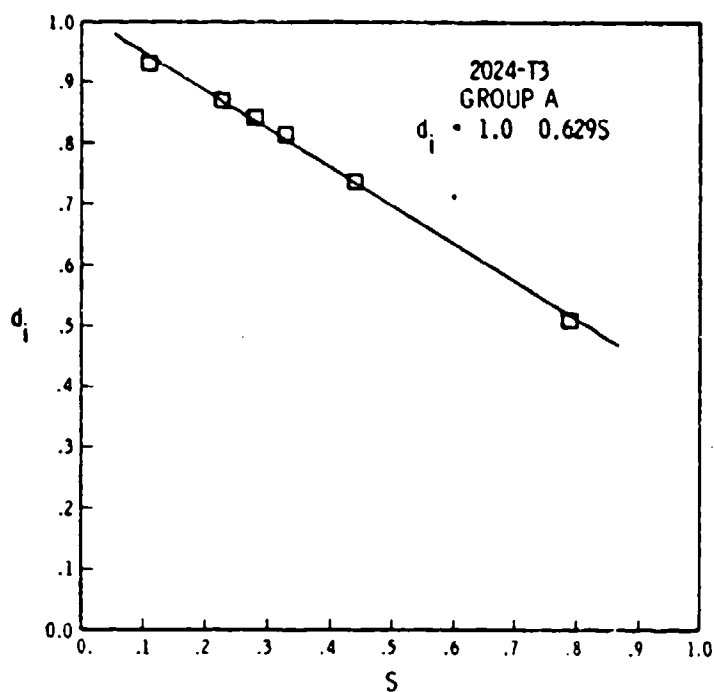


Figure 3-10. d_i vs S Data for 2024-T3 Group A Specimens

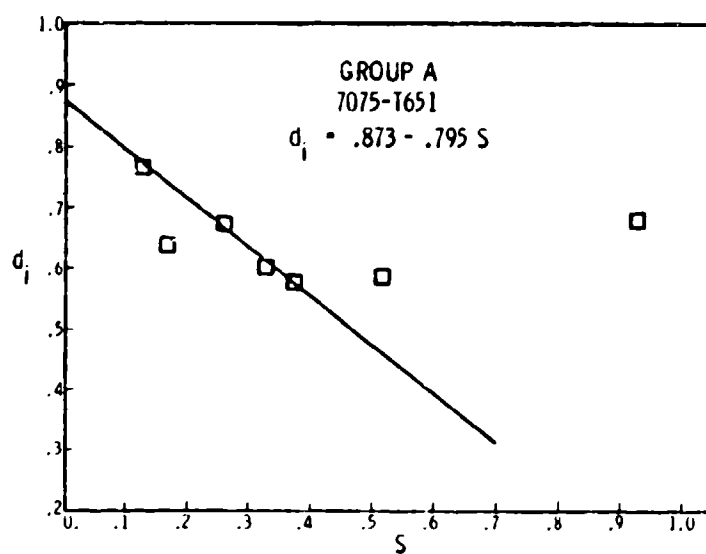


Figure 3-11. d_i vs S Data for 7075-T651 Group A Specimens

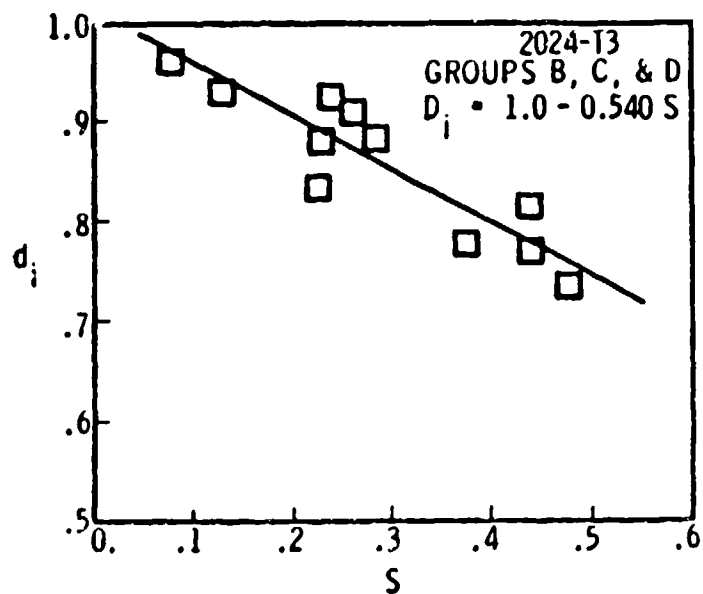


Figure 3-12. d_i vs S Data for 2024-T3 Groups B, C and D Specimens

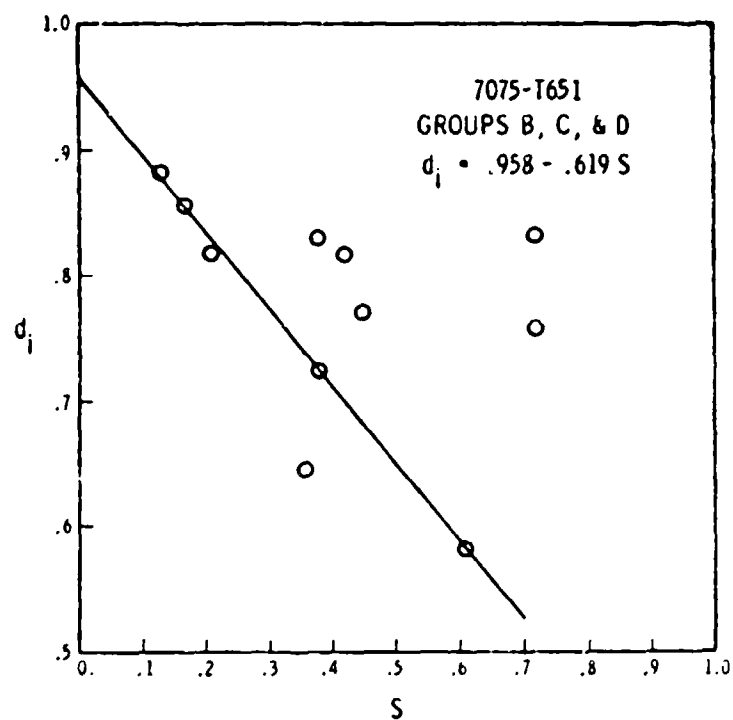


Figure 3-13. d_i vs S Data for 7075-T651 Groups B, C and D Specimens

4.0 FRACTURE TOUGHNESS TEST PROGRAM

The purpose of the fracture toughness test program was to establish fracture toughness allowables for the material form used during the structural test program defined in Task IV. The test included an evaluation of the critical fracture toughness factor ' K_{app} ' and the construction of the resistance curves (R-Curves). The test procedure and data reduction were performed in compliance with ASTM E561.

4.1 TEST SPECIMENS

Twenty (20) center crack tension (CCT) specimens were tested. The materials selected were "2024-T3XX" and "7075-T6XX" aluminum alloys in various product form as shown in Figures 4-1 through 4-4. The material type and product form was consistent with the type used during the structural test program. The specimens were fabricated from sheet, plate, extruded angle and extruded 'Tee' section. The initial flaws were introduced at the mid section of each specimen by a sawcut followed by the application of constant amplitude loading. The magnitude of the maximum load did not exceed 40% of the yield value based on net section. The loading continued until crack propagation of 0.050 in. at each side of the initial sawcut was achieved. The size of the crack at the start of the fracture toughness test was within 30 to 40 percent of the specimen width.

4.2 TEST ENVIRONMENT

The fracture toughness test program was conducted under controlled lab-air environment, at FRC testing laboratories located in Farmingdale, N.Y.

4.3 LOADING

Constant amplitude loading was initially applied to obtain a sharp initial crack. The magnitude of the load was set to 40% of the yield stress based on net section. During the fracture toughness test phase, the load was incrementally increased until fast fracture was achieved. Measurement of the crack opening was obtained using a crack opening gage installed at the crack mid section. This data was used to determine the fracture resistance curves (R-Curves).

4.4 TEST RESULTS

The test results of twenty (20) fracture toughness specimens are summarized in Table 4-1. In general the sheet material exhibited higher fracture toughness than the extruded material for 2024-T3 and 7075-T6 aluminum alloy. The critical fracture toughness was evaluated for each specimen in terms of apparent fracture toughness K_{app} using the equation:

$$K_{APP} = \frac{P_{max}}{WB} \left(\pi a_o \left(\sec \frac{\pi a_o}{W} \right) \right)^{1/2}$$

Where ' P_{max} ' is the maximum applied load recorded just before specimen failure and ' a_o ' is the initial half crack length at the start of the specimen loading.

The Raw Test Data are presented in Figures 4-5 through 4-24. It includes initial specimen configuration and crack opening displacement vs. applied load. This data were reduced (Ref. Volume III) to obtain R-Curves for the material in question.

TABLE 4-1. FRACTURE TOUGHNESS TEST DATA

SPECIMEN I.D.	MATERIAL	THICKNESS (in.)	WIDTH (in.)	a_0 (in.)	P_{max} (kip)	K_{app} (ksi $\sqrt{in}$)
1B	2024-T3 Sheet	0.193	12.0	1.875	74.00	82.45
1C	2024-T3 Sheet	0.193	12.0	1.870	75.00	83.55
3A	2024-T3 Sheet	0.088	18.0	2.750	50.00	98.51
3C	2024-T3 Sheet	0.088	18.0	2.767	50.25	99.39
5A	2024-T351 Plate	0.253	8.0	1.285	71.50	75.86
5C	2024-T351 Plate	0.253	8.0	1.295	71.25	75.97
7A	2024-T3511 Tee	0.188	2.75	0.487	17.00	44.16
7B	2024-T3511 Tee	0.187	2.75	0.485	16.75	43.59
9A	2024-T3411 Angle	0.236	2.25	0.425	18.75	44.81
9B	2024-T3411 Angle	0.240	2.25	0.425	18.25	42.89
11A	7075-T6 Plate	0.325	3.0	0.520	34.75	49.25
11B	7075-T651 Plate	0.323	3.0	0.522	31.80	45.49
13B	7075-T651 Plate	0.406	3.0	0.535	34.50	39.89
13C	7075-T651 Plate	0.406	3.0	0.525	37.00	42.25
15B	7075-T6 Sheet	0.157	12.0	1.870	59.75	81.82
15C	7075-T6 Sheet	0.156	12.0	1.895	59.50	82.69
17B	7075-T6511 Tee	0.301	2.75	0.485	34.90	56.44
17C	7075-T6511 Tee	0.298	2.75	0.510	32.50	54.93
19A	7075-T6511 Angle	0.311	2.75	0.475	32.50	50.16
19B	7075-T6511 Angle	0.310	2.75	0.522	32.25	53.29

MATERIAL	THICKNESS (IN)
2024-T3511 Angle	0.190
7075-T6511 Tee	0.300
7075-T6511 Angle	0.310

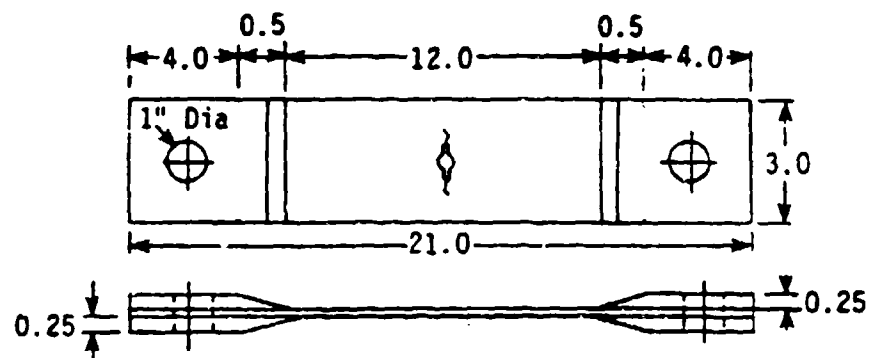


Figure 4-1. 'CCT' K_{IC} Specimen 3.0" Wide

MATERIAL	THICKNESS (IN)
2024-T3511 Angle	0.250

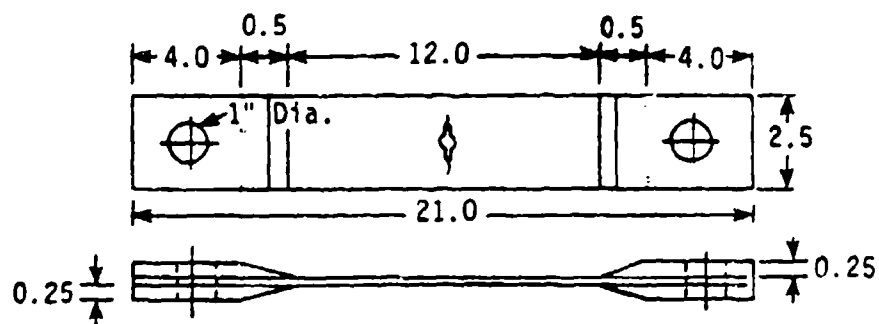


Figure 4-2. 'CCT' K_{IC} Specimens 2.5" Wide

MATERIAL	THICKNESS (IN)
2024-T3 Sheet	0.090
2024-T3 Sheet	0.190
7075-T6 Sheet	0.160

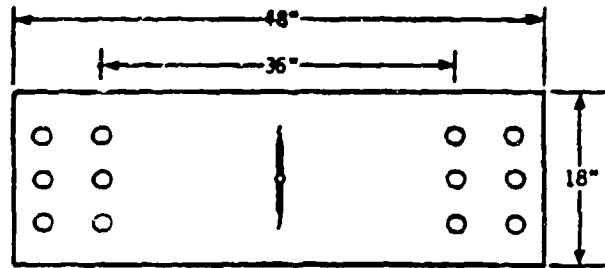


Figure 4-3. 'CCT' K_{IC} Specimen 18" Wide

MATERIAL	THICKNESS (IN)
2024-T351 Plate	0.25
7075-T651 Plate	0.31
7075-T651 Plate	0.42

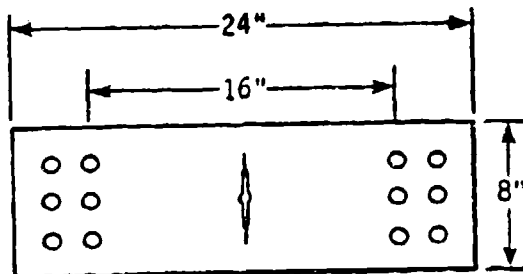
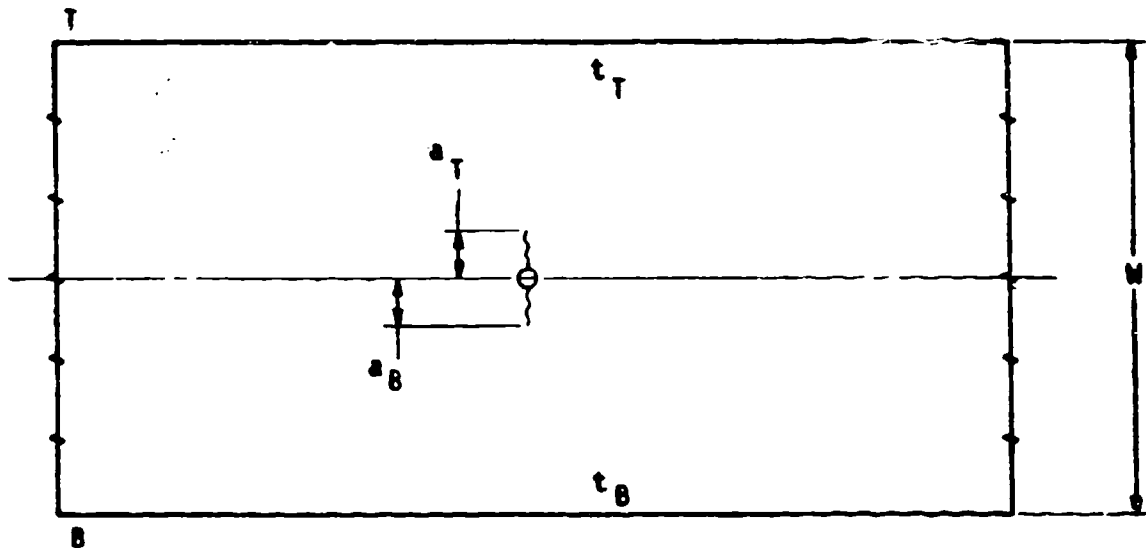


Figure 4-4. 'CCT' K_{IC} Specimen 8" Wide

SPECIMEN NO. GT160KAB51-1B

MAT'L — 2024-T3



SPECIMEN MEASUREMENTS

W = 12 in.
t_T = 0.1926 in.
t_B = 0.1940 in.

a_T = 1.810 in.
a_B = 1.780 in.
a₀ = 1.875 in.

PRECRACK DATA

NET AREA = 1.6257 in.²

P_{max} = 30,000 lbs
P_{min} = 3,000 lbs

LEFT = 0.060/0.060 in.
RIGHT = 0.050/0.078 in.
No of cycles = 1829

FAILURE LOAD AFTER
PRE-CRACKING
P = 74,000 lbs

Figure 4-5A. Fracture Toughness Data Sheet GT160KAB51-1B

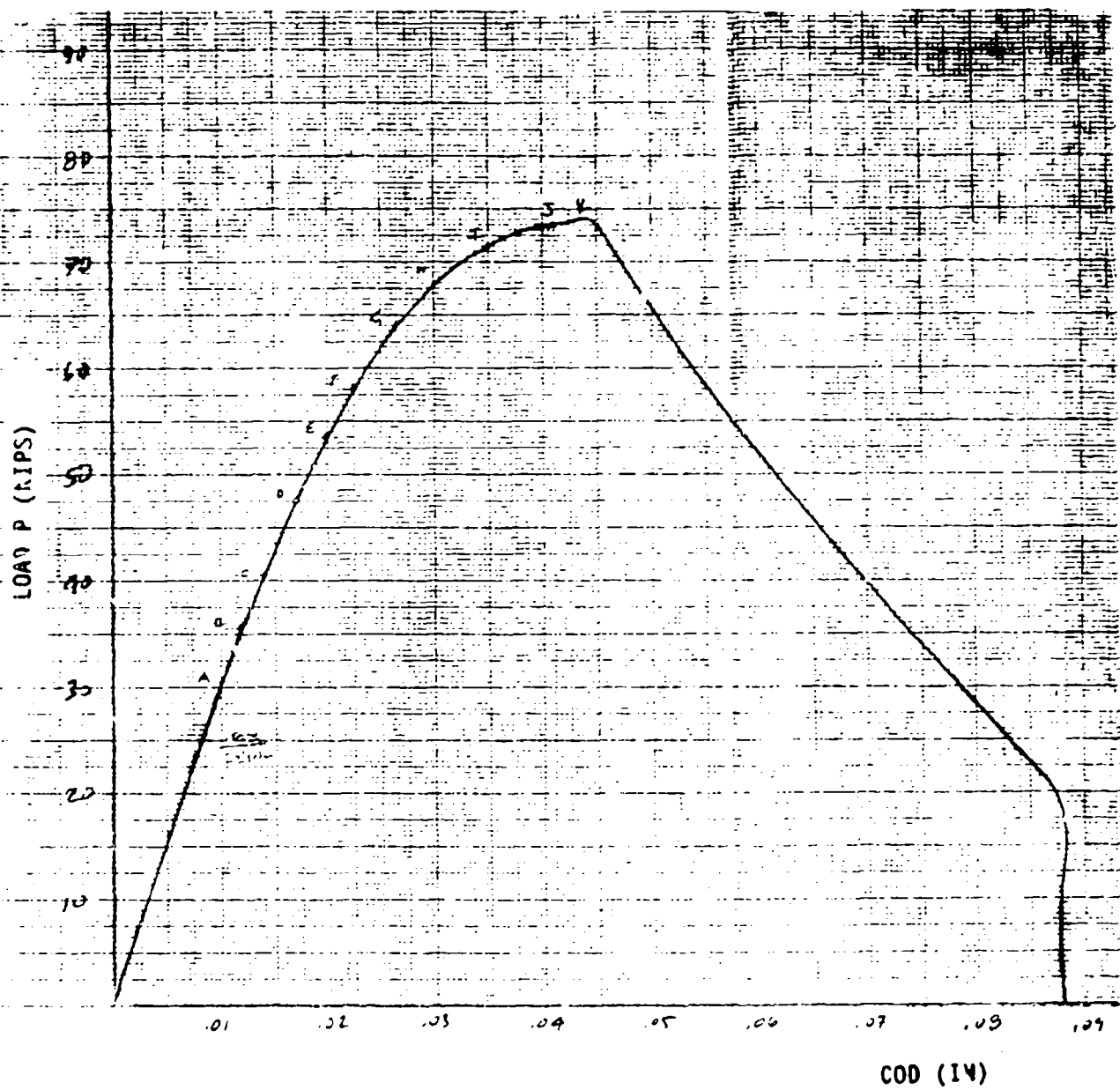
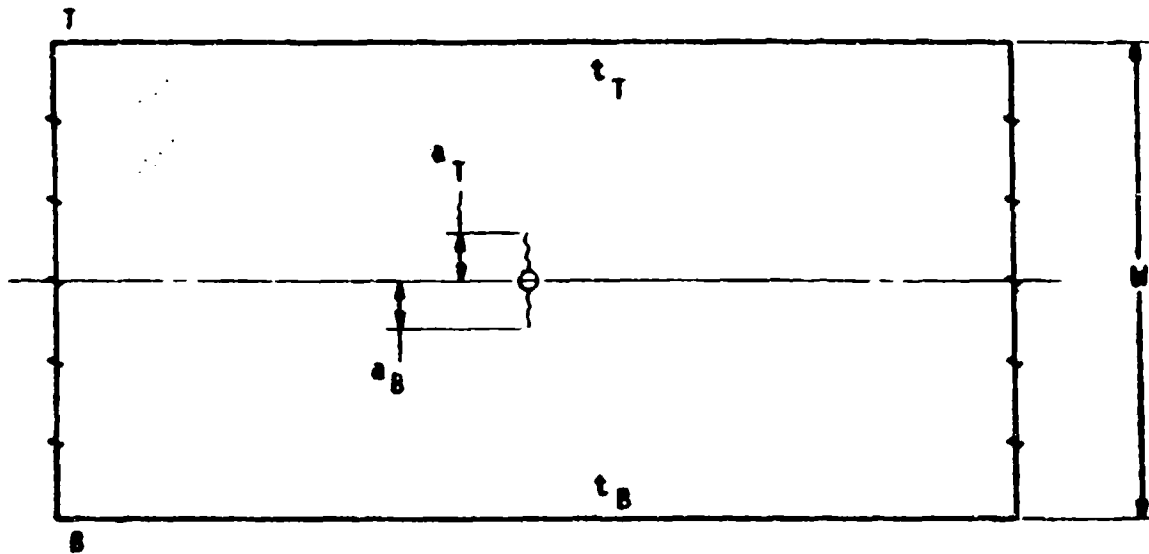


Figure 4-5B. Applied Load vs. Crack Opening Displacement GT160KAB51-18

SPECIMEN NO. GT160KAB51-1C

MAT'L — 2024-T3



SPECIMEN MEASUREMENTS

W = 12 in.
t_T = 0.1920 in.
t_B = 0.1939 in.

a_T = 1.790 in.
a_B = 1.790 in.

PRECRACK DATA

NET AREA = 1.6246 in.²

P_{max} = 30,000 lbs
P_{min} = 3,000 lbs

LEFT = 0.080/0.050 in.
RIGHT = 0.050/0.060 in.
No of cycles = 1712

FAILURE LOAD AFTER
PRE-CRACKING
P = 107,840 lbs

Figure 4-6A. Fracture Toughness Data Sheet GT160KAB51-1C

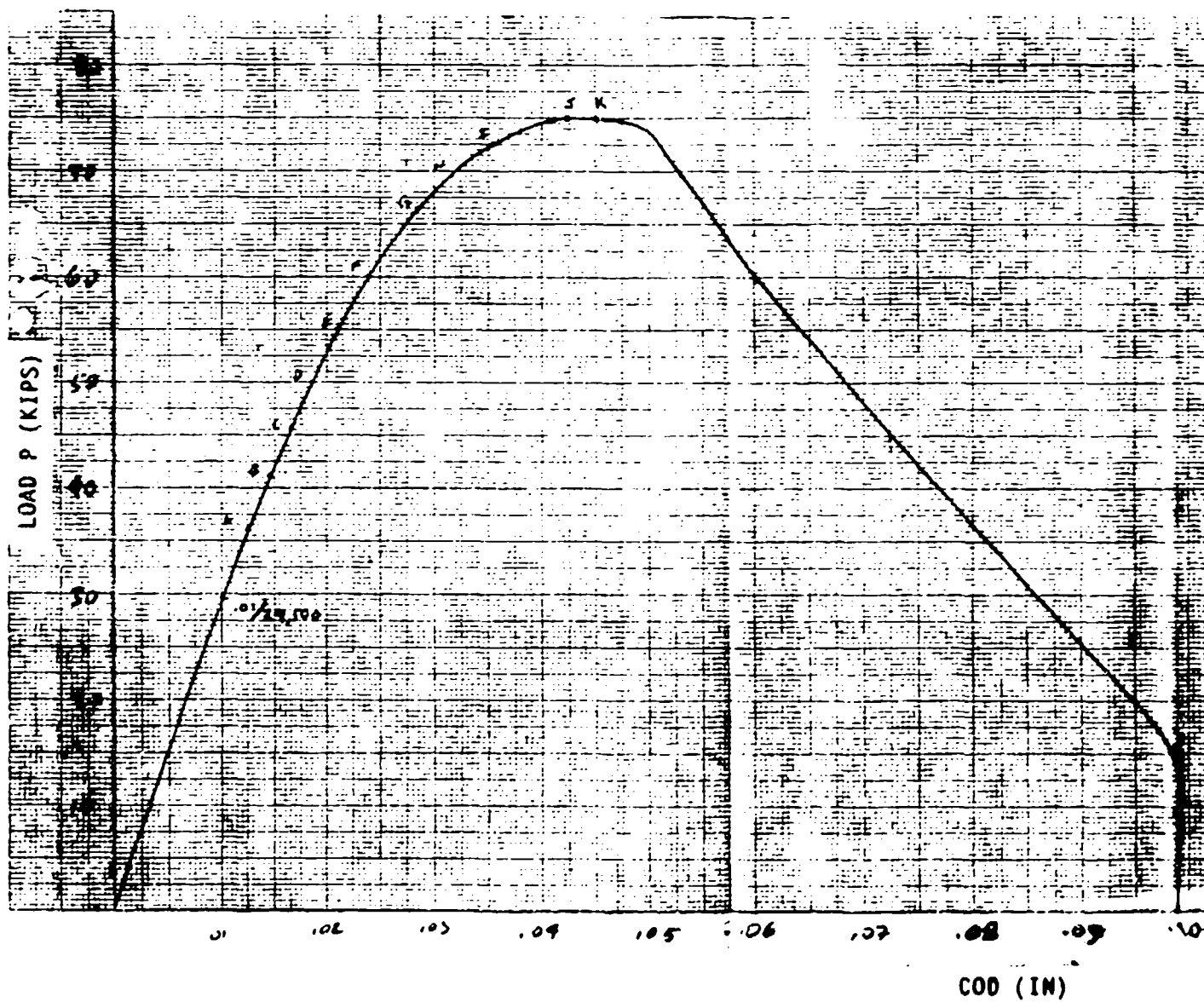
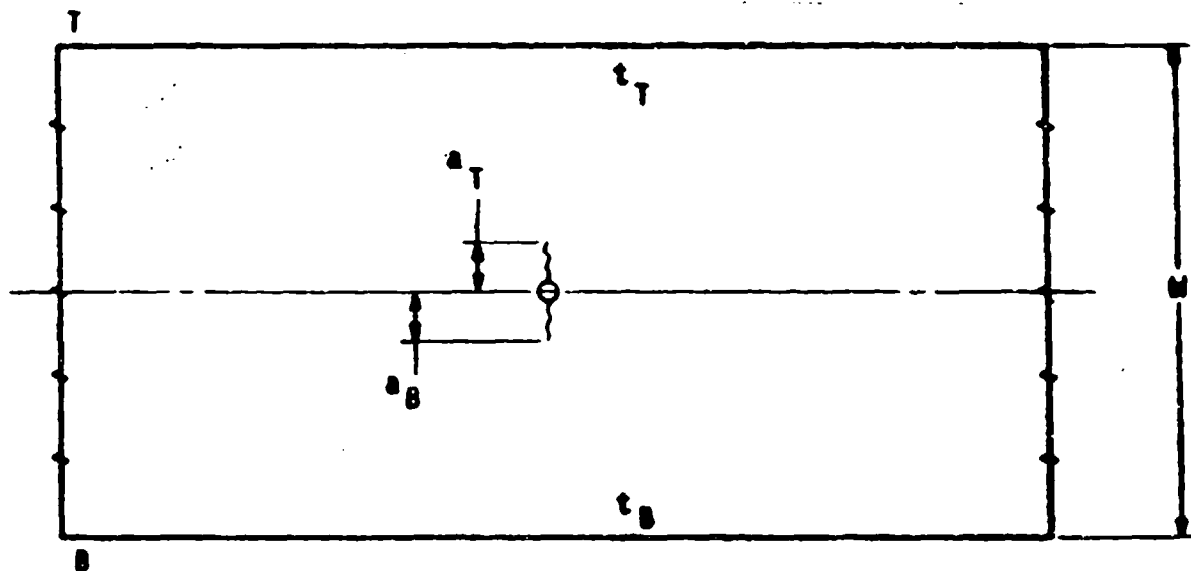


Figure 4-6B. Applied Load vs. Crack Opening Displacement GT160KAB51-1C

SPECIMEN NO. GT160KAB51-3A

MAT'L — 2024-T3



SPECIMEN MEASUREMENTS

$W = 18 \text{ in.}$
 $t_T = 0.088 \text{ in.}$
 $t_B = 0.088 \text{ in.}$

$a_T = 2.680 \text{ in.}$
 $a_B = 2.680 \text{ in.}$
 $a_0 = 2.75 \text{ in.}$

PRECRACK DATA

NET AREA = 1.112 in.^2

$P_{\max} = 21,000 \text{ lbs}$
 $P_{\min} = 2,100 \text{ lbs}$

LEFT = N/A
RIGHT = N/A
No of cycles = N/A

FAILURE LOAD AFTER
PRE-CRACKING
 $P = 50,000 \text{ lbs}$

Figure 4-7A. Fracture Toughness Data Sheet GT160KAB51-3A

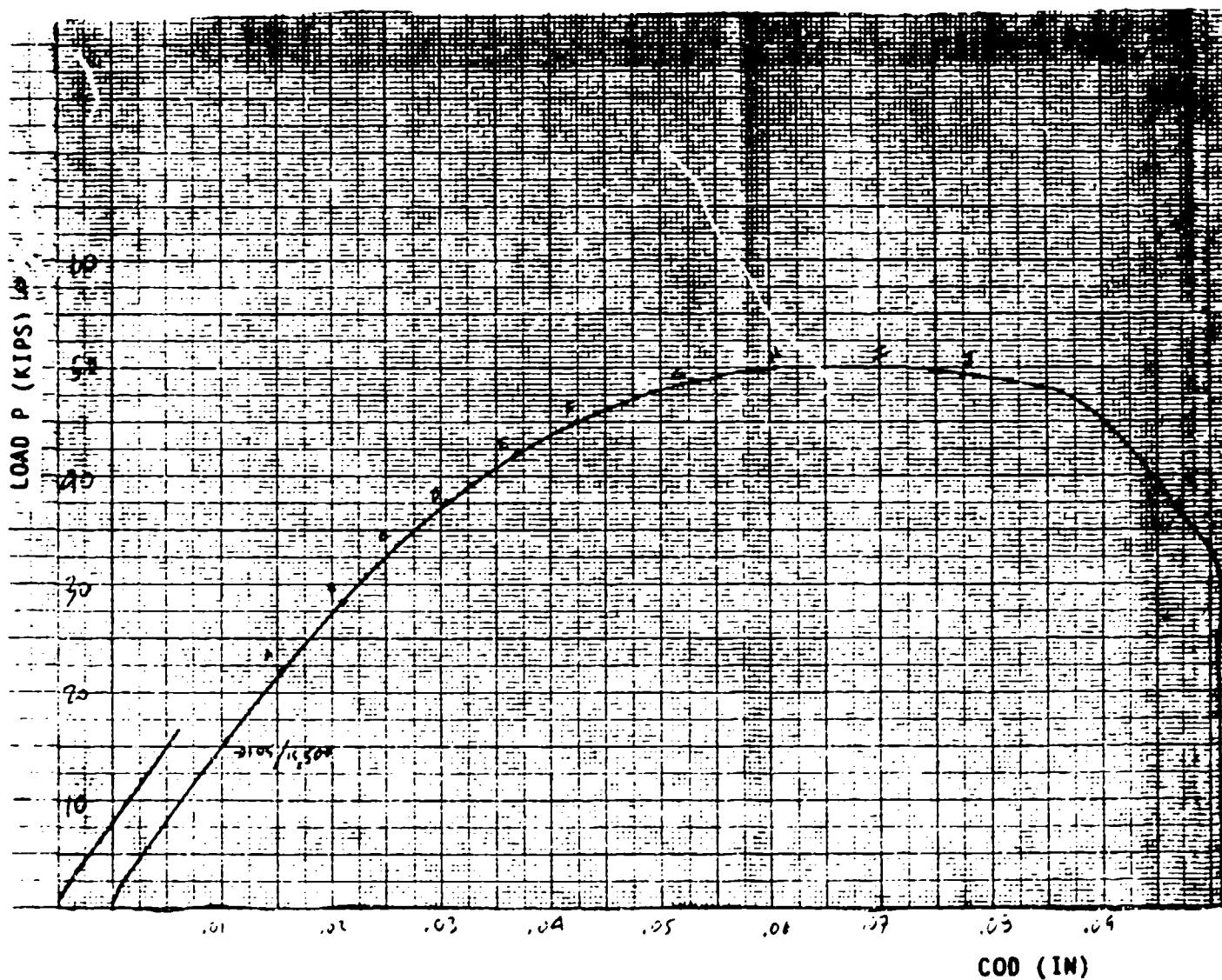
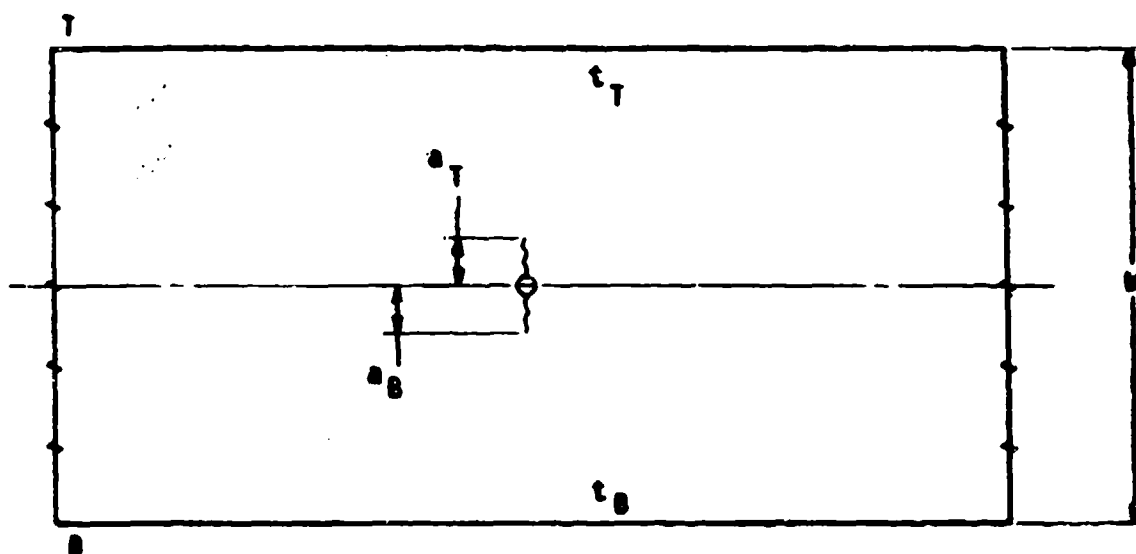


Figure 4-7B. Applied Load vs. Crack Opening Displacement GT160KAB51-3A

SPECIMEN MEASUREMENTS

$W = 18.00 \text{ in.}$
 $t_T = 0.088 \text{ in.}$
 $t_B = 0.088 \text{ in.}$

$a_T = 2.700 \text{ in.}$
 $a_B = 2.680 \text{ in.}$
 $a_0 = 2.767 \text{ in.}$

PRECRACK DATA

NET AREA = 1.111 in.^2

$P_{\max} = 21,000 \text{ lbs}$
 $P_{\min} = 2,100 \text{ lbs}$

LEFT = $0.060/0.080 \text{ in.}$
 RIGHT = $0.060/0.070 \text{ in.}$
 No of cycles = 1181

FAILURE LOAD AFTER
 PRE-CRACKING
 $P = 50,250 \text{ lbs}$

Figure 4-8A. Fracture Toughness Data Sheet GT160KAB51-3C

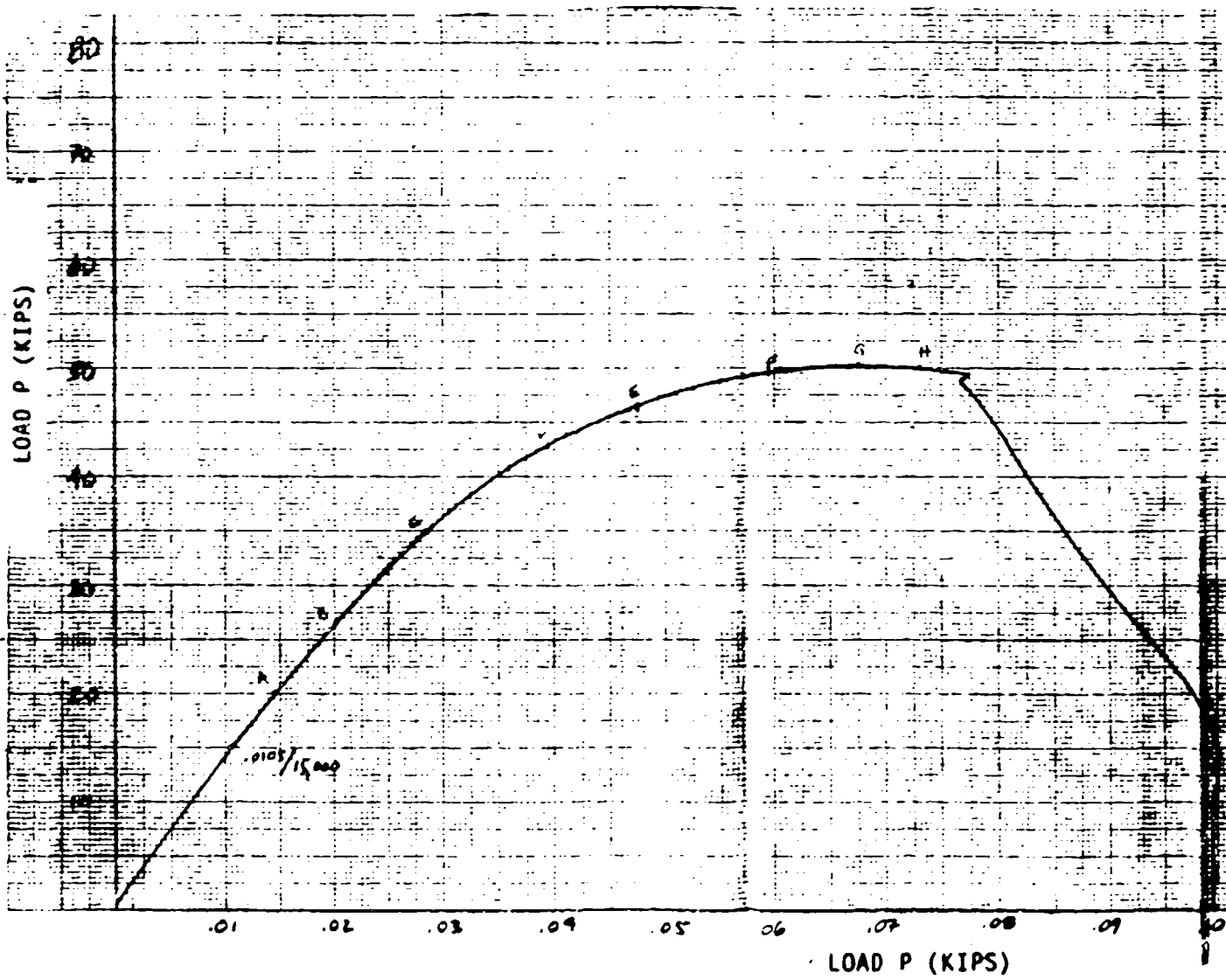
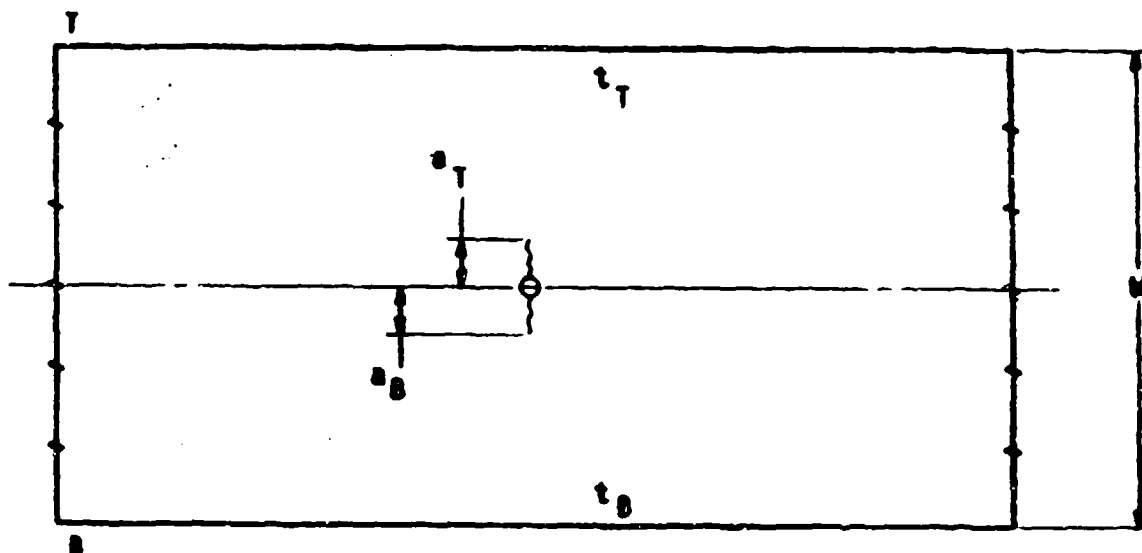


Figure 4-88. Applied Load vs. Crack Opening Displacement GT160KAB51-3C

SPECIMEN NO. GT160KAB51-5A

MAT'L — 2024-T351



SPECIMEN MEASUREMENTS

W = 8.00 in.
t_T = 0.2530 in.
t_B = 0.2523 in.

a_T = 1.190 in.
a_B = 1.200 in.
a₀ = 1.285 in.

PRECRACK DATA

NET AREA = 1.417 in.²

P_{max} = 26,000 lbs
P_{min} = 2,600 lbs

LEFT = 0.060/0.060 in.
RIGHT = 0.050/0.050 in.
No of cycles = 2500

FAILURE LOAD AFTER
PRE-CRACKING
P = 71,500 lbs

Figure 4-9A. Fracture Toughness Data Sheet GT160KAB51-5A

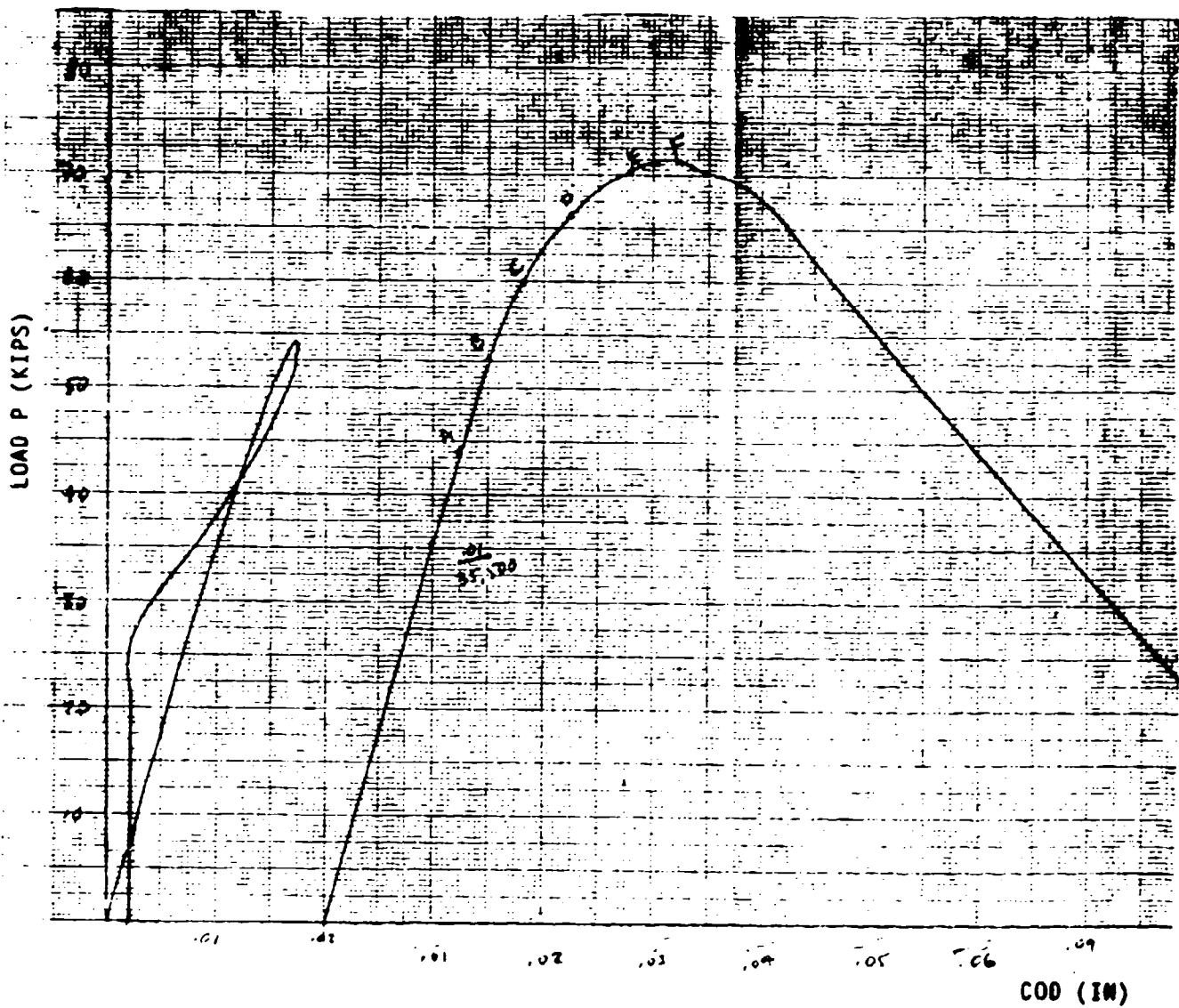
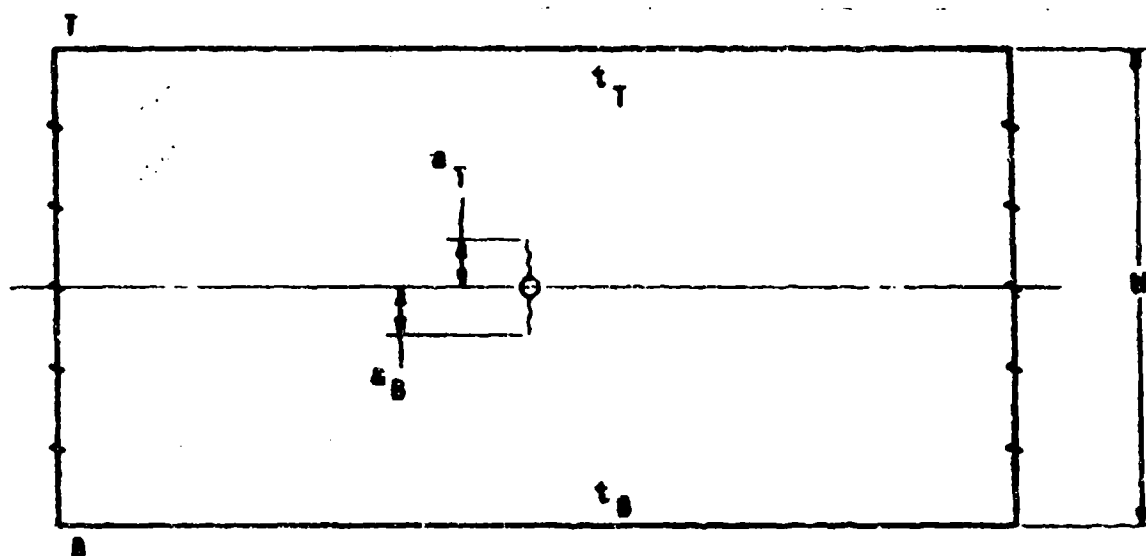


Figure 4-98. Applied Load vs. Crack Opening Displacement GT160KAB51-5A

SPECIMEN NO. GT160KAB51-5C

MAT'L --- 2024-T351



SPECIMEN MEASUREMENTS

W = 8.00 in.
t_T = 0.2530 in.
t_B = 0.2526 in.

a_T = 1.210 in.
a_B = 1.190 in.
a₀ = 1.295 in.

PRECRACK DATA

NET AREA = 1.416 in.²

P_{max} = 26,000 lbs
P_{min} = 2,600 lbs

LEFT = 0.050/0.050 in.
RIGHT = 0.060/0.060 in.
No of cycles = 2769

FAILURE LOAD AFTER
PRE-CRACKING
P = 71,250 lbs

Figure 4-10A. Fracture Toughness Data Sheet GT160KAB51-5C

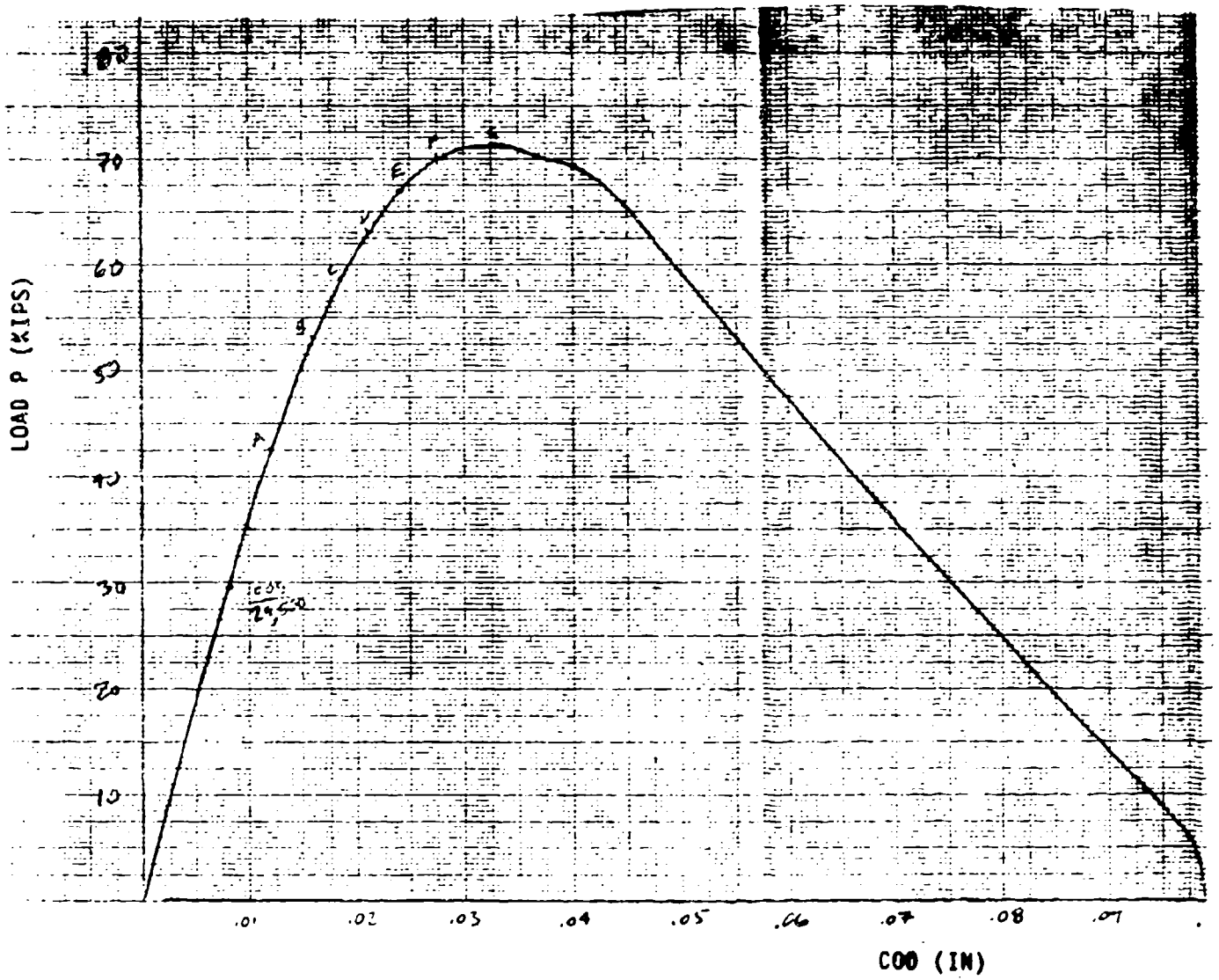
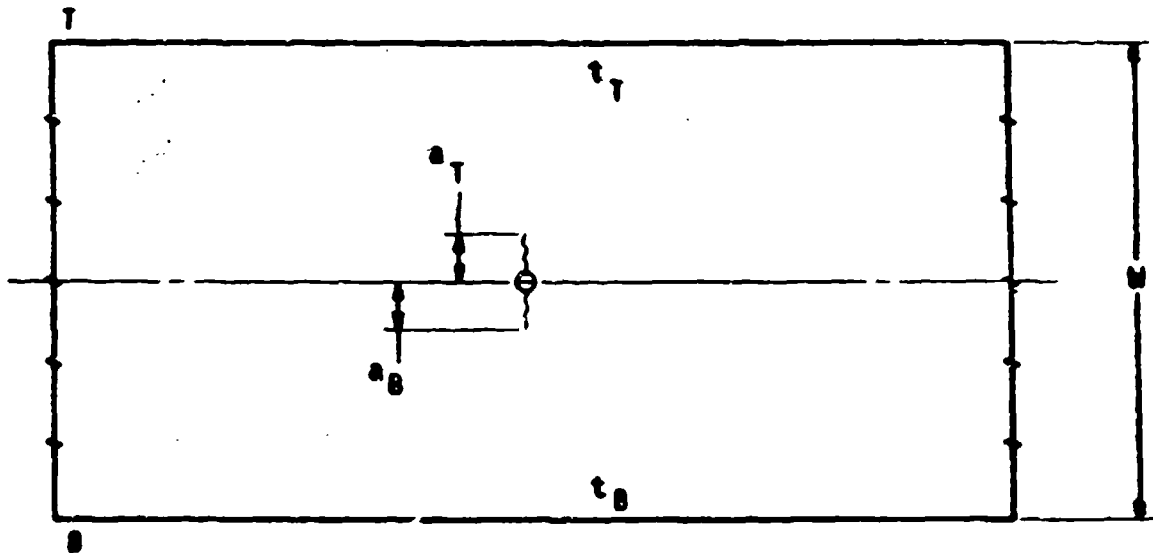


Figure 4-108. Applied Load vs. Crack Opening Displacement GT160KAB51-5C

SPECIMEN NO. GT160KAB51-7A

MAT'L — 2024-T3511 EXT.



SPECIMEN MEASUREMENTS

W = 2.75 in.
t_T = 0.1865 in.
t_B = 0.1880 in.

a_T = 0.405 in.
a_B = 0.410 in.
a₀ = 0.4875 in.

PRECRACK DATA

NET AREA = 0.3631 in.²

P_{max} = 6,100 lbs
P_{min} = 610 lbs

LEFT = 0.080/0.050 in.
RIGHT = 0.050/0.050 in.
No of cycles = 8095

FAILURE LOAD AFTER
PRE-CRACKING
P = 17,000 lbs

Figure 4-11A. Fracture Toughness Data Sheet GT160KAB51-7A

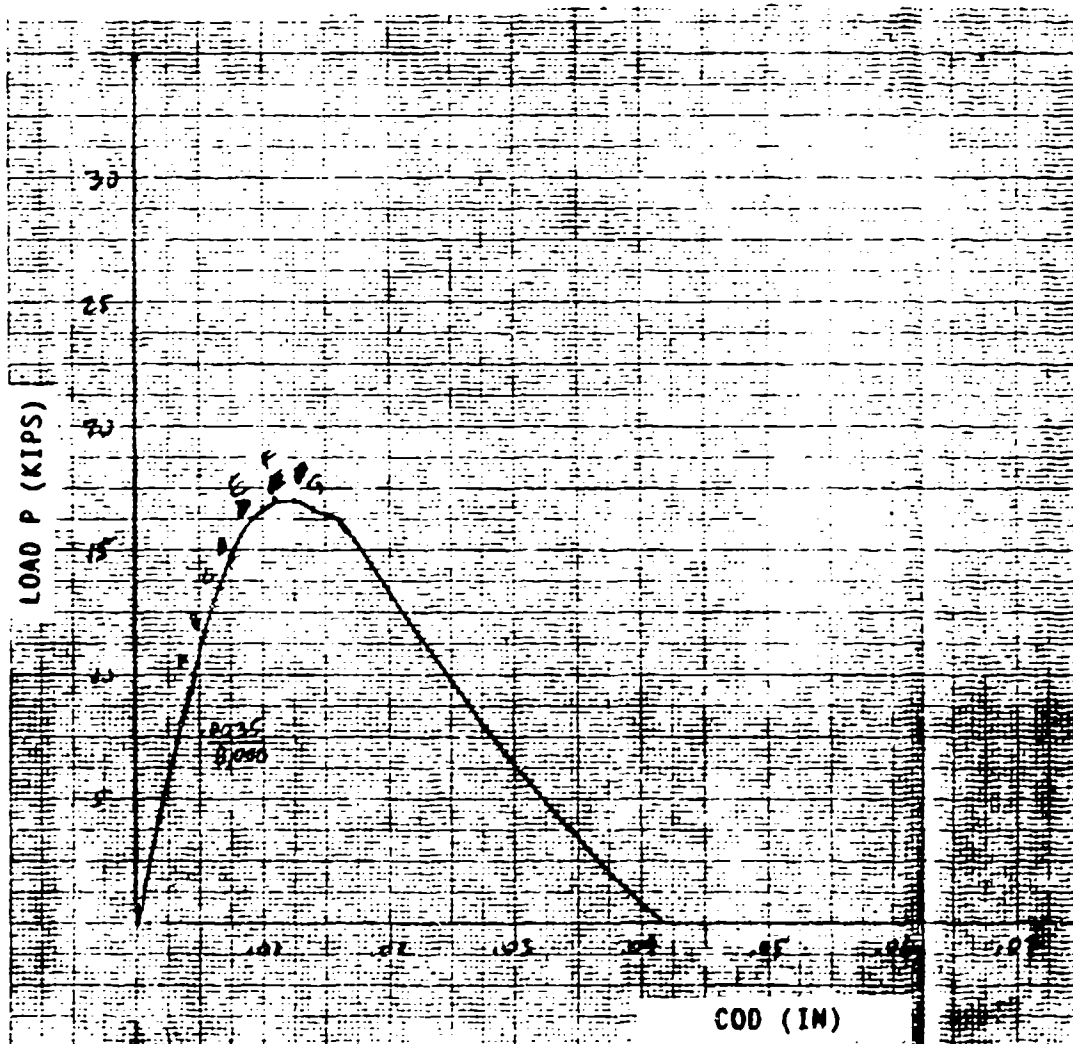
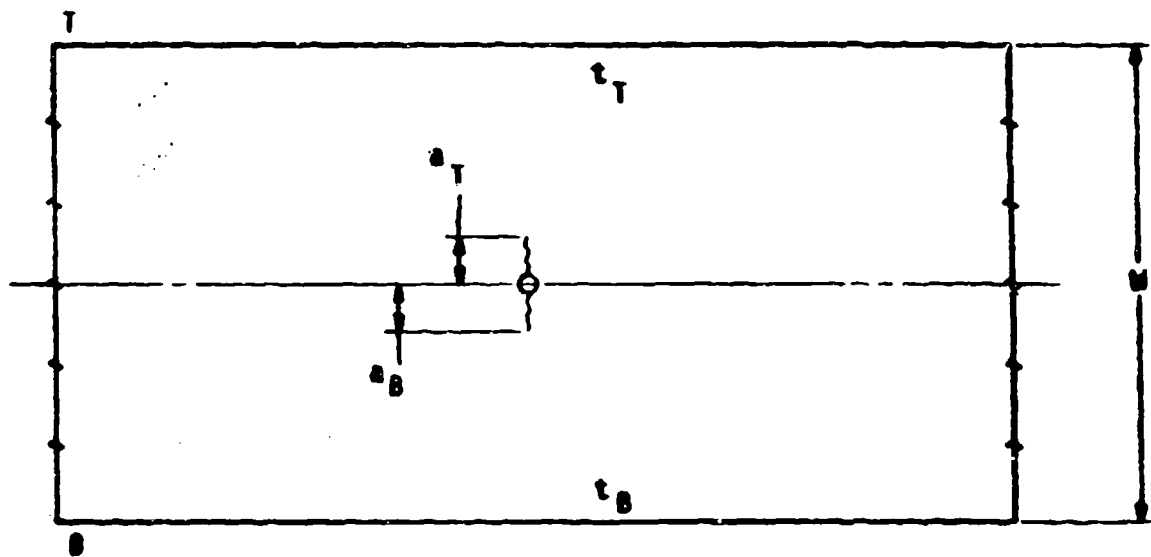


Figure 4-11B. Applied Load vs. Crack Opening Displacement GT160KAB51-7A

SPECIMEN NO. GT160KAB51-78

MAT'L — 2024-T3511 EXT.



SPECIMEN MEASUREMENTS

W = 2.749 in.
t_T = 0.1860 in.
t_B = 0.1886 in.

a_T = 0.410 in.
a_B = 0.430 in.
a₀ = 0.485 in.

PRECRACK DATA

NET AREA = 0.3576 in.²

P_{max} = 6,007 lbs
P_{min} = 600 lbs

LEFT = 0.050/0.070 in.
RIGHT = 0.050/0.055 in.
No of cycles = 14344

FAILURE LOAD AFTER
PRE-CRACKING
P = 16,750 lbs

Figure 4-12A. Fracture Toughness Data Sheet GT160KAB51-78

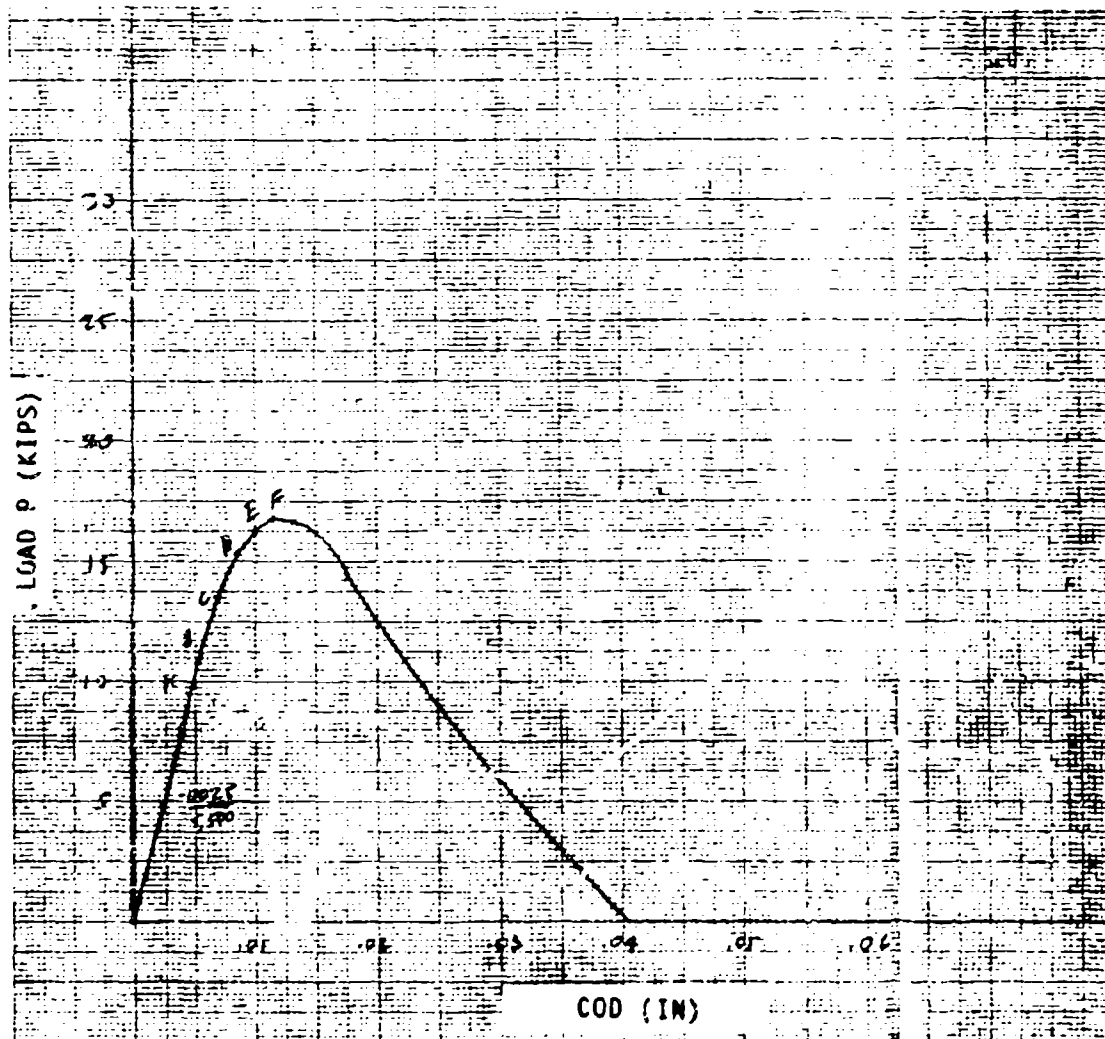
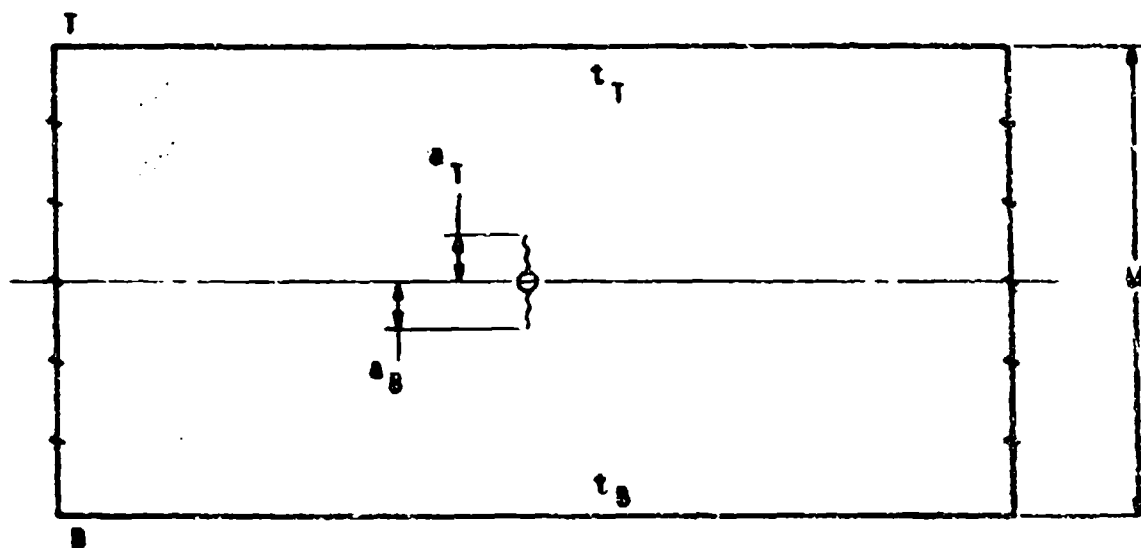


Figure 4-12B. Applied Load vs. Crack Opening Displacement GT160KAB51-78

SPECIMEN NO. GT160KAB51-9A

MAT'L — 2024-T3511 EXT.



SPECIMEN MEASUREMENTS

W = 2.259 in.
t_T = 0.230 in.
t_B = 0.242 in.

a_T = 0.350 in.
a_B = 0.350 in.
a₀ = 0.425 in.

PRECRACK DATA

NET AREA = 0.3679 in.²

P_{max} = 6,475 lbs
P_{min} = 648 lbs

LEFT = 0.090/0.090 in.
RIGHT = 0.050/0.055 in.
No of cycles = 14246

FAILURE LOAD AFTER
PRE-CRACKING
P = 18,750 lbs

Figure 4-13A. Fracture Toughness Data Sheet GT160KAB51-9A

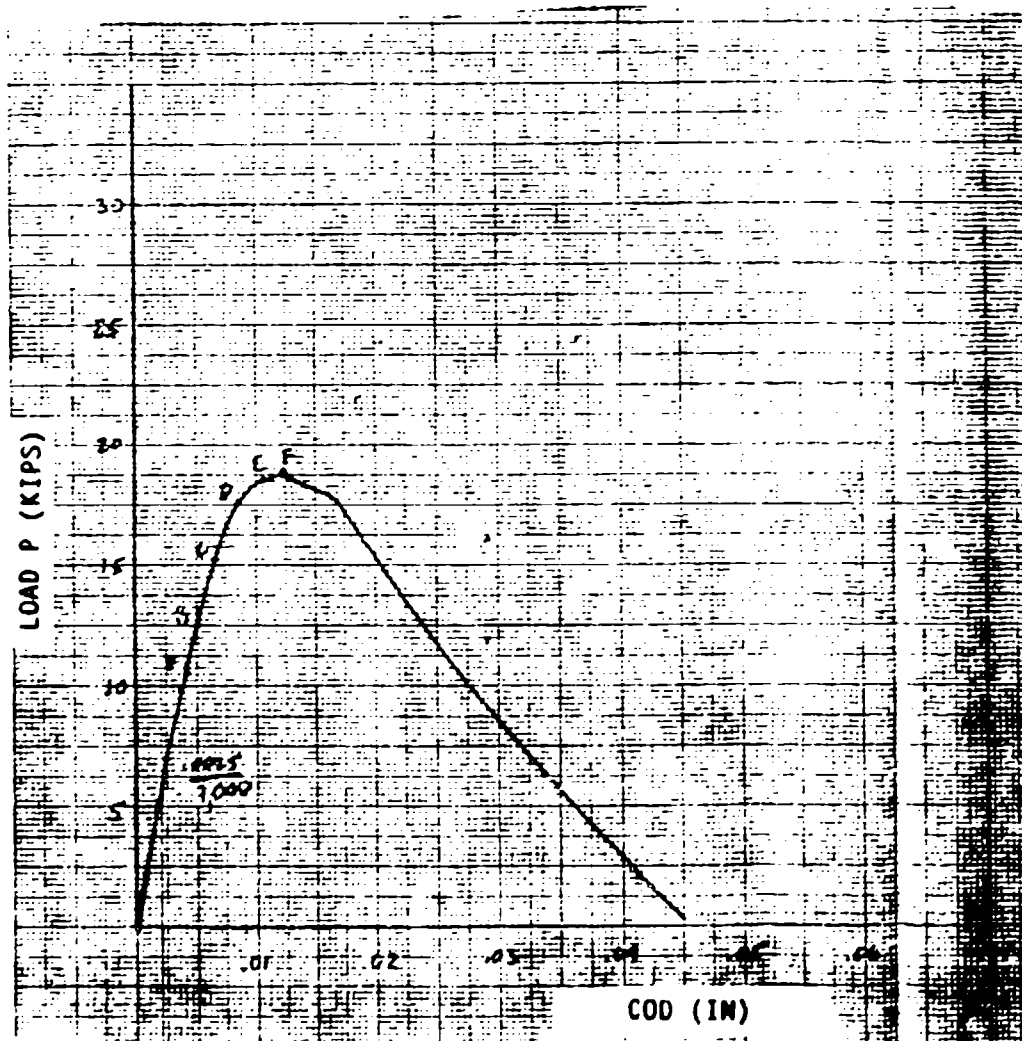
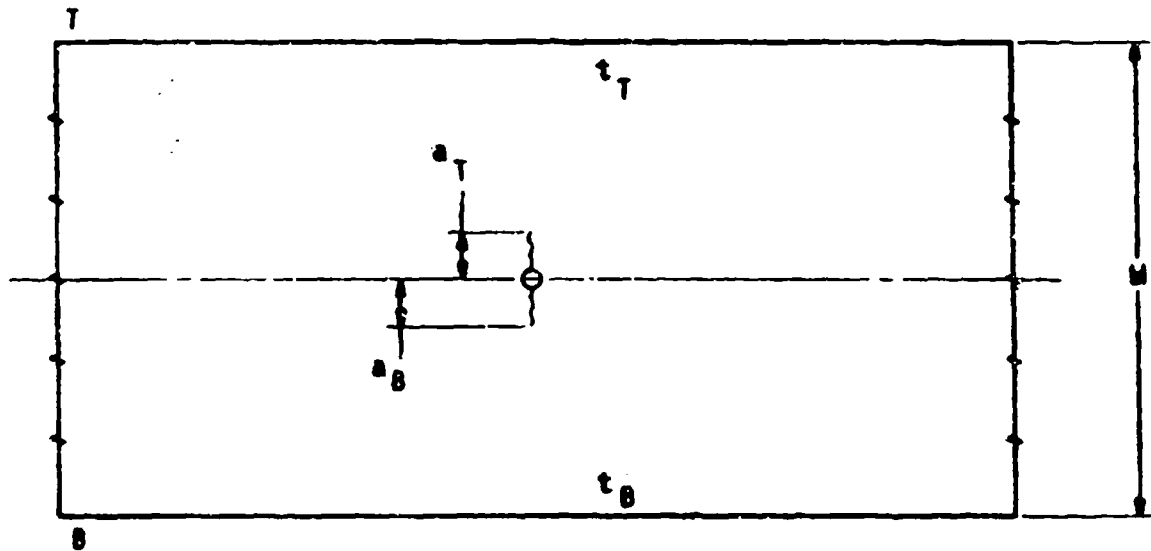


Figure 4-13B. Applied Load vs. Crack Opening Displacement GT160KAB51-9A

SPECIMEN NO. GT160KAB51-98

MAT'L — 2024-T3511 EXT.



SPECIMEN MEASUREMENTS

W = 2.258 in.
t_T = 0.2425 in.
t_B = 0.2370 in.

a_T = 0.340 in.
a_B = 0.350 in.
a₀ = 0.425 in.

PRECRACK DATA

NET AREA = 0.3759 in.²

P_{max} = 6,616 lbs
P_{min} = 662 lbs

LEFT = 0.055/0.055 in.
RIGHT = 0.070/0.070 in.
No of cycles = 15643

FAILURE LOAD AFTER
PRE-CRACKING
P = 18,250 lbs

Figure 4-14A. Fracture Toughness Data Sheet GT160KAB51-98

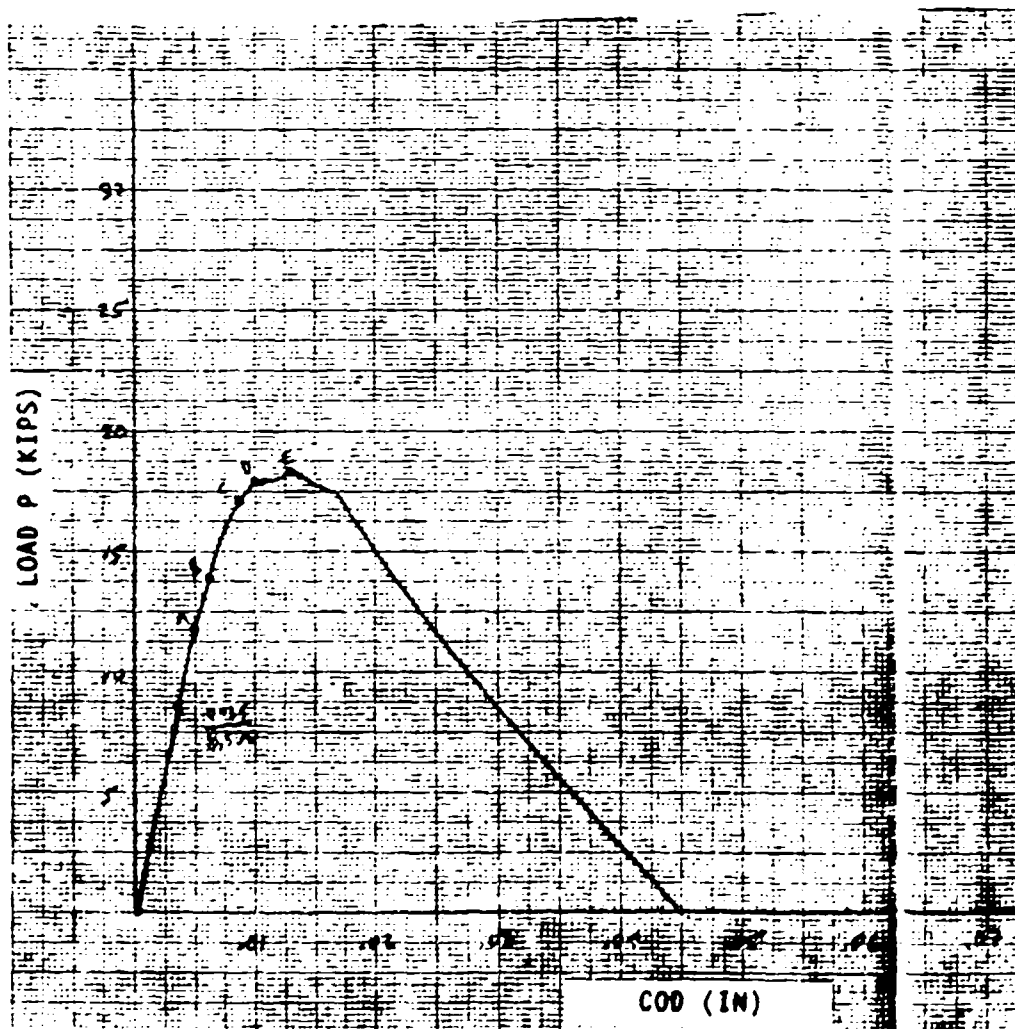
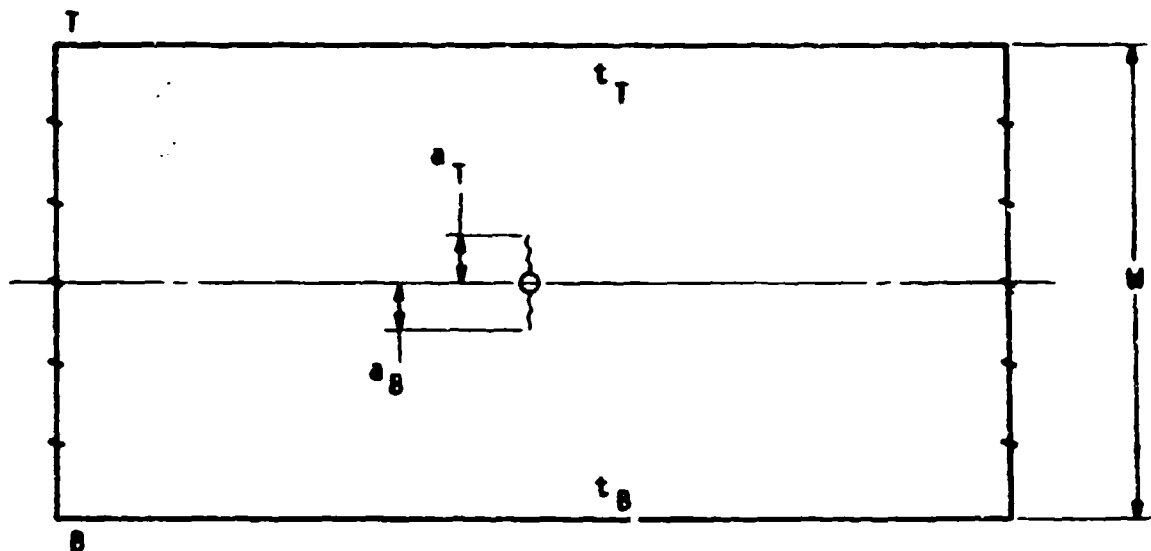


Figure 4-148. Applied Load vs. Crack Opening Displacement GT160KAB51-9B

SPECIMEN NO. GT160KAB51-11A

MAT'L — 7075-T651



SPECIMEN MEASUREMENTS

W = 3.000 in.
t_T = 0.3245 in.
t_B = 0.3245 in.

a_T = 0.450 in.
a_B = 0.440 in.
a₀ = 0.520 in.

PRECRACK DATA

NET AREA = 0.6847 in.²

P_{max} = 9,449 lbs
P_{min} = 945 lbs

LEFT = 0.050/0.078 in.
RIGHT = 0.050/0.068 in.
No of cycles = 8915

FAILURE LOAD AFTER
PRE-CRACKING
P = 34,750 lbs

Figure 4-15A. Fracture Toughness Data Sheet GT160KAB51-11A

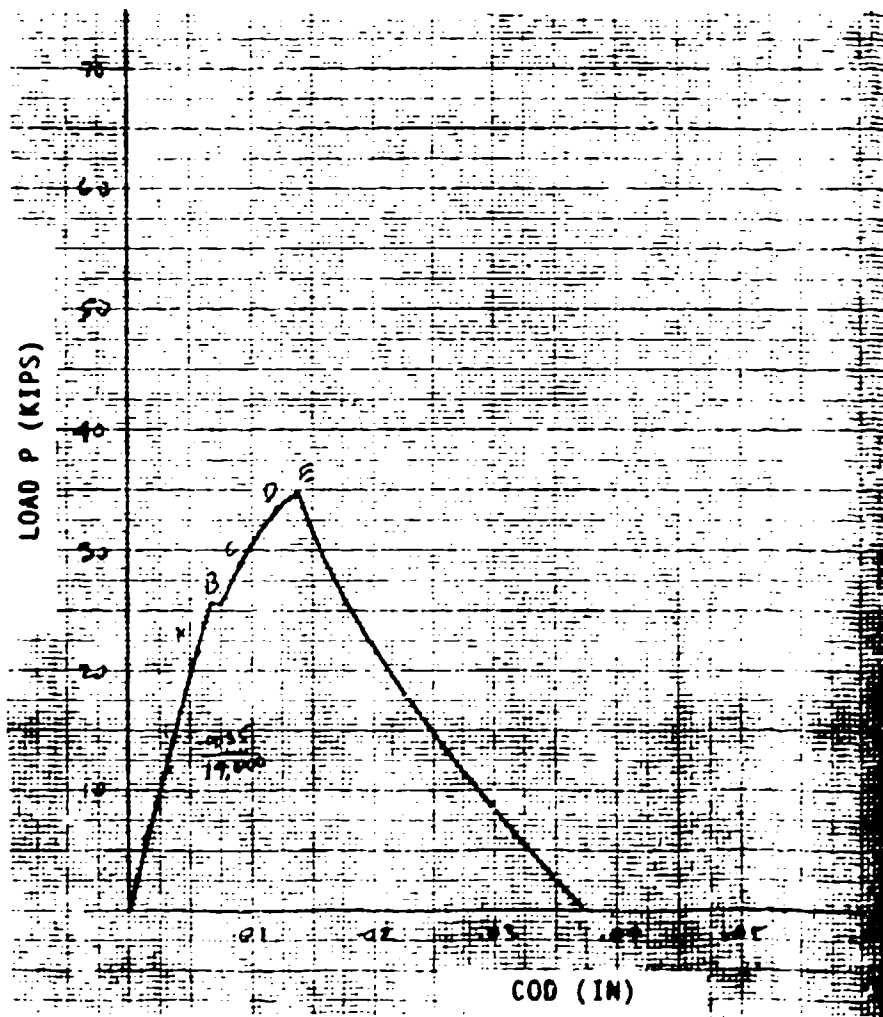
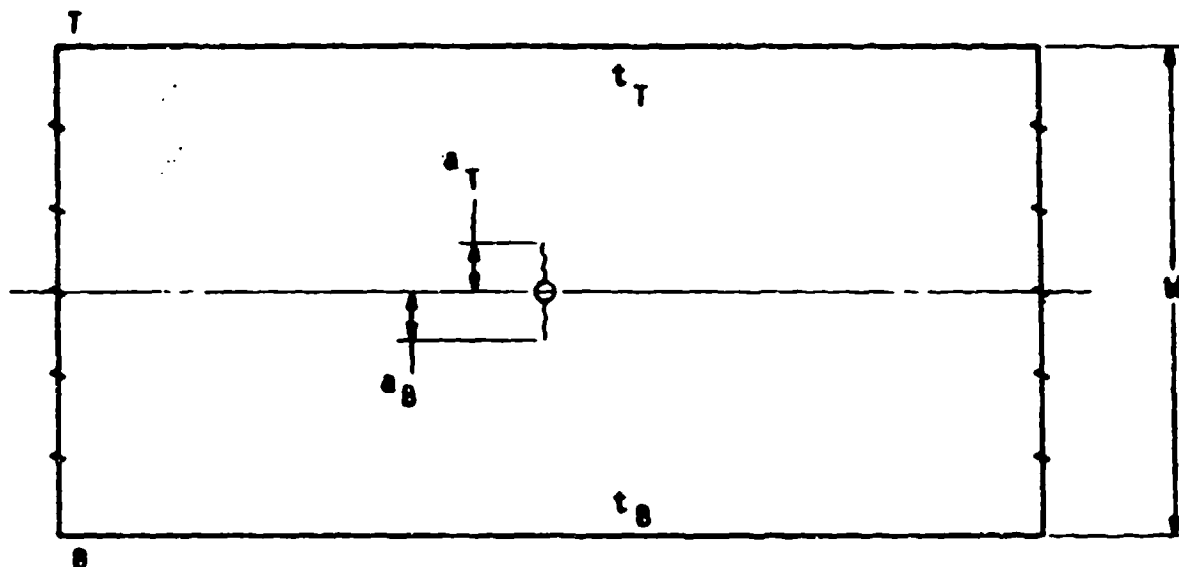


Figure 4-158. Applied Load vs. Crack Opening Displacement GT160KAB51-11A

SPECIMEN NO. GT160KAB51-11B

MAT'L — 7075-T651



SPECIMEN MEASUREMENTS

$W = 2.999 \text{ in.}$
 $t_T = 0.322 \text{ in.}$
 $t_B = 0.324 \text{ in.}$

$a_T = 0.450 \text{ in.}$
 $a_B = 0.430 \text{ in.}$
 $a_0 = 0.5225 \text{ in.}$

PRECRACK DATA

NET AREA = 0.6844 in.^2

$P_{\max} = 9,445 \text{ lbs}$
 $P_{\min} = 945 \text{ lbs}$

LEFT = $0.068/0.050 \text{ in.}$
 RIGHT = $0.080/0.050 \text{ in.}$
 No of cycles = 12500

FAILURE LOAD AFTER
 PRE-CRACKING
 $P = 31,800 \text{ lbs}$

Figure 4-16A. Fracture Toughness Data Sheet GT160KAB51-11B

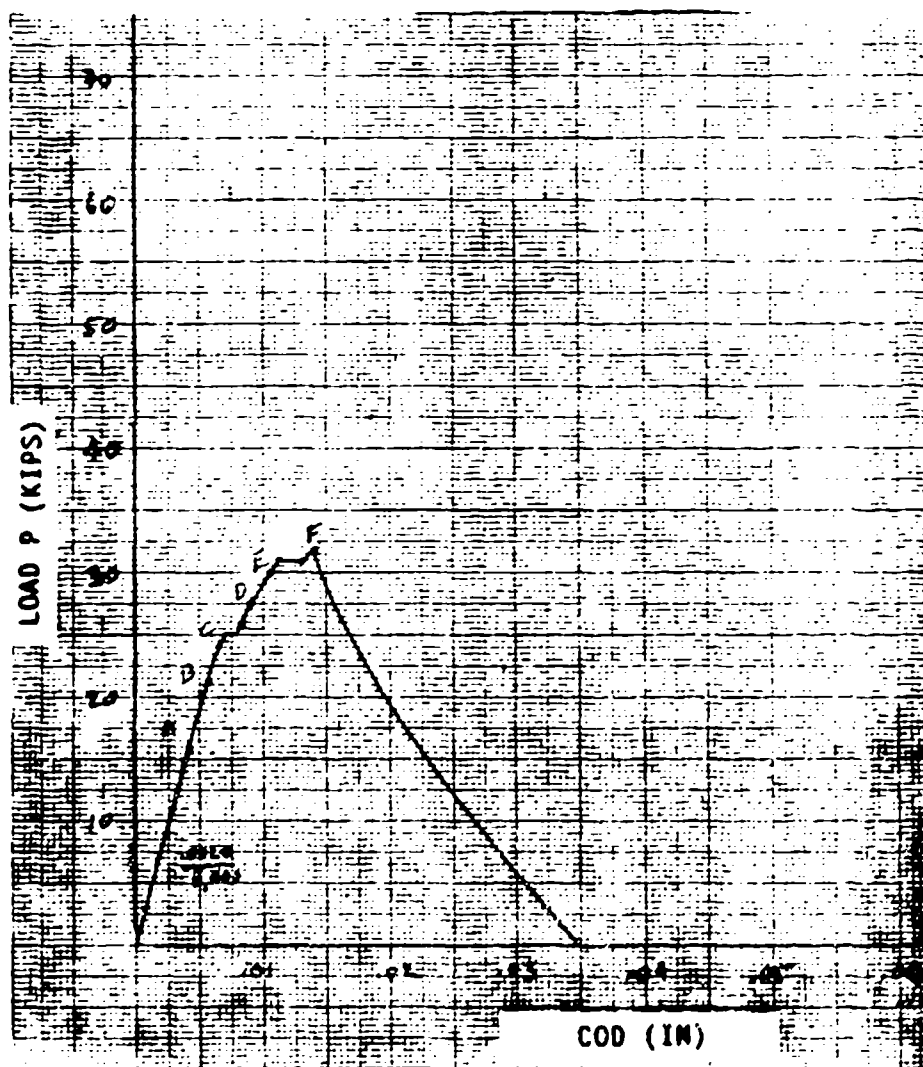
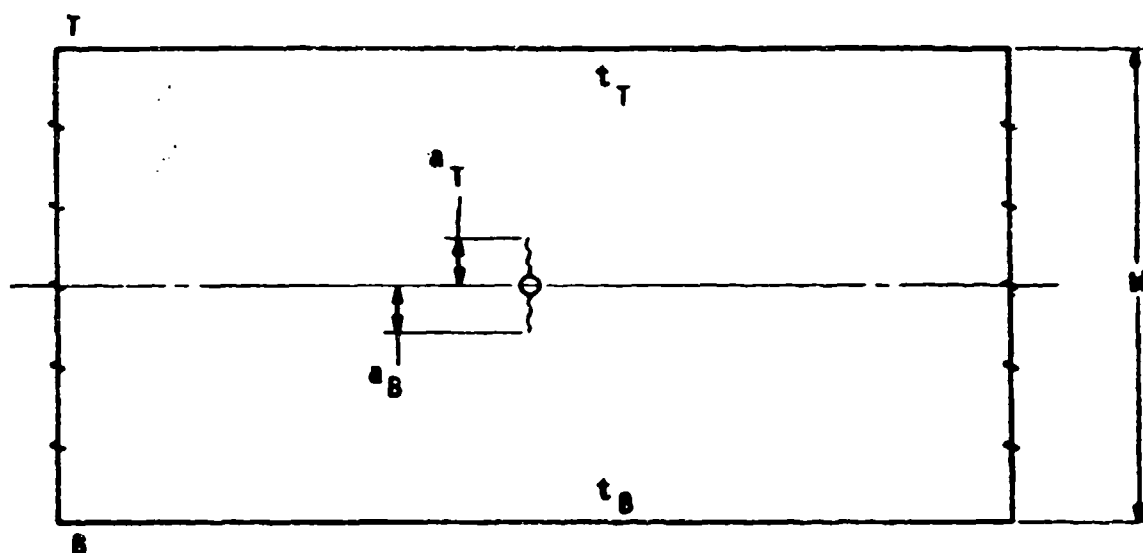


Figure 4-16B. Applied Load vs. Crack Opening Displacement GT160KAB51-11B

SPECIMEN NO. GT160KAB51-13B

MAT'L — 7075-T651



SPECIMEN MEASUREMENTS

W = 3.005 in.
t_T = 0.406 in.
t_B = 0.406 in.

a_T = 0.450 in.
a_B = 0.460 in.
a₀ = 0.535 in.

PRECRACK DATA

NET AREA = 0.8506 in.²

P_{max} = 11,738 lbs
P_{min} = 1,174 lbs

LEFT = 0.080/0.076 in.
RIGHT = 0.068/0.055 in.
No of cycles = 9450

FAILURE LOAD AFTER
PRE-CRACKING
P = 34,500 lbs

Figure 4-17A. Fracture Toughness Data Sheet GT160KAB51-13B

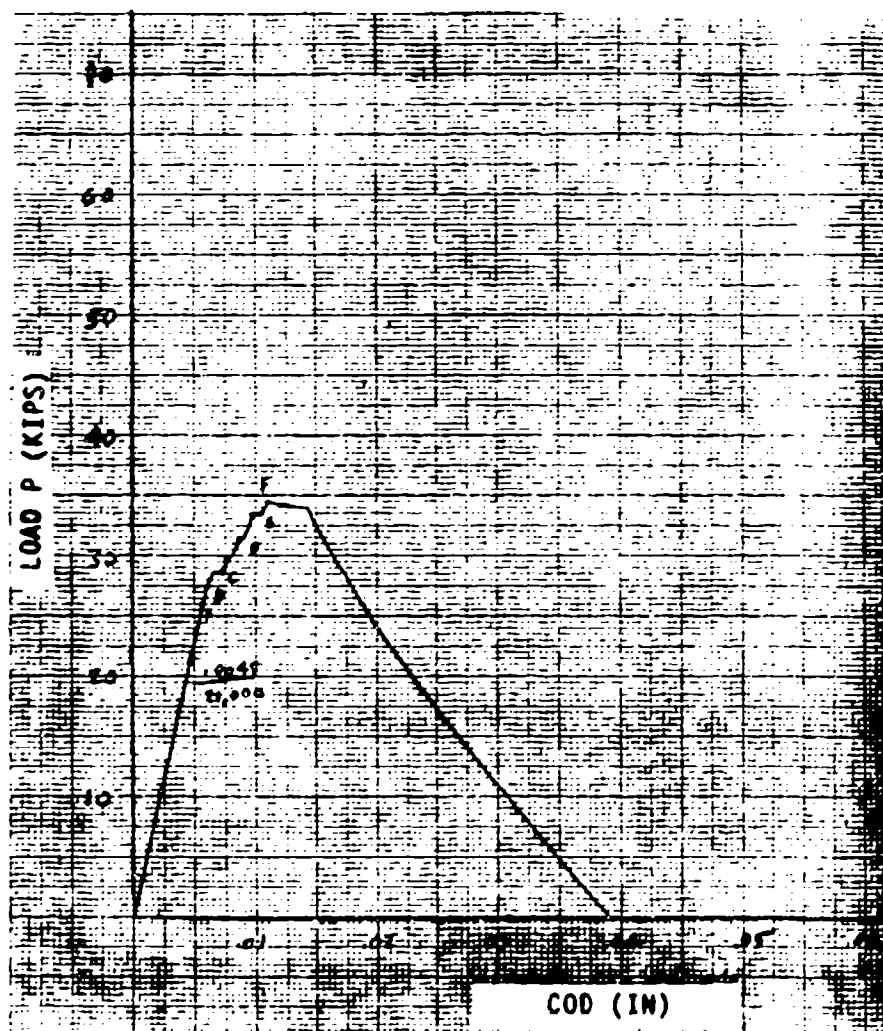
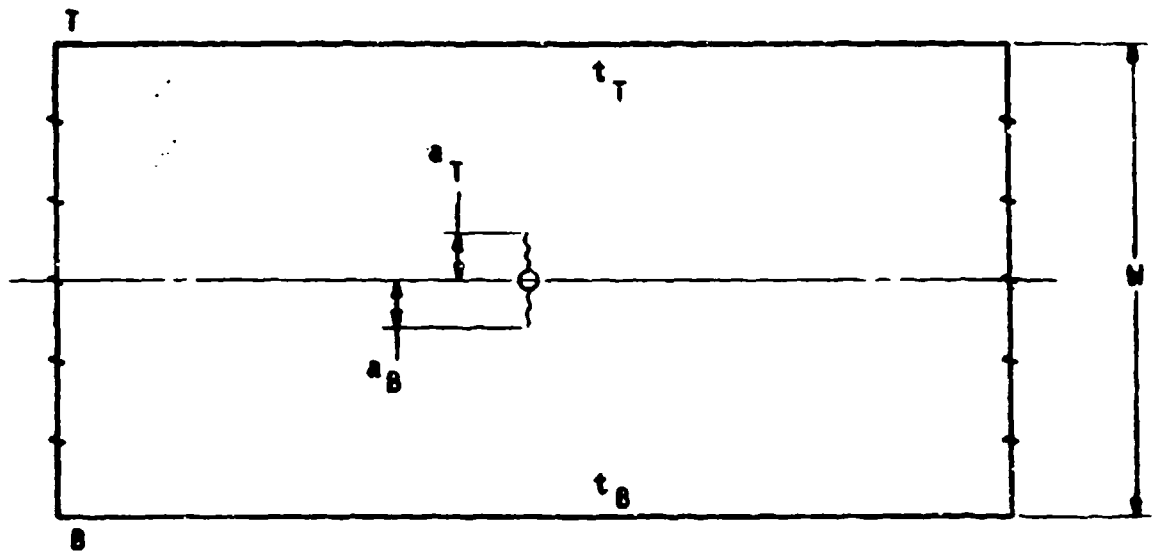


Figure 4-178. Applied Load vs. Crack Opening Displacement GT160KA851-13B

SPECIMEN NO. GT160KAB51-13C

MAT'L — 7075-T651



SPECIMEN MEASUREMENTS

W = 2.999 in.
t_T = 0.4060 in.
t_B = 0.4055 in.

a_T = 0.440 in.
a_B = 0.460 in.
a₀ = 0.525 in.

PRECRACK DATA

NET AREA = 0.8517 in.²

P_{max} = 11,753 lbs
P_{min} = 1,175 lbs

LEFT = 0.062/0.050 in.
RIGHT = 0.068/0.050 in.
No of cycles = 10332

FAILURE LOAD AFTER
PRE-CRACKING
P = 37,000 lbs

Figure 4-18A. Fracture Toughness Data Sheet GT160KAB51-13C

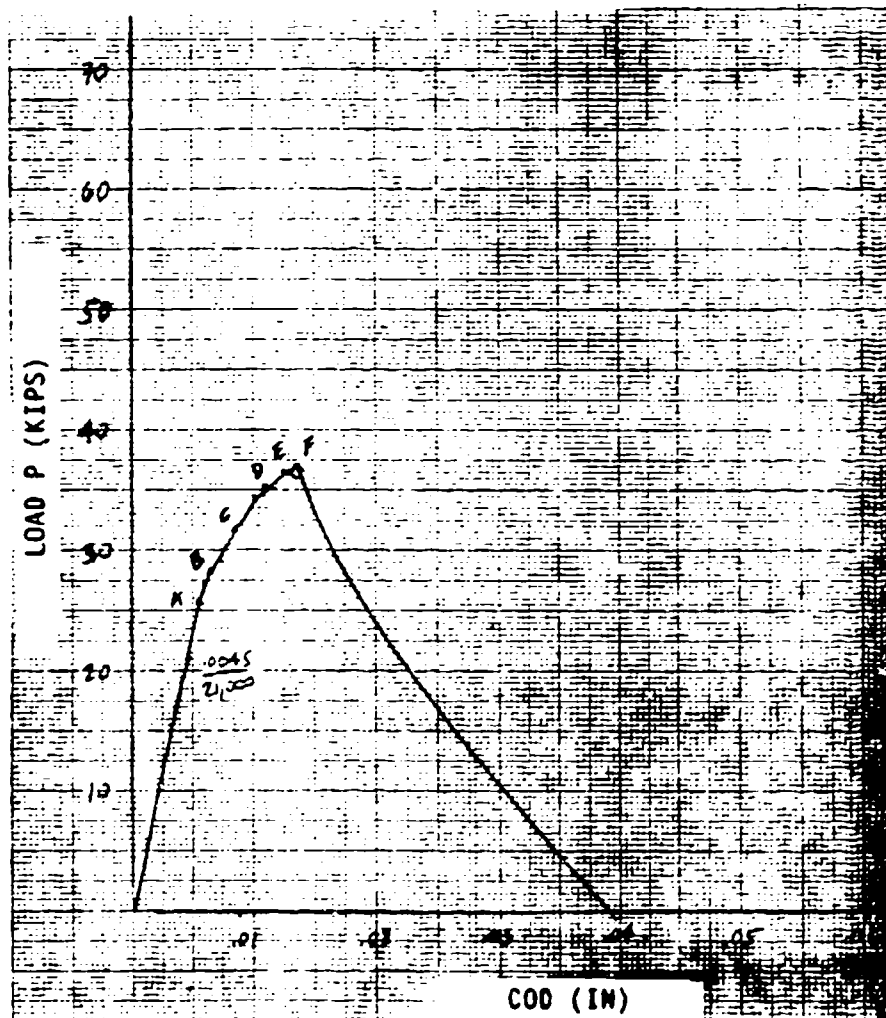
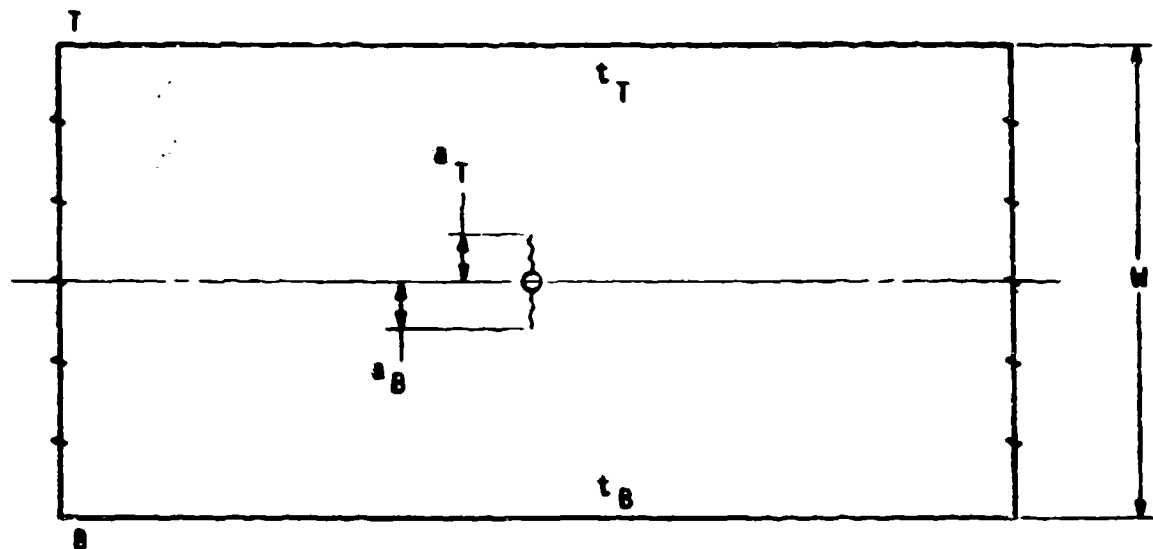


Figure 4-18B. Applied Load vs. Crack Opening Displacement GT160KAB51-13C

SPECIMEN NO. GT160KAB51-15B

MAT'L — 7075-T6



SPECIMEN MEASUREMENTS

$W = 12.00$ in.
 $t_T = 0.1573$ in.
 $t_B = 0.1570$ in.

$a_T = 1.785$ in.
 $a_B = 1.785$ in.
 $a_0 = 1.870$ in.

PRECRACK DATA

NET AREA = 1.3248 in.²

$P_{max} = 18,800$ lbs
 $P_{min} = 1,880$ lbs

LEFT = $0.060/0.050$ in.
RIGHT = $0.065/0.060$ in.
No of cycles = 1173

FAILURE LOAD AFTER
PRE-CRACKING
 $P = 59,750$ lbs

Figure 4-19A. Fracture Toughness Data Sheet GT160KAB51-15B

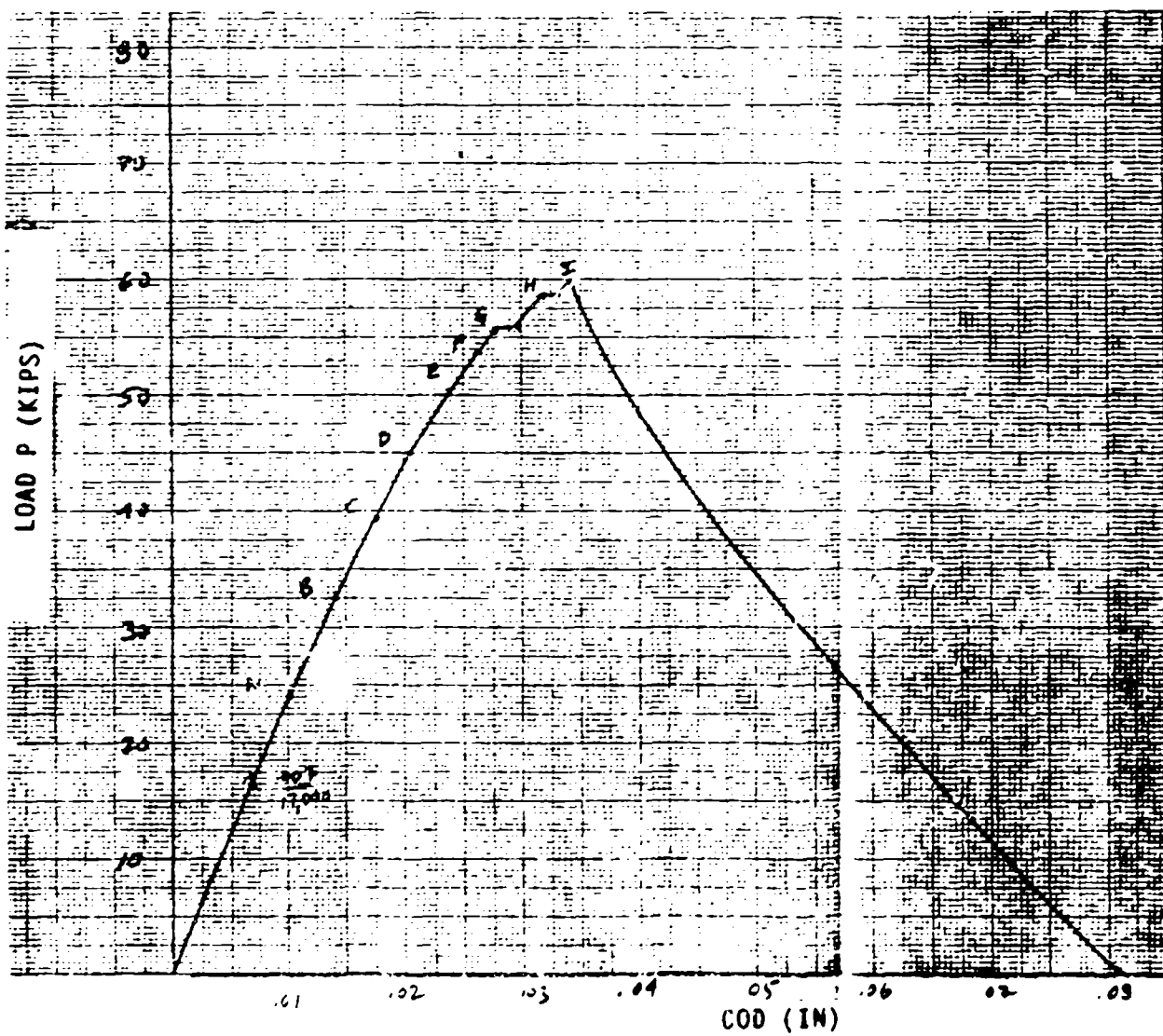
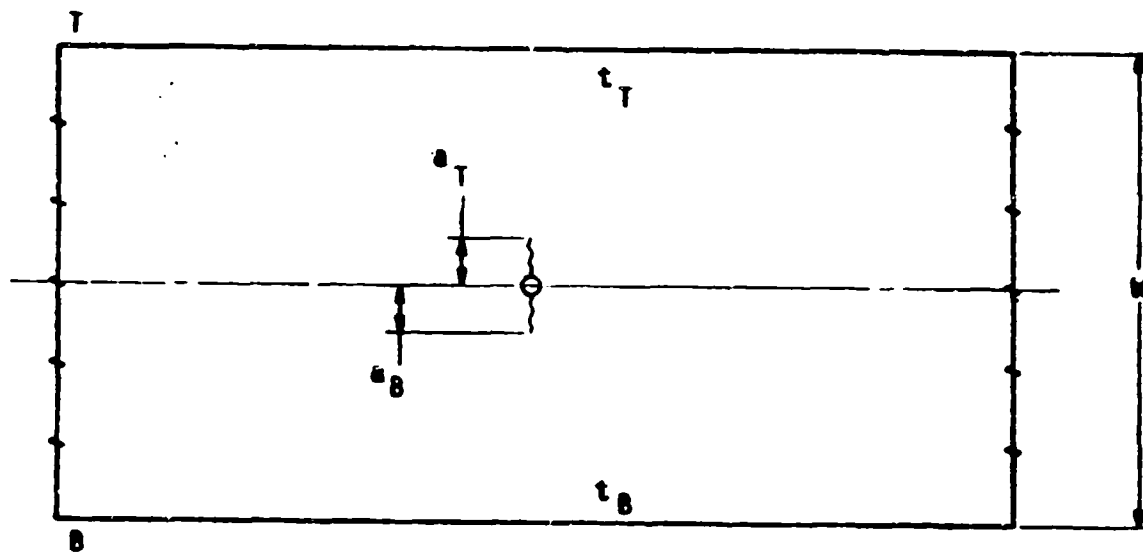


Figure 4-19B. Applied Load vs. Crack Opening Displacement GT160KAB51-15B

SPECIMEN NO. GT160KAB51-15C

MAT'L — 7075-T6



SPECIMEN MEASUREMENTS

$W = 12.00 \text{ in.}$
 $t_T = 0.1558 \text{ in.}$
 $t_B = 0.1569 \text{ in.}$

$a_T = 1.810 \text{ in.}$
 $a_B = 1.810 \text{ in.}$
 $a_0 = 1.895 \text{ in.}$

PRECRACK DATA

NET AREA = 1.3102 in.^2

$P_{\max} = 18,600 \text{ lbs}$
 $P_{\min} = 1,860 \text{ lbs}$

LEFT = $0.080/0.070 \text{ in.}$
 RIGHT = $0.050/.100 \text{ in.}$
 No of cycles = 1477

FAILURE LOAD AFTER
 PRE-CRACKING
 $P = 59,500 \text{ lbs}$

Figure 4-20A. Fracture Toughness Data Sheet GT160KAB51-15C

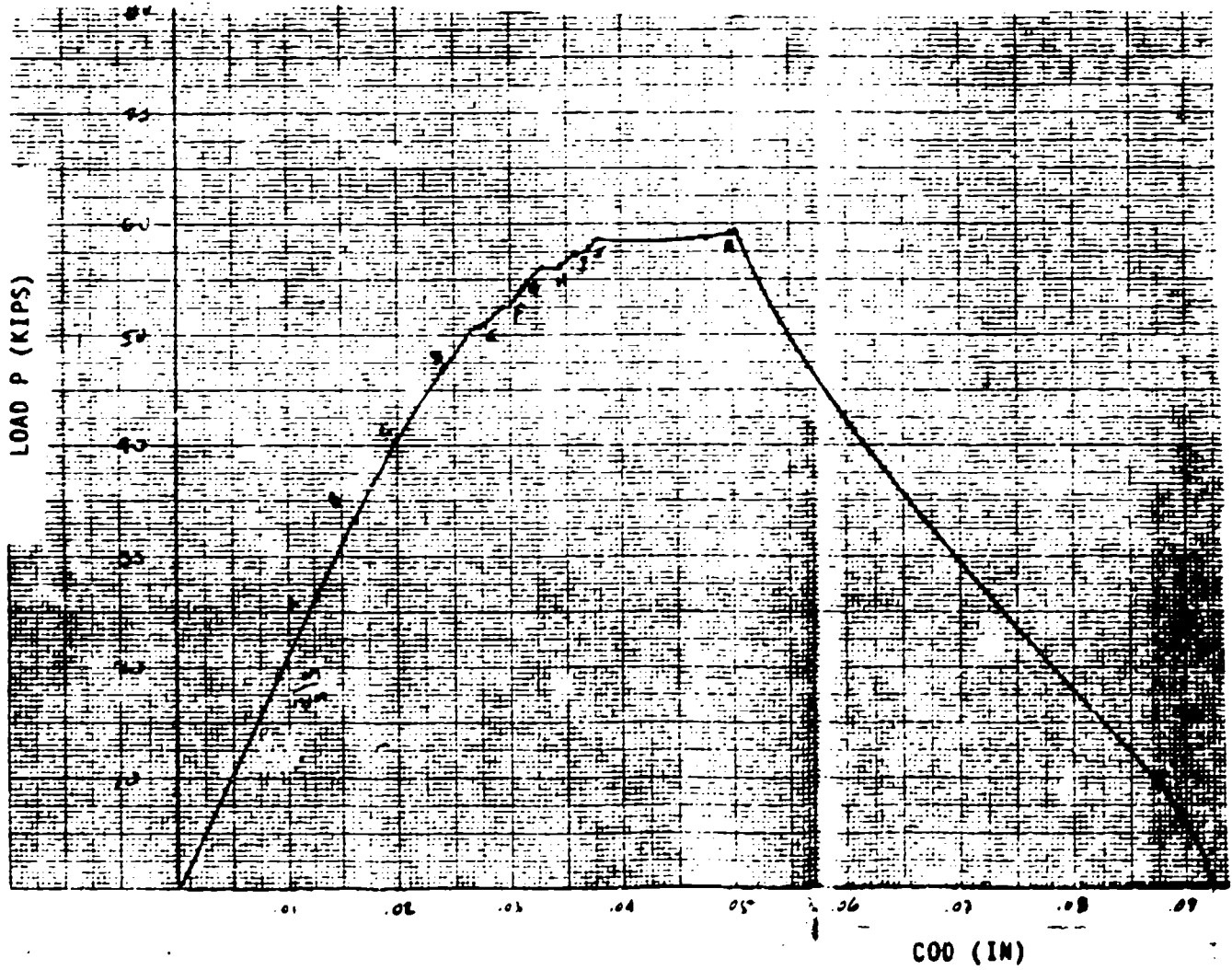
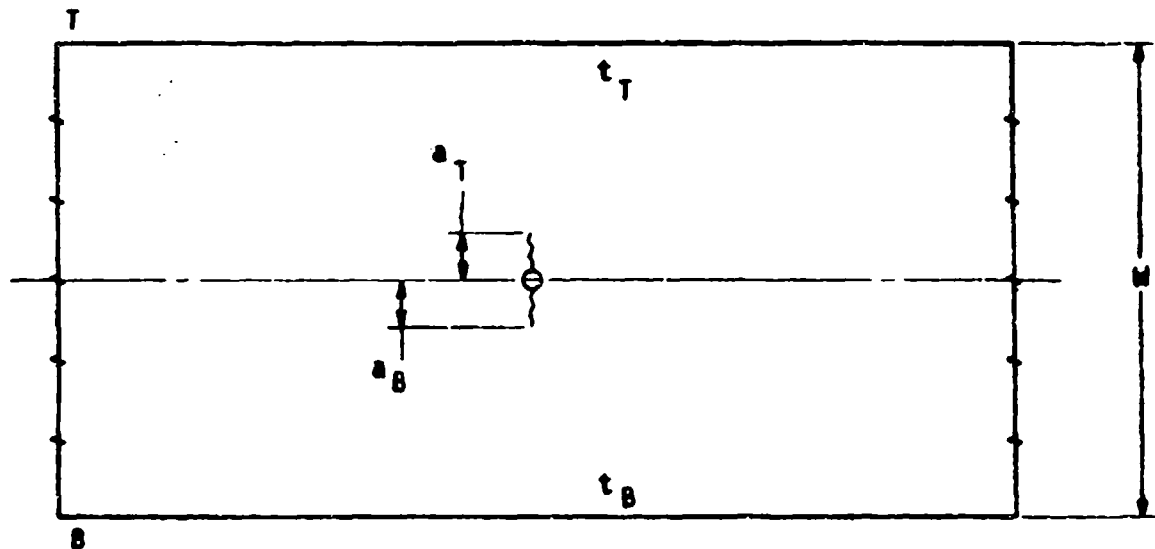


Figure 4-208. Applied Load vs. Crack Opening Displacement GT160KAB51-15C

SPECIMEN NO. GT160KAB51-17B

MAT'L — 7075-T6511 EXT.



SPECIMEN MEASUREMENTS

W = 2.748 in.
 t_T = 0.300 in.
 t_B = 0.3015 in.

a_T = 0.430 in.
 a_B = 0.430 in.
 a_0 = 0.485 in.

PRECRACK DATA

NET AREA = 0.5678 in.²

P_{max} = 8,290 lbs
 P_{min} = 829 lbs

LEFT = 0.045/0.050 in.
RIGHT = 0.040/0.060 in.
No of cycles = 17500

FAILURE LOAD AFTER
PRE-CRACKING
P = 34,900 lbs

Figure 4-21A. Fracture Toughness Data Sheet GT160KAB51-17B

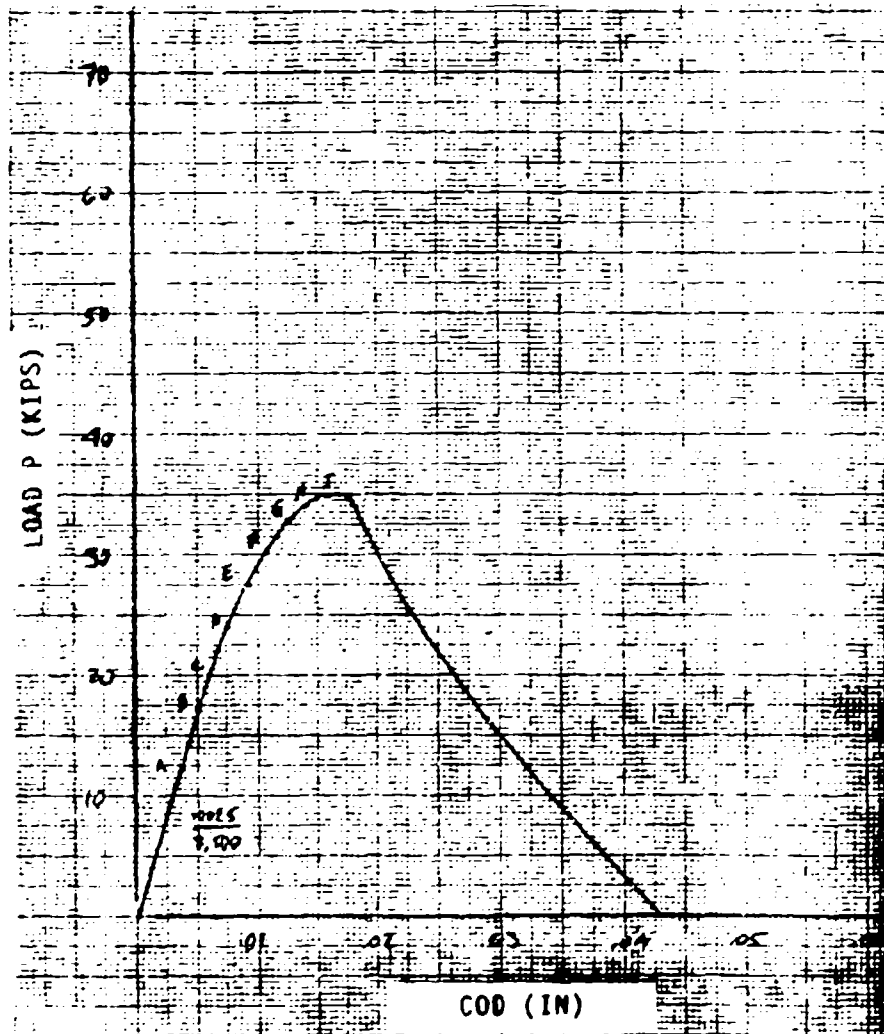
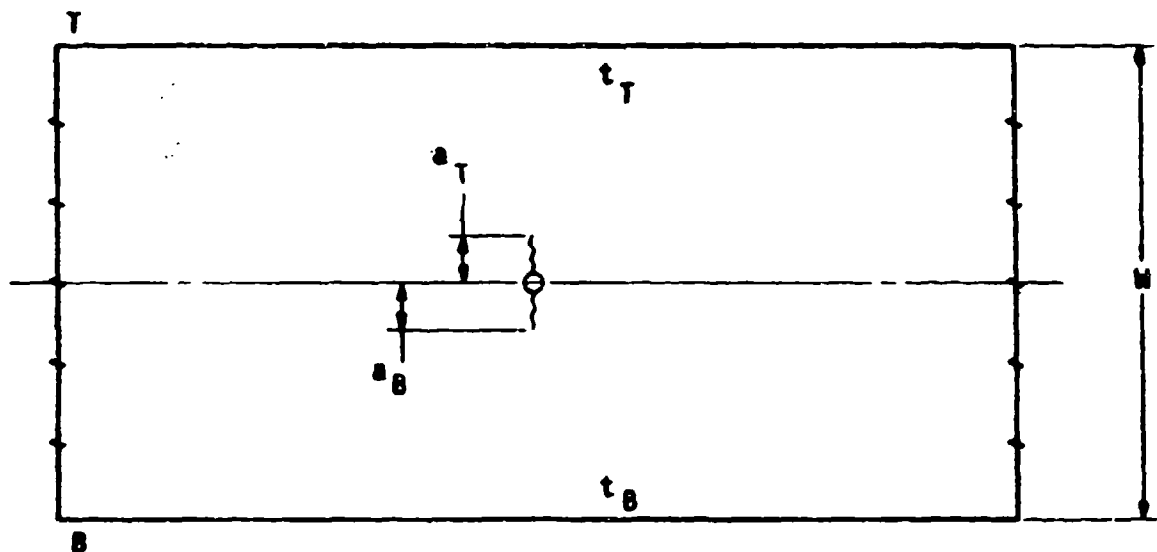


Figure 4-21B. Applied Load vs. Crack Opening Displacement GT160KAB51-17B

SPECIMEN NO. GT160KAB51-17C

MAT'L — 7075-T6511 EXT.



SPECIMEN MEASUREMENTS

W = 2.7475 in.
t_T = 0.2975 in.
t_B = 0.2985 in.

a_T = 0.400 in.
a_B = 0.410 in.
a_o = 0.510 in.

PRECRACK DATA

NET AREA = 0.5774 in.²

P_{max} = 8,430 lbs
P_{min} = 843 lbs

LEFT = 0.055/0.065 in.
RIGHT = 0.082/0.070 in.
No of cycles = 8860

FAILURE LOAD AFTER
PRE-CRACKING
P = 32,500 lbs

Figure 4-22A. Fracture Toughness Data Sheet GT160KAB51-17C

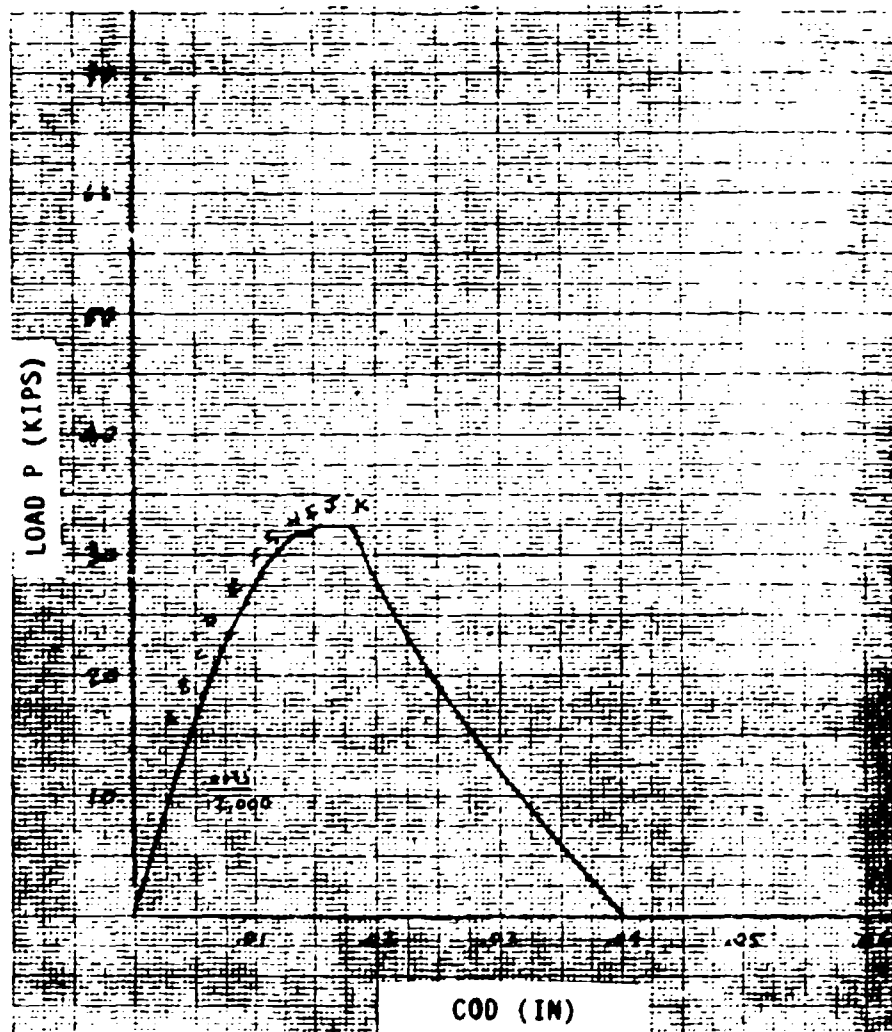
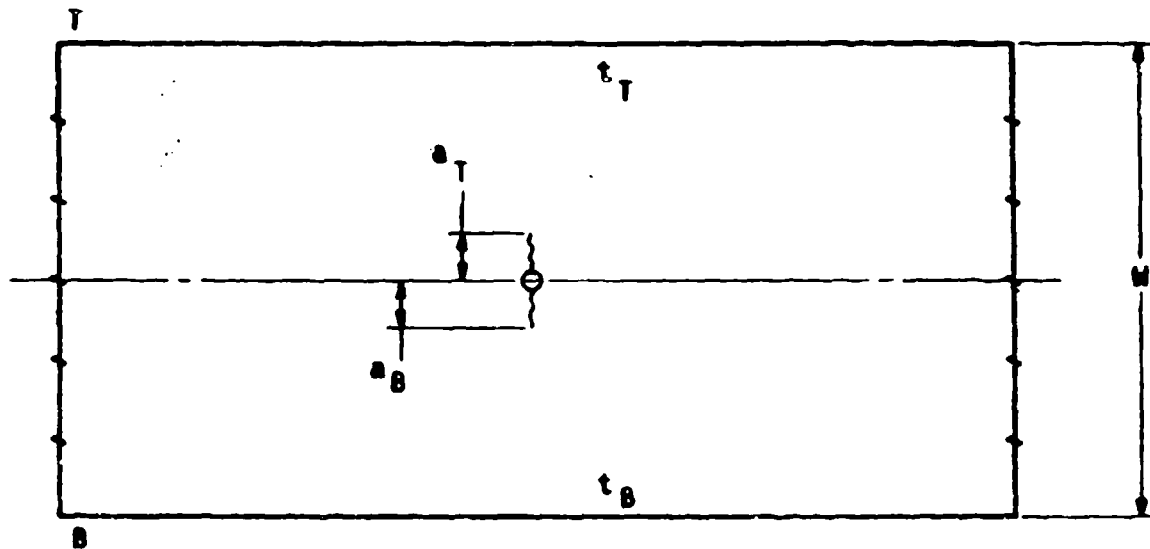


Figure 4-22B. Applied Load vs. Crack Opening Displacement GT160KAB51-17C

SPECIMEN NO. GT160KAB51-19A

MAT'L — 7075-T6511 EXT.



SPECIMEN MEASUREMENTS

W = 2.746 in.
t_T = 0.314 in.
t_B = 0.307 in.

a_T = 0.400 in.
a_B = 0.410 in.
a₀ = 0.475 in.

PRECRACK DATA

NET AREA = 0.6011 in.²

P_{max} = 8,776 lbs
P_{min} = 876 lbs

LEFT = 0.060/0.050 in.
RIGHT = 0.062/0.067 in.
No of cycles = 14235

FAILURE LOAD AFTER
PRE-CRACKING
P = 32,500 lbs

Figure 4-23A. Fracture Toughness Data Sheet GT160KAB51-19A

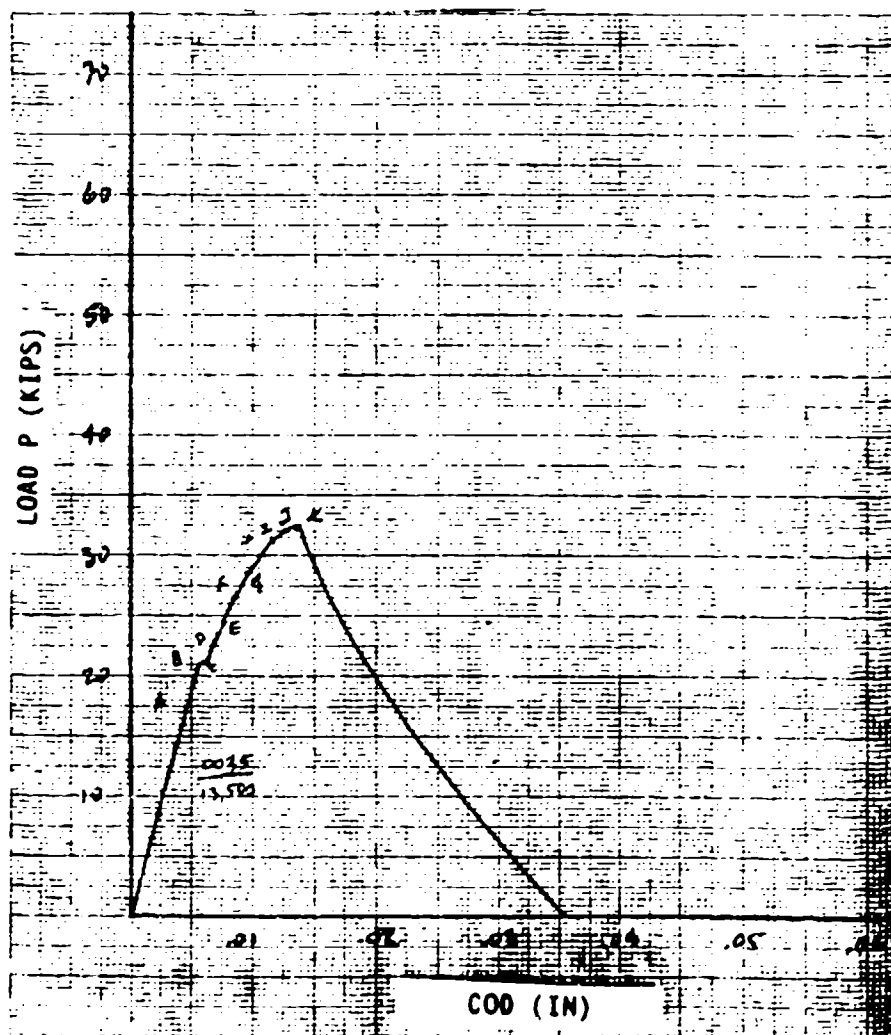
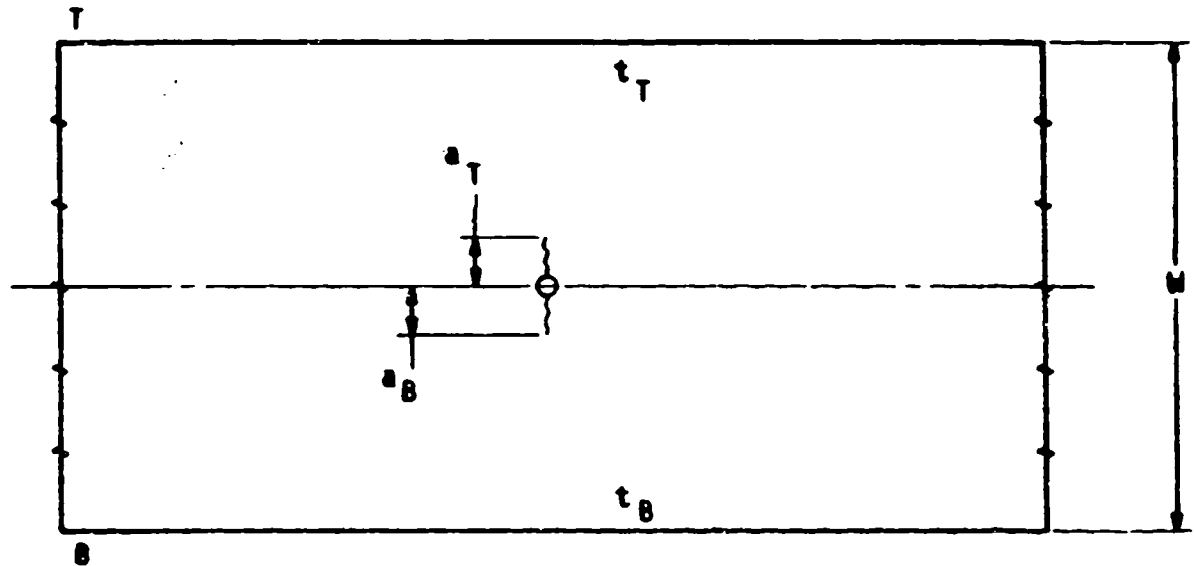


Figure 4-23B. Applied Load vs. Crack Opening Displacement GT160KAB51-19A

SPECIMEN NO. GT160KAB51-198

MAT'L — 7075-T6511 EXT.



SPECIMEN MEASUREMENTS

$W = 2.747$ in.
 $t_T = 0.3105$ in.
 $t_B = 0.3095$ in.

$a_T = 0.400$ in.
 $a_B = 0.410$ in.
 $a_0 = 0.5225$ in.

PRECRACK DATA

NET AREA = 0.6005 in.²

$P_{max} = 8,767$ lbs
 $P_{min} = 877$ lbs

LEFT = $0.095/0.050$ in.
RIGHT = $0.090/0.090$ in.
Nc of cycles = 9296

FAILURE LOAD AFTER
PRE-CRACKING
 $P = 32,250$ lbs

Figure 4-24A. Fracture Toughness Data Sheet GT160KAB51-198

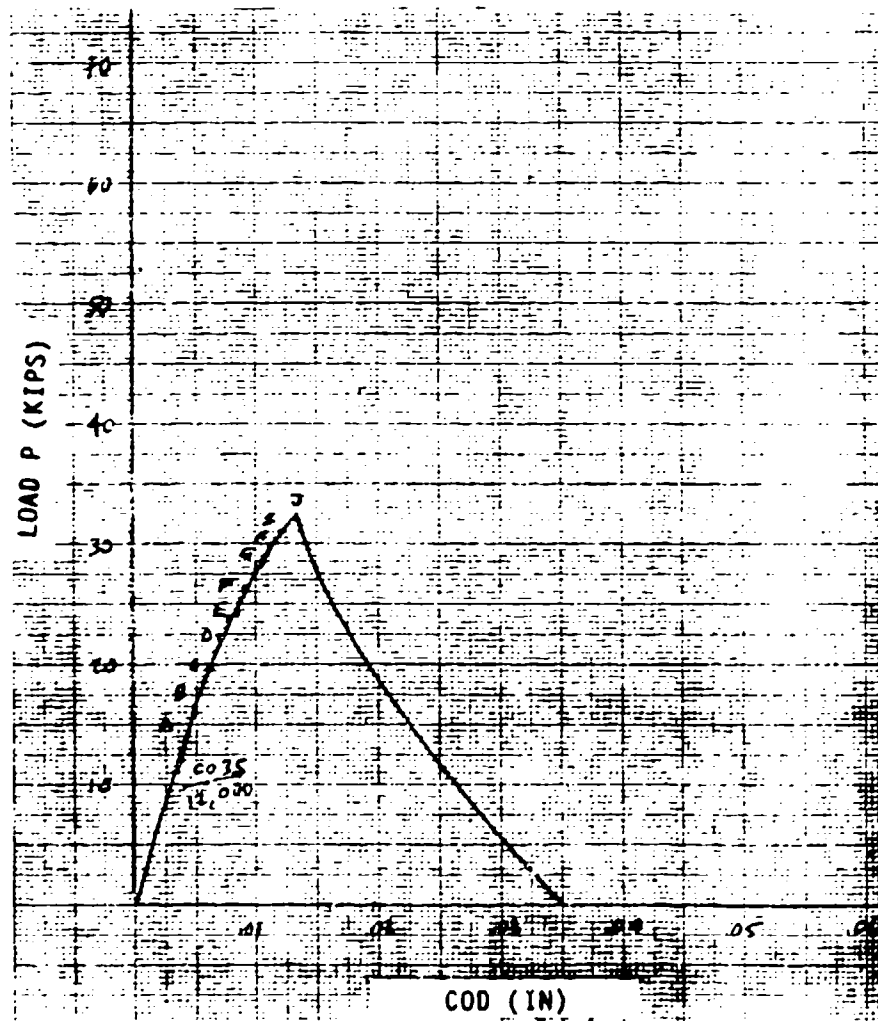


Figure 4-24B. Applied Load vs. Crack Opening Displacement GT160KAB51-198

5.0 CONSTANT AMPLITUDE CRACK GROWTH RATES TEST PROGRAM

The purpose of the constant amplitude crack growth rate test program was to establish crack growth allowables for the material form used during the structural test program. The specimens were manufactured and tested in compliance with ASTM standard E-647. The test data were fit into the "Modified Walker Equation" in term of da/dn vs K_{max} .

5.1 TEST SPECIMENS

A total of sixty-four (64) specimen were tested. The specimen configurations are shown in Figures 5-1 through 5-3. The specimens were made of 2024-T3XX and 7075-T6XX aluminum alloys, and included sheet, plate and extruded sections. The selection of the material type and material form was consistent with that used during the structural test program. Each specimen contained an initial flaw at mid section. The flaw was introduced by means of a saw-cut followed by the application of constant amplitude cycles. During the test, measurements of the crack growth were made using 'KRAK GAGES' installed on both sides of the crack. The specimens were manufactured at FRC, and tested at Mechanical Technology, Inc. located in Latham, N.Y.

5.2 TEST ENVIRONMENT

The specimens were tested under a controlled lab-air environment. The test frequency was approximately 10 Hz.

5.3 LOADING SPECTRUM

The specimens were subjected to constant amplitude loading, with maximum stress levels and stress ratios from 7.0 Ksi to 12.5 Ksi, and -0.50 to 0.50 respectively (Ref. Table 5-1).

5.4 TEST RESULTS

The test results of sixty-four (64) constant amplitude test specimens are summarized in Table 5-1. The crack propagation data for each specimen is provided in Tables 5-2 through 5-65. Most of the data shows consistent results with a relatively small degree of scatter. The test data were separated into groups of similar material form and stress ratios. Subsequently, the

Walker Constants were evaluated using a best fit curve. For the majority of the specimens, an excellent fit was obtained. An exception was the testing of the 2024-T3511 Tee section at $R > 0.0$, and the 7075-T611 Tee section at $R > 0.0$. The Raw Test Data for the 2024-T3511 Tee Section, S/N No. 2, and 7075-T6511 Tee Section, S/N No. 3 were therefore not used.

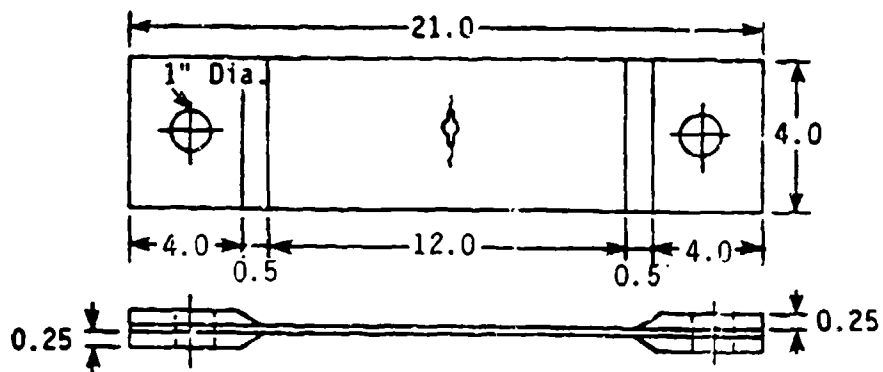


Figure 5-1. Crack Growth Specimen - 4" Wide

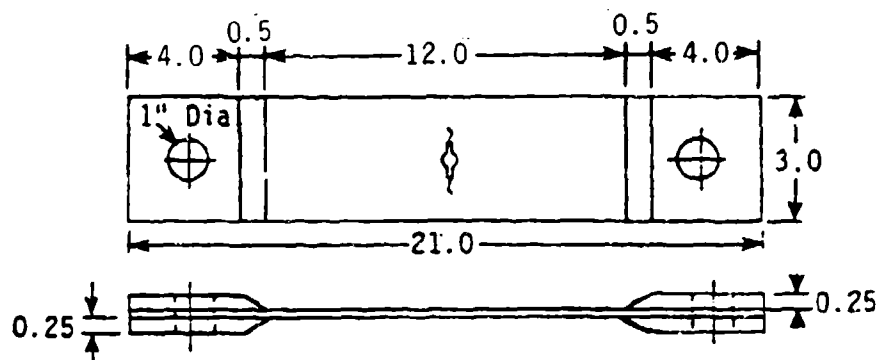


Figure 5-2. Crack Growth Specimen - 3" Wide

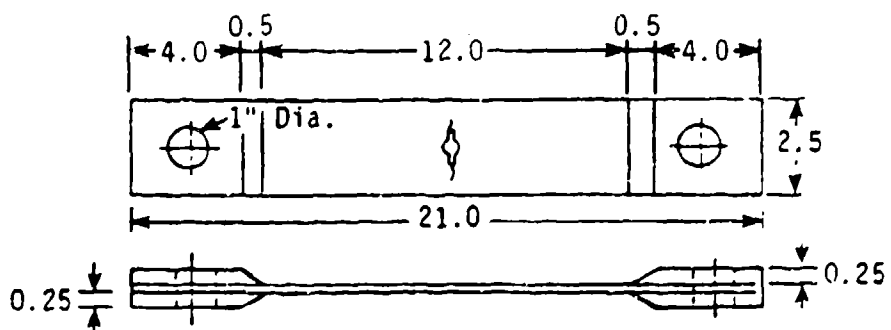


Figure 5-3. Crack Growth Specimen - 2.5" Wide

TABLE 5-1. SUMMARY OF CONSTANT AMPLITUDE COUPON TEST

REF. GT160KAB49- DASH	S/N	PRODUCT FORM	W (IN)	t (IN)	σ_{max} (ksi)	R	CYCLES TO FAILURE	a_{cr} (IN)
-1	1	2024-T3 Sheet	4.01	0.195	7.30	0.05	195,793	1.3987
↑	2	↑	4.01	0.195	12.34	0.05	31,761	1.3599
↓	3	↓	4.01	0.195	8.26	0.50	560,027	1.3541
-1	4	2024-T3 Sheet	4.01	0.195	12.37	0.50	103,620	0.9772
-21	1	2024-T3 Sheet	4.00	0.195	7.23	-0.31	169,654	1.4133
↑	2	↑	4.00	0.195	11.95	-0.30	30,356	1.3431
↓	3	↓	4.00	0.195	7.25	-0.50	165,200	1.3781
-21	4	2024-T3 Sheet	4.00	0.195	11.78	-0.50	31,286	1.4157
-03	1	2024-T351 Plate	4.00	0.250	7.62	0.05	183,160	1.3537
↑	2	↑	4.00	0.250	11.95	0.05	38,344	1.6596
↓	3	↓	4.00	0.250	7.60	0.50	1,039,616	1.3450
-03	4	2024-T351 Plate	4.00	0.250	11.96	0.50	132,349	1.3789
-23	1	2024-T351 Plate	4.01	0.250	7.00	-0.30	161,030	1.4048
↑	2	↑	4.01	0.250	11.97	-0.30	31,604	1.4439
↓	3	↓	4.01	0.250	7.06	-0.50	131,996	1.4088
-23	4	2024-T351 Plate	4.01	0.250	12.08	-0.50	40,827	1.3700
-07	1	2024-T3511 Angle	2.25	0.250	8.10	0.05	264,603	0.8205
↑	2	↑	2.25	0.250	10.54	0.05	73,321	0.8530
↓	3	↓	2.26	0.250	8.97	0.50	552,960	0.7421
-07	4	2024-T3511 Angle	2.26	0.250	12.40	0.50	149,082	0.4424
-27	1	2024-T3511 Angle	2.25	0.250	8.90	-0.30	361,811	0.7861
↑	2	↑	2.25	0.250	12.05	-0.30	52,950	0.8689
↓	3	↓	2.25	0.250	8.85	-0.50	365,959	0.8297
-27	4	2024-T3511 Angle	2.25	0.250	12.15	-0.50	58,846	0.9225
-05	1	2024-T3511 Tee	2.75	0.200	6.74	0.05	176,105	0.8633
↑	2	↑	2.75	0.192	11.42	0.05	215,109	0.9029
↓	3	↓	2.75	0.193	7.69	0.50	404,202	0.8580
-05	4	2024-T3511 Tee	2.75	0.198	11.15	0.50	257,406	0.8638
-25	1	2024-T3511 Tee	2.74	0.186	7.74	-0.30	215,060	0.9162
↑	2	↑	2.74	0.188	12.15	-0.30	19,050	0.9176
↓	3	↓	2.74	0.187	6.61	-0.50	105,610	0.9488
-25	4	2024-T3511 Tee	2.74	0.187	11.10	-0.50	20,451	0.8583
-11	1	7075-T6 Sheet	4.00	0.156	6.85	0.05	64,645	1.4916
↑	2	↑	4.00	0.156	11.90	0.05	17,792	0.9645
↓	3	↓	4.00	0.156	7.88	0.50	197,716	1.7698
-11	4	7075-T6 Sheet	4.00	0.156	12.05	0.50	36,996	1.5173

TABLE 5-1. SUMMARY OF CONSTANT AMPLITUDE COUPON TEST (Continued)

REF. GT160KAB49- DASH	S/N	PRODUCT FORM	W (IN)	t (IN)	σ_{max} (ksi)	R	CYCLES TO FAILURE	a_{cr} (IN)
-31	1	7075-T6 Sheet	4.00	0.158	6.85	-0.31	56,745	1.3239
↑	2	↑	4.00	0.158	11.98	-0.31	21,924	1.4690
↓	3	↓	4.00	0.158	7.00	-0.50	70,093	1.3450
-31	4	7075-T6 Sheet	4.00	0.158	12.00	-0.50	23,348	1.2650
-13	1	7075-T651 Plate	3.00	0.322	4.65	0.05	342,911	1.0775
↑	2	↑	3.00	0.322	10.50	0.05	39,107	1.2113
↓	3	↓	3.00	0.321	3.15	0.50	385,065	1.2180
-13	4	7075-T651 Plate	3.00	0.321	6.02	0.50	70,333	1.1775
-33	1	7075-T651 Plate	3.00	0.320	7.05	-0.30	71,502	1.0691
↑	2	↑	3.00	0.320	10.53	-0.30	37,051	0.9264
↓	3	↓	3.00	0.320	7.07	-0.50	80,404	0.8983
-33	4	7075-T651 Plate	3.00	0.320	11.38	-0.50	26,917	1.1493
-17	1	7075-T6511 Angle	2.75	0.309	7.12	0.05	129,789	0.6764
↑	2	↑	2.75	0.308	11.32	0.05	36,556	1.0085
↓	3	↓	2.75	0.307	7.24	0.50	272,880	1.1025
-17	4	7075-T6511 Angle	2.75	0.310	11.20	0.50	56,064	0.9471
-37	1	7075-T6511 Angle	2.75	0.320	7.00	-0.33	52,737	0.9171
↑	2	↑	2.75	0.320	11.89	-0.31	14,097	1.2785*
↓	3	↓	2.75	0.320	6.98	-0.51	66,755	0.9118
-37	4	7075-T6511 Angle	2.75	0.320	11.43	-0.50	12,323	1.1567
-15	1	7075-T6511 Tee	2.75	0.300	6.85	0.05	38,364	0.9522
↑	2	↑	2.75	0.300	10.73	0.05	29,848	1.1217
↓	3	↓	2.75	0.300	6.85	0.50	631,411	1.0358
-15	4	7075-T6511 Tee	2.75	0.300	11.04	0.50	66,364	0.9450
-35	1	7075-T6511 Tee	2.75	0.302	6.82	-0.33	53,127	1.1860
↑	2	↑	2.74	0.312	11.19	-0.30	19,224	1.1809*
↓	3	↓	2.74	0.312	6.80	-0.50	39,772	1.0807
-35	4	7075-T6411 Tee	2.75	0.302	11.86	-0.50	23,327	1.032

*Net stress exceed yield stress at failure

TABLE 5-4. CRACK GROWTH DATA SPECIMEN GT160KAB49-01 S/N 3

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
1.	0.3490	0.3400	0.3445	0.213
62512.	0.3423	0.3461	0.3452	0.499
98266.	0.3897	0.3750	0.3813	0.500
149937.	0.4071	0.3987	0.4029	0.498
202329.	0.4234	0.4207	0.4220	0.498
242860.	0.4478	0.4333	0.4416	0.498
269172.	0.4624	0.4619	0.4621	0.496
297060.	0.4868	0.4726	0.4797	0.498
319404.	0.5048	0.4989	0.5018	0.495
341655.	0.5292	0.5111	0.5202	0.497
358812.	0.5478	0.5337	0.5408	0.498
374690.	0.5664	0.5537	0.5611	0.497
389502.	0.5844	0.5783	0.5814	0.497
399660.	0.6089	0.5869	0.5979	0.498
411496.	0.6292	0.6126	0.6209	0.497
42440.	0.6336	0.6286	0.6401	0.498
43314.	0.6705	0.6450	0.6577	0.497
443309.	0.6923	0.6645	0.6800	0.498
451547.	0.7187	0.6841	0.7014	0.497
461906.	0.7362	0.5804	0.6583	0.498
489629.	0.7371	0.7317	0.7344	0.497
487942.	0.7827	0.7501	0.7664	0.498
483450.	0.8059	0.7715	0.7887	0.497
484389.	0.8274	0.7910	0.8092	0.497
493780.	0.8478	0.8118	0.8298	0.497
498366.	0.8687	0.8361	0.8494	0.498
502355.	0.8885	0.8485	0.8685	0.498
50744.	0.9094	0.8737	0.8906	0.497
513730.	0.9344	0.8925	0.9134	0.497
516095.	0.9588	0.9059	0.9324	0.498
518962.	0.9722	0.9194	0.9513	0.498
522387.	0.9960	0.9450	0.9705	0.497
525743.	1.0210	0.9572	0.9891	0.498
529417.	1.0437	0.9762	1.0099	0.497
531565.	1.0617	1.0006	1.0312	0.498
534488.	1.0822	1.0139	1.0533	0.498
536607.	1.1047	1.0373	1.0703	0.498
538412.	1.1257	1.0550	1.0903	0.498
540675.	1.1454	1.0711	1.1088	0.498
542729.	1.1664	1.0917	1.1190	0.497
545071.	1.1914	1.1113	1.1513	0.495
546968.	1.2135	1.1284	1.1709	0.498
549167.	1.2379	1.1479	1.1928	0.498
551137.	1.2605	1.1687	1.2146	0.498
552461.	1.2850	1.1846	1.2348	0.493
553938.	1.3094	1.2048	1.2571	0.494
555679.	1.3326	1.2261	1.2794	0.498
556792.	1.3553	1.2458	1.2981	0.497
557982.	1.3721	1.2594	1.3160	0.499
559018.	1.3966	1.2720	1.3343	0.498
560027.	1.4204	1.2875	1.3541	0.498

TABLE 5-5. CRACK GROWTH DATA SPECIMEN GT160KAB49-01 S/N 4

CYCLE #	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
7036	0.3172	0.2982	0.3078	12369	0.497
7663	0.3176	0.3199	0.3297	12356	0.498
7669	0.3601	0.3381	0.3491	12369	0.496
79526	0.3789	0.3539	0.3664	12369	0.498
84522	0.4035	0.3709	0.3872	12382	0.496
80079	0.4252	0.3879	0.4065	12369	0.498
73852	0.4437	0.4096	0.4276	12382	0.498
74085	0.4550	0.4201	0.4376	12369	0.497
52874	0.4902	0.4536	0.4719	12382	0.497
56151	0.5149	0.4700	0.4924	12382	0.497
59737	0.5360	0.4899	0.5129	12369	0.497
62357	0.5571	0.5075	0.5323	12382	0.498
63591	0.5805	0.5268	0.5537	12382	0.497
68316	0.5981	0.5491	0.5736	12382	0.497
70256	0.6233	0.5649	0.5941	12369	0.498
72746	0.6450	0.5866	0.6158	12369	0.498
7725	0.6685	0.6071	0.6378	12382	0.498
76743	0.6931	0.6218	0.6574	12356	0.498
78908	0.7124	0.6464	0.6794	12382	0.497
62537	0.7376	0.6529	0.6953	12369	0.497
81936	0.7482	0.6773	0.7128	12369	0.498
82850	0.7716	0.6845	0.7281	12382	0.497
84761	0.7904	0.7092	0.7498	12382	0.497
86312	0.8150	0.7262	0.7706	12395	0.497
87498	0.8349	0.7508	0.7929	12382	0.497
98701	0.8590	0.7602	0.8096	12369	0.498
90083	0.8824	0.7824	0.8324	12369	0.497
91460	0.9035	0.8053	0.8544	12356	0.498
92611	0.8543	0.8299	0.8421	12369	0.497
93708	0.8725	0.8345	0.8635	12369	0.498
94793	0.8947	0.8792	0.8869	12369	0.498
95865	0.9153	0.9028	0.9095	12356	0.498
103620	0.9833	0.9712	0.9772	12369	0.498

TABLE 5-7. CRACK GROWTH DATA SPECIMEN GT160XAB49-21 S/N 2

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	
	LEFT	RIGHT		AVERAGE	
1542	0.3206	0.3146	0.3177	11926	- 302
2548	0.3302	0.3281	0.3292	11899	- 303
3508	0.3427	0.3405	0.3416	11913	- 301
4419	0.3539	0.3511	0.3535	11913	- 303
5215	0.3672	0.3644	0.3658	11926	- 303
6038	0.3810	0.3738	0.3774	11926	- 303
6879	0.3944	0.3841	0.3894	11913	- 302
7822	0.4068	0.3978	0.4023	11886	- 303
8804	0.4197	0.4044	0.4120	11913	- 303
9839	0.4334	0.4194	0.4252	11913	- 303
10922	0.4475	0.4332	0.4399	11913	- 305
12088	0.4518	0.4425	0.4492	11940	- 303
13353	0.4630	0.4569	0.4609	11886	- 303
14739	0.4777	0.4634	0.4706	11899	- 302
16247	0.4913	0.4715	0.4814	11926	- 303
17889	0.5050	0.4830	0.4940	11899	- 302
19679	0.5188	0.4919	0.5053	11940	- 303
21615	0.5321	0.4955	0.5138	11998	- 301
23704	0.5475	0.5085	0.5280	11940	- 303
25952	0.5622	0.5215	0.5393	11926	- 303
28369	0.5777	0.5324	0.5548	11913	- 303
30958	0.5879	0.5353	0.5616	11926	- 303
33730	0.5939	0.5302	0.5620	11926	- 300
36694	0.6049	0.5369	0.5709	11913	- 302
39852	0.6194	0.55018	0.6106	11913	- 303
43308	0.6323	0.5613	0.6247	11940	- 302
46979	0.6445	0.6207	0.6376	11913	- 302
50862	0.6565	0.6347	0.6456	11940	- 302
54968	0.6699	0.6501	0.6600	11926	- 300
59303	0.6827	0.6608	0.6717	11886	- 303
63873	0.6900	0.6835	0.6913	11940	- 300
68684	0.7136	0.6944	0.7040	11926	- 303
73824	0.7286	0.7066	0.7176	11886	- 303
79303	0.7435	0.7167	0.7301	11926	- 302
85047	0.7551	0.7264	0.7407	11913	- 302
91098	0.7670	0.7428	0.7549	11940	- 303
97482	0.7807	0.7532	0.7669	11913	- 301
104288	0.7991	0.7603	0.7797	11899	- 300
111863	0.8127	0.7698	0.7913	11913	- 302
120695	0.8272	0.7834	0.8053	11886	- 301
130815	0.8433	0.7955	0.8194	11953	- 300
142391	0.8539	0.8096	0.8327	11926	- 302
15554	0.8722	0.8186	0.8449	11913	- 303
170091	0.8882	0.8307	0.8600	11940	- 302
186153	0.9085	0.8418	0.8751	11926	- 302
20392	0.9237	0.8608	0.8923	11926	- 302
22360	0.9422	0.8795	0.9103	11907	- 303
24504	0.9586	0.8982	0.9284	11926	- 303
26911	0.9808	0.9102	0.9455	11926	- 303
29580	0.9971	0.9226	0.9599	11899	- 302
32546	1.0130	0.9325	0.9727	11926	- 303
35801	1.0337	0.9464	0.9900	11996	- 303

TABLE 5-8. CRACK GROWTH DATA SPECIMEN GT160KAB49-21 S/N 3

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
33115	0.2940	0.3032	0.2986	122.
33803	0.3061	0.3111	0.3076	7234.
34118	0.3118	0.3239	0.3179	7275
34307	0.3236	0.3359	0.3297	7261.
34903	0.3352	0.3482	0.3417	7302.
35133	0.3442	0.3521	0.3521	7288.
36085	0.3558	0.3688	0.3623	7288.
37238	0.3679	0.3766	0.3722	7275.
38211	0.3802	0.3885	0.3843	7261.
38574	0.3920	0.4015	0.3968	7275.
39456	0.4023	0.4135	0.4079	7288.
40197	0.4097	0.4258	0.4177	7275.
40813	0.4219	0.4352	0.4286	7261.
41331	0.4342	0.4468	0.4405	7248.
42320	0.4467	0.4576	0.4522	7288.
43055	0.4569	0.4701	0.4635	7261.
43880	0.4699	0.4806	0.4748	7274.
44137	0.4812	0.4918	0.4865	7234.
45651	0.4935	0.5047	0.4991	7288.
46380	0.5019	0.5175	0.5099	7275.
47108	0.5136	0.5267	0.5206	7288.
48134	0.5272	0.5376	0.5324	7261.
48811	0.5399	0.5488	0.5444	7275.
49402	0.5534	0.5595	0.5565	7275.
50194	0.5662	0.5660	0.5661	7275.
51004	0.5764	0.5762	0.5773	7275.
51833	0.5886	0.5915	0.5900	7261.
52021	0.6009	0.5997	0.6003	7261.
52150	0.6131	0.6062	0.6097	7261.
52525	0.6255	0.6194	0.6219	7315.
53089	0.6389	0.6292	0.6330	7261.
53813	0.6496	0.6361	0.6429	7248.
54502	0.6627	0.6471	0.6549	7248.
55208	0.6720	0.6602	0.6661	7261.
55883	0.6847	0.6714	0.6780	7248.
56572	0.6937	0.6867	0.6902	7248.
57309	0.7052	0.6979	0.7010	7261.
58015	0.7183	0.7019	0.7101	7288.
58705	0.7322	0.7091	0.7207	7275.
59455	0.7457	0.7313	0.7330	7248.
60274	0.7559	0.7312	0.7430	7288.
61042	0.7639	0.7300	0.7560	7248.
61814	0.7739	0.7525	0.7670	7248.
62599	0.7839	0.7651	0.7790	7275.
63471	0.8060	0.7728	0.7894	7261.
64304	0.8185	0.7840	0.8013	7275.
65185	0.8297	0.7980	0.8139	7275.
66060	0.8422	0.8117	0.8270	7261.
66925	0.8544	0.8255	0.8399	7248.
67833	0.8682	0.8350	0.8516	7248.
68689	0.8809	0.8490	0.8649	7251.
69572	0.8972	0.8552	0.8762	7261.
70493	0.9109	0.8627	0.8868	7261.
71418	0.9239	0.8737	0.8988	7261.
72343	0.9381	0.8828	0.9104	7261.
73268	0.9524	0.8916	0.9220	7248.
74193	0.9660	0.8984	0.9322	7275.
75118	0.9794	0.9050	0.9422	7234.
76043	0.9943	0.9175	0.9559	7234.
77018	1.0083	0.9300	0.9692	7261.
78043	1.0170	0.9436	0.9803	7261.
79068	1.0299	0.9533	0.9916	7288.
80093	1.0430	0.9607	1.0018	7275.
81118	1.0575	0.9692	1.0134	7234.
82143	1.0716	0.9787	1.0251	7261.
83168	1.0866	0.9890	1.0372	7248.
84193	1.0980	1.0023	1.0501	7248.
85218	1.1106	1.0107	1.0606	7275.
86243	1.1175	1.0267	1.0721	7261.
87268	1.1286	1.0406	1.0846	7288.
88293	1.1399	1.0568	1.0983	7248.
89318	1.1482	1.0723	1.1104	7248.
90343	1.1592	1.0881	1.1237	7248.
91368	1.1648	1.1035	1.1342	7248.
92393	1.1762	1.1175	1.1469	7234.
93418	1.1935	1.1293	1.1614	7248.
94443	1.2208	1.1350	1.1779	7275.
95468	1.2321	1.1426	1.1873	7261.
96493	1.2451	1.1502	1.1977	7261.
97518	1.2566	1.1638	1.2102	7261.
98543	1.2640	1.1803	1.2221	7261.
99568	1.2777	1.1906	1.2442	7248.
100593	1.2201	1.2045	1.2623	7261.
101618	1.3363	1.2147	1.2755	7261.
102643	1.3507	1.2278	1.2893	7275.
103668	1.3640	1.2417	1.3029	7261.
104693	1.3776	1.2553	1.3164	7261.
105718	1.3937	1.2685	1.3311	7248.
106743	1.4049	1.2761	1.3405	7421.
107768	1.4245	1.2853	1.3549	7221.
108793	1.4411	1.2942	1.3677	7275.
109818	1.4573	1.2990	1.3781	7275.

TABLE 5-10. CRACK GROWTH DATA SPECIMEN GT160KAB49-03 S/N 1

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
355-9	0.3230	0.3675	7021	0.054
41137	0.3241	0.3790	7021	0.054
4265	0.3270	0.3915	7021	0.054
53223	0.3266	0.4036	7021	0.054
50987	0.3402	0.3781	7021	0.054
6-836	0.3504	0.4262	7021	0.054
77635	0.3614	0.4407	7021	0.054
75246	0.3691	0.4530	7021	0.054
81175	0.3819	0.4646	7021	0.054
80096	0.3910	0.4770	7031	0.049
90851	0.4012	0.4893	7010	0.055
94909	0.4140	0.4967	7021	0.051
99113	0.4265	0.5112	7010	0.053
0-1328	0.4536	0.5242	7021	0.051
0-014	0.4465	0.5376	7031	0.052
07494	0.4577	0.5501	7021	0.053
09157	0.4642	0.5618	7010	0.053
12211	0.4760	0.5749	7010	0.051
16036	0.4666	0.5873	7010	0.054
16392	0.4937	0.5998	7010	0.053
19673	0.5308	0.6129	7021	0.053
20434	0.5176	0.6217	7010	0.053
277600	0.5276	0.6335	7031	0.052
24393	0.5400	0.6466	7021	0.054
26888	0.5526	0.6599	7021	0.053
28400	0.5634	0.6708	7000	0.053
32105	0.5751	0.6850	7021	0.056
32090	0.5875	0.6953	7010	0.054
33661	0.6000	0.7080	7021	0.054
32673	0.6106	0.7208	7010	0.053
37339	0.6214	0.7334	7021	0.054
38350	0.6347	0.7418	7021	0.054
40068	0.6455	0.7547	7021	0.054
42230	0.6530	0.7672	7021	0.054
42953	0.6672	0.7763	7021	0.053
43597	0.6787	0.7895	7010	0.053
45340	0.6919	0.8014	7021	0.054
47216	0.7055	0.8125	7010	0.054
48501	0.7197	0.8245	7031	0.055
49768	0.7329	0.8372	7010	0.053
50941	0.7439	0.8503	7021	0.053
51425	0.7571	0.8633	7010	0.053
53490	0.7701	0.8752	7021	0.053
54720	0.7831	0.8881	7010	0.054
56803	0.7965	0.9024	7010	0.054
57766	0.8136	0.9151	7010	0.054
58697	0.8292	0.9287	7021	0.056
59731	0.8404	0.9317	7021	0.054
60488	0.8544	0.9622	7021	0.056
61285	0.8682	0.9721	7021	0.051
62550	0.8802	0.9847	7000	0.054

TABLE 5-13. CRACK GROWTH DATA SPECIMEN GT160KA849-03 S/N 4

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
996	0.3122	0.3321	11965	0.496
1169	0.3174	0.3436	11956	0.495
1635	0.3266	0.3580	11973	0.497
2138	0.3398	0.3692	11965	0.497
2661	0.3425	0.3826	11954	0.496
3023	0.3528	0.3964	11996	0.496
3385	0.3618	0.4102	12017	0.498
3769	0.3715	0.3976	11996	0.496
4145	0.3711	0.4373	11965	0.497
4529	0.3869	0.4472	11996	0.496
4915	0.3964	0.4508	11973	0.499
5301	0.4075	0.4703	11965	0.496
5685	0.4190	0.4839	11973	0.496
6069	0.4304	0.4926	11986	0.497
6454	0.4418	0.5041	11965	0.498
6838	0.4546	0.5185	11965	0.496
7222	0.4693	0.5329	11954	0.497
7606	0.4807	0.5468	11973	0.498
7990	0.4915	0.5592	11986	0.496
8374	0.5029	0.5723	11965	0.496
8758	0.5144	0.5860	11954	0.499
9142	0.5266	0.6004	11965	0.498
9526	0.5386	0.6160	11973	0.496
9910	0.5511	0.6328	11965	0.497
10294	0.5644	0.6504	11965	0.497
10678	0.5786	0.6694	11954	0.497
11062	0.5936	0.6894	11965	0.498
11446	0.6094	0.7104	11965	0.499
11830	0.6260	0.7324	11965	0.499
12214	0.6434	0.7554	11965	0.499
12598	0.6614	0.7794	11965	0.499
12982	0.6804	0.8044	11965	0.499
13366	0.7004	0.8304	11965	0.499
13750	0.7214	0.8574	11965	0.499
14134	0.7434	0.8854	11965	0.499
14518	0.7664	0.9144	11965	0.499
14902	0.7904	0.9444	11965	0.499
15286	0.8154	0.9754	11965	0.499
15670	0.8414	1.0074	11965	0.499
16054	0.8684	1.0404	11965	0.499
16438	0.8964	1.0744	11965	0.499
16822	0.9254	1.1094	11965	0.499
17206	0.9554	1.1454	11965	0.499
17590	0.9864	1.1824	11965	0.499
17974	1.0184	1.2204	11965	0.499
18358	1.0514	1.2594	11965	0.499
18742	1.0854	1.3004	11965	0.499
19126	1.1204	1.3424	11965	0.499
19510	1.1564	1.3854	11965	0.499
19894	1.1934	1.4294	11965	0.499
20278	1.2314	1.4744	11965	0.499
20662	1.2704	1.5204	11965	0.499
21046	1.3104	1.5674	11965	0.499
21430	1.3514	1.6154	11965	0.499
21814	1.3934	1.6644	11965	0.499
22198	1.4364	1.7144	11965	0.499
22582	1.4804	1.7654	11965	0.499
22966	1.5254	1.8174	11965	0.499
23350	1.5714	1.8704	11965	0.499
23734	1.6184	1.9244	11965	0.499
24118	1.6664	1.9794	11965	0.499
24502	1.7154	2.0354	11965	0.499
24886	1.7654	2.0924	11965	0.499
25270	1.8164	2.1504	11965	0.499
25654	1.8684	2.2094	11965	0.499
26038	1.9214	2.2694	11965	0.499
26422	1.9754	2.3304	11965	0.499
26806	2.0304	2.3924	11965	0.499
27190	2.0864	2.4554	11965	0.499
27574	2.1434	2.5194	11965	0.499
27958	2.2014	2.5844	11965	0.499
28342	2.2594	2.6494	11965	0.499
28726	2.3174	2.7144	11965	0.499
29110	2.3754	2.7794	11965	0.499
29494	2.4334	2.8444	11965	0.499
29878	2.4914	2.9094	11965	0.499
30262	2.5494	2.9744	11965	0.499
30646	2.6074	3.0394	11965	0.499
31030	2.6654	3.1044	11965	0.499
31414	2.7234	3.1694	11965	0.499
31798	2.7814	3.2344	11965	0.499
32182	2.8394	3.2994	11965	0.499
32566	2.8974	3.3644	11965	0.499
32950	2.9554	3.4294	11965	0.499
33334	3.0134	3.4944	11965	0.499
33718	3.0714	3.5594	11965	0.499
34102	3.1294	3.6244	11965	0.499
34486	3.1874	3.6894	11965	0.499
34870	3.2454	3.7544	11965	0.499
35254	3.3034	3.8194	11965	0.499
35638	3.3614	3.8844	11965	0.499
36022	3.4194	3.9494	11965	0.499
36406	3.4774	4.0144	11965	0.499
36790	3.5354	4.0794	11965	0.499
37174	3.5934	4.1444	11965	0.499
37558	3.6514	4.2094	11965	0.499
37942	3.7094	4.2744	11965	0.499
38326	3.7674	4.3394	11965	0.499
38710	3.8254	4.4044	11965	0.499
39094	3.8834	4.4694	11965	0.499
39478	3.9414	4.5344	11965	0.499
39862	4.0004	4.5994	11965	0.499
40246	4.0584	4.6644	11965	0.499
40630	4.1164	4.7294	11965	0.499
41014	4.1744	4.7944	11965	0.499
41398	4.2324	4.8594	11965	0.499
41782	4.2904	4.9244	11965	0.499
42166	4.3484	4.9894	11965	0.499
42550	4.4064	5.0544	11965	0.499
42934	4.4644	5.1194	11965	0.499
43318	4.5224	5.1844	11965	0.499
43702	4.5804	5.2494	11965	0.499
44086	4.6384	5.3144	11965	0.499
44470	4.6964	5.3794	11965	0.499
44854	4.7544	5.4444	11965	0.499
45238	4.8124	5.5094	11965	0.499
45622	4.8704	5.5744	11965	0.499
46006	4.9284	5.6394	11965	0.499
46390	4.9864	5.7044	11965	0.499
46774	5.0444	5.7694	11965	0.499
47158	5.1024	5.8344	11965	0.499
47542	5.1604	5.8994	11965	0.499
47926	5.2184	5.9644	11965	0.499
48310	5.2764	6.0294	11965	0.499
48694	5.3344	6.0944	11965	0.499
49078	5.3924	6.1594	11965	0.499
49462	5.4504	6.2244	11965	0.499
49846	5.5084	6.2894	11965	0.499
50230	5.5664	6.3544	11965	0.499
50614	5.6244	6.4194	11965	0.499
51000	5.6824	6.4844	11965	0.499
51384	5.7404	6.5494	11965	0.499
51768	5.7984	6.6144	11965	0.499
52152	5.8564	6.6794	11965	0.499
52536	5.9144	6.7444	11965	0.499
52920	5.9724	6.8094	11965	0.499
53304	6.0304	6.8744	11965	0.499
53688	6.0884	6.9394	11965	0.499
54072	6.1464	7.0044	11965	0.499
54456	6.2044	7.0694	11965	0.499
54840	6.2624	7.1344	11965	0.499
55224	6.3204	7.1994	11965	0.499
55608	6.3784	7.2644	11965	0.499
55992	6.4364	7.3294	11965	0.499
56376	6.4944	7.3944	11965	0.499
56760	6.5524	7.4594	11965	0.499
57144	6.6104	7.5244	11965	0.499
57528	6.6684	7.5894	11965	0.499
57912	6.7264	7.6544	11965	0.499
58296	6.7844	7.7194	11965	0.499
58680	6.8424	7.7844	11965	0.499
59064	6.9004	7.8494	11965	0.499
59448	6.9584	7.9144	11965	0.499
59832	7.0164	7.9794	11965	0.499
60216	7.0744	8.0444	11965	0.499
60600	7.1324	8.1094	11965	0.499
60984	7.1904	8.1744	11965	0.499
61368	7.2484	8.2394	11965	0.499
61752	7.3064	8.3044	11965	0.499
62136	7.3644	8.3694	11965	0.499
62520	7.4224	8.4344	11965	0.499
62904	7.4804	8.4994	11965	0.499
63288	7.5384	8.5644	11965	0.499
63672	7.5964	8.6294	11965	0.499
64056	7.6544	8.6944	11965	0.499
64440	7.7124	8.7594	11965	0.499
64824	7.7704	8.8244	11965	0.499
65208	7.8284	8.8894	11965	0.499
65592	7.8864	8.9544	11965	0.499
65976	7.9444	9.0194	11965	0.499
66360	8.0024	9.0844	11965	0.499
66744	8.0604	9.1494	11965	0.499
67128	8.1184	9.2144	11965	0.499
67512	8.1764	9.2794	11965	0.499
67896	8.2344	9.3444	11965	0.499
68280	8.2924	9.4094	11965	0.499
68664	8.3504	9.4744	11965	0.499
69048	8.4084	9.5394	11965	0.499
69432	8.4664	9.6044	11965	0.499
69816	8.5244	9.6694	11965	0.499
70200	8.5824	9.7344	11965	0.499
70584	8.6404	9.7994	11965	0.499
70968	8.6984	9.8644	11965	0.499
71352	8.7564	9.9294	11965	0.499
71736	8.8144	9.9944	11965	0.499
72120	8.8724	10.0594	11965	0.499
72504	8.9304	10.1244	11965	0.499
72888	8.9884	10.1894	11965	0.499
73272	9.0464	10.2544	11965	0.499
73656	9.1044	10.3194	11965	0.499
74040	9.1624	10.3844	11965	0.499
74424	9.2204	10.4494	11965	0.499
74808	9.2784	10.5144	11965	0.499
75192	9.3364	10.5794	11965	0.499
75576	9.3944	10.6444	11965	0.499
75960	9.4524	10.7094	11965	0.499
76344	9.5104	10.7744	11965	0.499
76728	9.5684	10.8394	11965	0.499
77112	9.6264	10.9044	11965	0.499
77496	9.6844	10.9694	11965	0.499
77880	9.7424	11.0344	11965	0.499
78264	9.8004	11.0994	11965	0.499
78648	9.8584	11.1644	11965	0.499
79032	9.9164	11.2294	11965	0.499
79416	9.9744	11.2944	11965	0.499
79800	10.0324	11.3594	11965	0.499
80184	10.0904	11.4244	11965	0.499
80568	10.1484	11.4894	11965	0.499
80952	10.2064	11.5544	11965	0.499
81336	10.2644	11.6194	11965	0.499
81720	10.3224	11.6844	11965	0.499
82104	10.3804	11.7494	11965	0.499
82488	10.4384	11.8144	11965	0.499
82872	10.4964	11.8794	11965	0.499
83256	10.5544	11.9444	11965	0.499
83640	10.6124	12.0094	11965	0.499
84024	10.6704	12.0744	11965	0.499
84408	10.7284	12.1394	11965	0.499
84792	10.7864	12.2044	11965	0.499
85176	10.8444			

TABLE 5-14. CRACK GROWTH DATA SPECIMEN GT160KAB49-23 S/N 1

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
30551	0.2909	0.2730	7001.	- 301
30552	0.3030	0.2746	7022.	- 300
30553	0.3149	0.2808	6991.	- 301
30554	0.3270	0.2906	7003.	- 299
30555	0.3392	0.3165	7001.	- 301
30556	0.3512	0.3252	6995.	- 303
30557	0.3630	0.3011	7033.	- 299
30558	0.3760	0.3124	7012.	- 299
30559	0.3880	0.3221	7012.	- 300
30560	0.4003	0.3326	7012.	- 302
30561	0.4128	0.3422	7001.	- 299
30562	0.4258	0.3546	7022.	- 301
30563	0.4370	0.3582	7001.	- 302
30564	0.4492	0.3634	7012.	- 300
30565	0.4618	0.3739	7012.	- 302
30566	0.4741	0.3800	7012.	- 302
30567	0.4865	0.3919	7012.	- 300
30568	0.4993	0.4046	7012.	- 300
30569	0.5120	0.4136	7012.	- 302
30570	0.5246	0.4260	7001.	- 302
30571	0.5371	0.4376	7012.	- 300
30572	0.5496	0.4500	7012.	- 299
30573	0.5623	0.4633	7001.	- 301
30574	0.5749	0.4707	7012.	- 300
30575	0.5872	0.4832	7012.	- 300
30576	0.5995	0.4973	7012.	- 300
30577	0.6113	0.5057	7001.	- 301
30578	0.6232	0.5380	7012.	- 297
30579	0.6350	0.5690	7022.	- 297
30580	0.6462	0.5803	7001.	- 299
30581	0.6572	0.5900	7001.	- 299
30582	0.6687	0.6008	7001.	- 301
30583	0.6797	0.6128	7001.	- 299
30584	0.6913	0.6251	7001.	- 301
30585	0.7025	0.6353	7001.	- 301
30586	0.7139	0.6476	7001.	- 299
30587	0.7250	0.6582	6991.	- 303
30588	0.7358	0.6695	6991.	- 301
30589	0.7465	0.6791	7022.	- 300
30590	0.7570	0.6880	7001.	- 302
30591	0.7672	0.6972	7001.	- 301
30592	0.7772	0.7072	7001.	- 301
30593	0.7872	0.7172	6991.	- 300
30594	0.7972	0.7272	7012.	- 299
30595	0.8072	0.7372	7012.	- 298
30596	0.8172	0.7472	7012.	- 299
30597	0.8272	0.7572	7012.	- 300
30598	0.8372	0.7672	7012.	- 300
30599	0.8472	0.7772	7012.	- 300
30600	0.8572	0.7872	7012.	- 300
30601	0.8672	0.7972	7012.	- 300
30602	0.8772	0.8072	7012.	- 300
30603	0.8872	0.8172	7012.	- 300
30604	0.8972	0.8272	7012.	- 300
30605	0.9072	0.8372	7012.	- 300
30606	0.9172	0.8472	7012.	- 300
30607	0.9272	0.8572	7012.	- 300
30608	0.9372	0.8672	7012.	- 300
30609	0.9472	0.8772	7012.	- 300
30610	0.9572	0.8872	7012.	- 300
30611	0.9672	0.8972	7012.	- 300
30612	0.9772	0.9072	7012.	- 300
30613	0.9872	0.9172	7012.	- 300
30614	0.9972	0.9272	7012.	- 300
30615	1.0072	0.9372	7012.	- 300
30616	1.0172	0.9472	7012.	- 300
30617	1.0272	0.9572	7012.	- 300
30618	1.0372	0.9672	7012.	- 300
30619	1.0472	0.9772	7012.	- 300
30620	1.0572	0.9872	7012.	- 300
30621	1.0672	0.9972	7012.	- 300
30622	1.0772	1.0072	7012.	- 300
30623	1.0872	1.0172	7012.	- 300
30624	1.0972	1.0272	7012.	- 300
30625	1.1072	1.0372	7012.	- 300
30626	1.1172	1.0472	7012.	- 300
30627	1.1272	1.0572	7012.	- 300
30628	1.1372	1.0672	7012.	- 300
30629	1.1472	1.0772	7012.	- 300
30630	1.1572	1.0872	7012.	- 300
30631	1.1672	1.0972	7012.	- 300
30632	1.1772	1.1072	7012.	- 300
30633	1.1872	1.1172	7012.	- 300
30634	1.1972	1.1272	7012.	- 300
30635	1.2072	1.1372	7012.	- 300
30636	1.2172	1.1472	7012.	- 300
30637	1.2272	1.1572	7012.	- 300
30638	1.2372	1.1672	7012.	- 300
30639	1.2472	1.1772	7012.	- 300
30640	1.2572	1.1872	7012.	- 300
30641	1.2672	1.1972	7012.	- 300
30642	1.2772	1.2072	7012.	- 300
30643	1.2872	1.2172	7012.	- 300
30644	1.2972	1.2272	7012.	- 300
30645	1.3072	1.2372	7012.	- 300
30646	1.3172	1.2472	7012.	- 300
30647	1.3272	1.2572	7012.	- 300
30648	1.3372	1.2672	7012.	- 300
30649	1.3472	1.2772	7012.	- 300
30650	1.3572	1.2872	7012.	- 300
30651	1.3672	1.2972	7012.	- 300
30652	1.3772	1.3072	7012.	- 300
30653	1.3872	1.3172	7012.	- 300
30654	1.3972	1.3272	7012.	- 300
30655	1.4072	1.3372	7012.	- 300
30656	1.4172	1.3472	7012.	- 300
30657	1.4272	1.3572	7012.	- 300
30658	1.4372	1.3672	7012.	- 300
30659	1.4472	1.3772	7012.	- 300
30660	1.4572	1.3872	7012.	- 300
30661	1.4672	1.3972	7012.	- 300
30662	1.4772	1.4072	7012.	- 300
30663	1.4872	1.4172	7012.	- 300
30664	1.4972	1.4272	7012.	- 300
30665	1.5072	1.4372	7012.	- 300
30666	1.5172	1.4472	7012.	- 300
30667	1.5272	1.4572	7012.	- 300
30668	1.5372	1.4672	7012.	- 300
30669	1.5472	1.4772	7012.	- 300
30670	1.5572	1.4872	7012.	- 300
30671	1.5672	1.4972	7012.	- 300
30672	1.5772	1.5072	7012.	- 300
30673	1.5872	1.5172	7012.	- 300
30674	1.5972	1.5272	7012.	- 300
30675	1.6072	1.5372	7012.	- 300
30676	1.6172	1.5472	7012.	- 300
30677	1.6272	1.5572	7012.	- 300
30678	1.6372	1.5672	7012.	- 300
30679	1.6472	1.5772	7012.	- 300
30680	1.6572	1.5872	7012.	- 300
30681	1.6672	1.5972	7012.	- 300
30682	1.6772	1.6072	7012.	- 300
30683	1.6872	1.6172	7012.	- 300
30684	1.6972	1.6272	7012.	- 300
30685	1.7072	1.6372	7012.	- 300
30686	1.7172	1.6472	7012.	- 300
30687	1.7272	1.6572	7012.	- 300
30688	1.7372	1.6672	7012.	- 300
30689	1.7472	1.6772	7012.	- 300
30690	1.7572	1.6872	7012.	- 300
30691	1.7672	1.6972	7012.	- 300
30692	1.7772	1.7072	7012.	- 300
30693	1.7872	1.7172	7012.	- 300
30694	1.7972	1.7272	7012.	- 300
30695	1.8072	1.7372	7012.	- 300
30696	1.8172	1.7472	7012.	- 300
30697	1.8272	1.7572	7012.	- 300
30698	1.8372	1.7672	7012.	- 300
30699	1.8472	1.7772	7012.	- 300
30700	1.8572	1.7872	7012.	- 300
30701	1.8672	1.7972	7012.	- 300
30702	1.8772	1.8072	7012.	- 300
30703	1.8872	1.8172	7012.	- 300
30704	1.8972	1.8272	7012.	- 300
30705	1.9072	1.8372	7012.	- 300
30706	1.9172	1.8472	7012.	- 300
30707	1.9272	1.8572	7012.	- 300
30708	1.9372	1.8672	7012.	- 300
30709	1.9472	1.8772	7012.	- 300
30710	1.9572	1.8872	7012.	- 300
30711	1.9672	1.8972	7012.	- 300
30712	1.9772	1.9072	7012.	- 300
30713	1.9872	1.9172	7012.	- 300
30714	1.9972	1.9272	7012.	- 300
30715	2.0072	1.9372	7012.	- 300
30716	2.0172	1.9472	7012.	- 300
30717	2.0272	1.9572	7012.	- 300
30718	2.0372	1.9672	7012.	- 300
30719	2.0472	1.9772	7012.	- 300
30720	2.0572	1.9872	7012.	- 300
30721	2.0672	1.9972	7012.	- 300
30722	2.0772	2.0072	7012.	- 300
30723	2.0872	2.0172	7012.	- 300
30724	2.0972	2.0272	7012.	- 300
30725	2.1072	2.0372	7012.	- 300
30726	2.1172	2.0472	7012.	- 300
30727	2.1272	2.0572	7012.	- 300
30728	2.1372	2.0672	7012.	- 300
30729	2.1472	2.0772	7012.	- 300
30730	2.1572	2.0872	7012.	- 300
30731	2.1672	2.0972	7012.	- 300
30732	2.1772	2.1072	7012.	- 300
30733	2.1872	2.1172	7012.	- 300
30734	2.1972	2.1272	7012.	- 300
30735	2.2072	2.1372	7012.	- 300
30736	2.2172	2.1472	7012.	- 300
30737	2.2272	2.1572	7012.	- 300
30738	2.2372	2.1672	7012.	- 300
30739	2.2472	2.1772	7012.	- 300
30740	2.2572	2.1872	7012.	- 300
30741	2.2672	2.1972	7012.	- 300
30742	2.2772	2.2072	7012.	- 300
30743	2.2872	2.2172	7012.	- 300
30744	2.2972	2.2272	7012.	- 300
30745	2.3072	2.2372	7012.	- 300
30746	2.3172	2.2472	7012.	- 300
30747	2.3272	2.2572	7012.	- 300
30748	2.3372	2.2672	7012.	- 300
30749	2.3472	2.2772	7012.	- 300
30750	2.3572	2.2872	7012.	- 300
30751	2.3672	2.2972	7012.	- 300
30752	2.3772	2.3072	7012.	- 300
30753	2.3872	2.3172	7012.	- 300
30754	2.3972	2.3272	7012.	- 300
30755	2.4072	2.3372	7012.	- 300
30756	2.4172	2.3472	7012.	- 300
30757	2.4272	2.3572	7012.	- 300
30758	2.4372	2.3672	7012.	- 300
30759	2.4472	2.3772	7012.	- 300
30760	2.4572	2.3872	7012.	- 300
30761	2.4672	2.3972	7012.	- 300
30762	2.4772	2.4072	7012.	- 300
30763	2.4872	2.4172	7012.	- 300
30764	2.4972	2.4272	7012.	- 300
30765	2.5072	2.4372	7012.	- 300
30766	2.5172	2.4472	7012.	- 300
30767	2.5272	2.4572	7012.	- 300
30768	2.5372	2.4672	7012.	- 300
30769	2.5472	2.4772	7012.	- 300
30770	2.5572	2.4872	7012.	- 300
30771	2.5672	2.4972	7012.	- 300
30772	2.5772	2.5072	7012.	- 300
30773	2.5872	2.5172	7012.	- 300
30774	2.5972	2.5272	7012.	- 300
30775	2.6072	2.5372	7012.	- 300
30776	2.6172	2.5472	7012.	- 300
30777	2.6272	2.5572	7012.	- 300
30778	2.6372	2.5672	7012.	- 300

TABLE 5-15. CRACK GROWTH DATA SPECIMEN GT160KAB49-23 S/N 2

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	
	LEFT	RIGHT			
1541	0.3119	0.2930	11971.	-300	11971.
2403	0.3227	0.3073	11950.	-300	11981
3189	0.3358	0.3219	11950.	-300	11950.
4365	0.3501	0.3346	11981.	-299	11971
5161	0.3599	0.3496	11981.	-300	11992
5781	0.3732	0.3593	11971.	-299	11971.
6579	0.3865	0.3691	11950.	-300	11971.
7374	0.4016	0.3805	11992.	-299	11981.
8129	0.4142	0.3998	12002.	-298	11960.
8680	0.4273	0.4165	11981.	-302	11981.
9127	0.4403	0.4241	11992.	-299	11960.
9957	0.4534	0.4378	12002.	-299	11960.
10091	0.4669	0.4430	11971.	-300	11950.
10819	0.4806	0.4577	11950.	-300	11950.
11233	0.4874	0.4671	11971.	-302	11981.
11663	0.4921	0.4662	11971.	-299	11971.
12256	0.5065	0.4812	11981.	-298	11981.
12648	0.5178	0.4900	11960.	-300	11960.
13237	0.5322	0.5072	11971.	-300	11971.
13755	0.5467	0.5231	11960.	-299	11981.
14199	0.5615	0.5369	11981.	-298	11981.
14576	0.5742	0.5483	11981.	-300	11981.
15056	0.5858	0.5596	11981.	-300	11981.
15467	0.5945	0.5621	11971.	-298	11971.
15915	0.6079	0.5721	11981.	-296	11981.
16395	0.6214	0.5810	11971.	-297	11971.
16875	0.6394	0.6080	11971.	-298	11971.
17459	0.6561	0.6288	11981.	-300	11981.
18077	0.6706	0.6418	11960.	-298	11960.
18556	0.6837	0.6545	11950.	-299	11950.
19108	0.6981	0.6695	11971.	-299	11971.
19553	0.7113	0.6808	11981.	-296	11981.
19753	0.7175	0.6830	11971.	-299	11971.
20132	0.7291	0.6950	11971.	-297	11971.
20508	0.7424	0.7066	11981.	-298	11981.
21299	0.7565	0.7203	11960.	-299	11960.
21744	0.7646	0.7271	11971.	-299	11971.
22332	0.7774	0.7415	11960.	-300	11960.
22813	0.7904	0.7543	11971.	-299	11971.
23268	0.8036	0.7672	11971.	-300	11971.
23773	0.8180	0.7801	11971.	-299	11971.
24461	0.8338	0.7941	11971.	-299	11971.
24904	0.8462	0.8052	11981.	-298	11981.
25389	0.8581	0.8177	11971.	-298	11971.
25855	0.8670	0.8245	11971.	-299	11971.
26106	0.8832	0.8424	11981.	-296	11981.
26482	0.8964	0.8542	11950.	-300	11950.
26657	0.9103	0.8679	11971.	-298	11971.
27198	0.9252	0.8820	11950.	-300	11950.
27577	0.9429	0.9049	11971.	-301	11971.
27952	0.9586	0.9247	11971.	-296	11971.

TABLE 5-16. CRACK GROWTH DATA SPECIMEN GT160KAB49-23 S/N 3

CYCLE #	CRACK LENGTH (INS)		VAN STRESS (PSI)	STRESS RATIO					
	LEFT	RIGHT AVERAGE							
13426	0.3377	0.3341	0.3339	7036	-306	116670	1.4224	1.3534	1.3679
2222	0.3618	0.3405	0.3512	7046	-307	111122	1.4397	1.3779	1.4088
28108	0.3872	0.3539	0.3705	7036	-309	131996	1.4903	0.3582	0.9093
34326	0.4000	0.3738	0.3869	7036	-307				
3794	0.4251	0.3895	0.4073	7046	-307				
4224	0.4335	0.4039	0.4182	7036	-306				
4636	0.4571	0.4292	0.4432	7036	-307				
49035	0.4830	0.4543	0.4687	7067	-303				
51321	0.5045	0.4701	0.4873	7036	-307				
54226	0.5264	0.4900	0.5082	7067	-305				
56948	0.5425	0.5121	0.5273	7067	-307				
59484	0.5615	0.5367	0.5491	7067	-305				
61993	0.5845	0.5548	0.5696	7036	-306				
64396	0.6047	0.5754	0.5903	7036	-307				
67038	0.6259	0.5968	0.6113	7036	-306				
68607	0.6467	0.6173	0.6320	7067	-307				
70985	0.6714	0.6382	0.6548	7036	-307				
72583	0.6876	0.6598	0.6737	7036	-306				
75074	0.7071	0.6809	0.6940	7067	-307				
77289	0.7231	0.7019	0.7125	7067	-305				
79311	0.7399	0.7264	0.7332	7067	-305				
81975	0.7572	0.7359	0.7465	7067	-305				
83218	0.7917	0.7654	0.7786	7067	-305				
85222	0.8165	0.7778	0.7971	7067	-305				
86944	0.8324	0.8023	0.8169	7036	-306				
88032	0.8596	0.8227	0.8411	7067	-305				
89382	0.8638	0.8396	0.8517	7067	-305				
90144	0.9016	0.8642	0.8829	7036	-306				
90144	0.9160	0.8887	0.9023	7036	-306				
91212	0.9344	0.9062	0.9203	7067	-304				
92471	0.9363	0.9290	0.9426	7036	-306				
92705	0.9770	0.9482	0.9626	7036	-306				
94853	1.0012	0.9634	0.9823	7036	-306				
96171	1.0219	0.9879	1.0049	7067	-305				
97108	1.0415	1.0095	1.0255	7036	-306				
98423	1.0605	1.0340	1.0472	7036	-306				
99747	1.0777	1.0536	1.0661	7036	-306				
100960	1.0967	1.0817	1.0902	7036	-306				
102299	1.1134	1.1029	1.1082	7036	-306				
102734	1.1311	1.1244	1.1278	7067	-304				
105368	1.1571	1.1426	1.1499	7036	-306				
106704	1.1819	1.1447	1.1633	7036	-306				
108413	1.2060	1.1584	1.1822	7036	-306				
109339	1.2273	1.1812	1.2042	7036	-306				
109861	1.2475	1.1993	1.2234	7036	-304				
106601	1.2663	1.2228	1.2445	7036	-306				
107214	1.2907	1.2423	1.2665	7036	-306				
107346	1.3148	1.2570	1.2859	7067	-305				
108330	1.3344	1.2810	1.3077	7036	-306				
109197	1.3566	1.2930	1.3248	7036	-306				
109821	1.3927	1.3096	1.3442	7036	-306				
110231	1.4046	1.3289	1.3667	7036	-306				

TABLE 5-18. CRACK GROWTH DATA SPECIMEN GT160KAB49-07 S/N 1

[illegible]

TABLE 5-20. CRACK GROWTH DATA SPECIMEN GT160KAB49-07 S/N 3

CYCLE #	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
19466	0.2508	0.2791	0.2700	8937	0.500
53443	0.2652	0.2943	0.2798	8919	0.500
92051	0.2660	0.3118	0.2889	9007	0.500
125611	0.2664	0.3258	0.2961	8989	0.500
173534	0.2680	0.3405	0.3043	9007	0.500
192549	0.2796	0.3489	0.3142	8989	0.500
211856	0.2972	0.3559	0.3265	8989	0.500
225070	0.3104	0.3632	0.3368	9007	0.500
259262	0.3272	0.3699	0.3486	8972	0.500
297188	0.3316	0.3846	0.3581	8972	0.500
332758	0.3424	0.3986	0.3705	8969	0.500
357139	0.3496	0.4126	0.3811	8972	0.500
377900	0.3620	0.4266	0.3943	8972	0.500
398015	0.3740	0.4363	0.4051	9007	0.500
412011	0.3816	0.4513	0.4165	9007	0.500
424218	0.3956	0.4633	0.4295	8972	0.500
437728	0.4028	0.4773	0.4401	9007	0.500
453748	0.4148	0.4863	0.4506	8972	0.500
473921	0.4200	0.5003	0.4602	8972	0.500
484407	0.4276	0.5147	0.4712	8972	0.500
492556	0.4380	0.5290	0.4835	8972	0.500
481910	0.4424	0.5431	0.4927	8972	0.500
488023	0.4476	0.5571	0.5024	8972	0.500
493330	0.4520	0.5711	0.5116	8972	0.500
496841	0.4560	0.5851	0.5206	8972	0.500
503030	0.4663	0.5961	0.5313	8954	0.500
509781	0.4725	0.6101	0.5413	8954	0.500
513248	0.4881	0.6195	0.5538	8954	0.500
513300	0.4897	0.6338	0.5617	8954	0.500
520339	0.4940	0.6482	0.5711	8937	0.500
524391	0.5019	0.6622	0.5825	8972	0.500
526937	0.5061	0.6762	0.5911	8972	0.500
530430	0.5085	0.6909	0.5997	8934	0.500
534732	0.5169	0.7049	0.6109	8954	0.500
537078	0.5189	0.7189	0.6159	8954	0.500
538871	0.5209	0.7329	0.6269	8937	0.500
541413	0.5273	0.7469	0.6371	8937	0.500
545579	0.5393	0.7586	0.6489	8937	0.500
545831	0.5421	0.7729	0.6575	8937	0.500
546482	0.5433	0.7870	0.6651	8919	0.500
547311	0.5457	0.8010	0.6733	8919	0.500
548263	0.5501	0.8150	0.6825	8937	0.500
548864	0.5517	0.8293	0.6905	8937	0.500
549609	0.5541	0.8437	0.6999	8919	0.500
550206	0.5557	0.8580	0.7069	8919	0.500
551055	0.5597	0.8720	0.7159	8919	0.500
551577	0.5629	0.8861	0.7245	8919	0.500
552101	0.5649	0.9004	0.7326	8919	0.500
552380	0.5653	0.9144	0.7398	8919	0.500
552960	0.5677	0.9284	0.7481	8919	0.500

TABLE 5-21. CRACK GROWTH DATA SPECIMEN GT160KAB49-07 S/N 4

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
1.	0.2520	0.2564	13772.	0.500
11107.	0.2553	0.2667	12498.	0.500
16807.	0.2579	0.2769	12498.	0.500
22787.	0.2613	0.2872	12465.	0.500
26003.	0.2691	0.2945	12480.	0.500
35445.	0.2684	0.3055	12480.	0.500
40238.	0.2765	0.3072	12463.	0.500
43430.	0.2843	0.3087	12480.	0.500
45322.	0.2858	0.3189	12463.	0.500
49178.	0.2992	0.3292	12480.	0.500
33509.	0.2925	0.3395	12463.	0.500
38631.	0.2925	0.3497	12480.	0.500
48137.	0.2970	0.3600	12463.	0.500
72470.	0.3007	0.3702	12445.	0.500
79509.	0.3085	0.3771	12393.	0.500
83507.	0.3155	0.3873	12393.	0.500
87959.	0.3182	0.3976	12393.	0.500
92836.	0.3126	0.4079	12353.	0.500
101395.	0.3204	0.4167	12393.	0.500
107130.	0.3282	0.4230	12293.	0.500
112819.	0.3278	0.4333	12393.	0.500
118319.	0.3360	0.4386	12393.	0.500
120106.	0.3371	0.4489	12393.	0.500
123911.	0.3449	0.4567	12393.	0.500
130952.	0.3516	0.4670	12393.	0.500
136522.	0.3594	0.4709	12393.	0.500
138838.	0.3680	0.4714	12410.	0.500
142058.	0.3758	0.4719	12393.	0.500
144983.	0.3836	0.4758	12393.	0.500
146727.	0.3914	0.4811	12393.	0.500
149082.	0.3992	0.4855	12393.	0.500

TABLE 5-22. CRACK GROWTH DATA SPECIMEN GT160KAB49-27 S/N 1

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	AVERAGE
	LEFT	RIGHT			
60033.	0.2569	0.2428	8694.	- 304	
92320.	0.2249	0.2391	8681.	- 313	
098537.	0.2937	0.2688	8700.	- 315	
31254.	0.2435	0.2791	8906	- 303	
465330.	0.3311	0.2482	8925	- 303	
68107.	0.3501	0.2503	8906	- 307	
80672.	0.3630	0.2533	8963.	- 303	
90298.	0.3819	0.3188	8981.	- 301	
10827.	0.3960	0.2588	8906	- 309	
26191.	0.4125	0.2619	8906.	- 305	
09494.	0.4288	0.2649	8869.	- 313	
43477.	0.4280	0.2681	869.	- 111	
46709.	0.4333	0.2711	9731.	- 304	
50670.	0.4393	0.2741	9713.	- 303	
5334.	0.4468	0.2773	9731.	- 303	
53994.	0.4505	0.2805	9731.	- 303	
59139.	0.4567	0.2828	9731.	- 301	
6026.	0.4633	0.2869	9769.	- 307	
68491.	0.4758	0.2900	9769	- 308	
74135.	0.4841	0.2931	9694.	- 308	
90850.	0.5028	0.2982	9713.	- 307	
93630.	0.5142	0.2993	9750.	- 304	
94681.	0.5238	0.3024	9694.	- 306	
95074.	0.5303	0.3055	9713.	- 306	
96105.	0.5363	0.3086	9769.	- 303	
99147.	0.5433	0.3118	9731.	- 306	
02569.	0.5528	0.3150	9713.	- 303	
00429.	0.5558	0.3184	9713.	- 301	
06224.	0.5654	0.3216	9731.	- 304	
10181.	0.5736	0.3247	9713.	- 305	
11979.	0.5821	0.3278	9731.	- 301	
13848.	0.5897	0.3311	9731.	- 301	
16146.	0.6087	0.3341	9713.	- 303	
18895.	0.6190	0.3371	9769.	- 305	
22147.	0.6263	0.3404	9656.	- 305	
23139.	0.6411	0.3437	8694.	- 304	
26535.	0.6445	0.3471	9713.	- 305	
27812.	0.6495	0.3503	9731.	- 301	
29087.	0.6565	0.3535	9769.	- 303	
30466.	0.6606	0.3563	9694.	- 302	
31259.	0.6671	0.3601	9731.	- 301	
36507.	0.6722	0.3634	9769.	- 303	
33615.	0.6746	0.3668	9713.	- 299	
37238.	0.6844	0.3703	9731.	- 299	
38585.	0.6872	0.3731	9731.	- 306	
39410.	0.6898	0.3772	9731.	- 303	
40264.	0.6926	0.3808	9694.	- 309	
41132.	0.6962	0.3843	9713.	- 305	
42304.	0.7056	0.3877	9750	- 302	
43164.	0.7084	0.3909	9731.	- 304	
44269.	0.7151	0.3943	9731.	- 303	
45241.	0.7266	0.3977	9731.	- 304	

TABLE 5-23. CRACK GROWTH DATA SPECIMEN GT160KAB49-27 S/N 2

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	YAX STRESS (PSI)	STRESS RATIO	YAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT						
3248	0.2111	0.2142	0.2127	- .305	12056.	- .305	52550.	- .305
3687	0.2162	0.2250	0.2206	- .303	12056.	- .303	52718.	- .303
10301	0.2187	0.2363	0.2275	- .301	12075.	- .301	52551.	- .301
15024	0.2260	0.2483	0.2372	- .305	12094.	- .305	52550.	- .305
18111	0.2329	0.2600	0.2464	- .303	12056.	- .303		
19981	0.2435	0.2661	0.2548	- .306	12056.	- .306		
20709	0.2348	0.2688	0.2618	- .309	12056.	- .309		
21607	0.2653	0.2731	0.2693	- .306	12056.	- .306		
22468	0.2766	0.2776	0.2772	- .310	12038.	- .310		
23503	0.2877	0.2794	0.2836	- .303	12056.	- .303		
25303	0.2991	0.2865	0.2928	- .305	12094.	- .305		
25993	0.3099	0.2901	0.3000	- .307	12019.	- .307		
27173	0.3206	0.2964	0.3085	- .305	12056.	- .305		
28553	0.3317	0.3069	0.3193	- .306	12075.	- .306		
29416	0.3409	0.3146	0.3277	- .302	12056.	- .302		
30833	0.3325	0.3205	0.3265	- .309	12019.	- .309		
32190	0.3635	0.3261	0.3448	- .305	12038.	- .305		
33170	0.3737	0.3352	0.3548	- .307	12019.	- .307		
34909	0.3852	0.3432	0.3642	- .305	12038.	- .305		
36610	0.3965	0.3501	0.3732	- .303	12056.	- .303		
36879	0.4077	0.3622	0.3850	- .301	12094.	- .301		
37670	0.4189	0.3718	0.3955	- .305	12094.	- .305		
38290	0.4312	0.3753	0.4032	- .304	12019.	- .304		
39359	0.4425	0.3853	0.4139	- .305	12038.	- .305		
40150	0.4325	0.3974	0.4150	- .305	12056.	- .305		
40812	0.4440	0.4043	0.4241	- .304	12038.	- .304		
41124	0.4751	0.4145	0.4448	- .305	12056.	- .305		
42395	0.4861	0.4241	0.4551	- .302	12094.	- .302		
43351	0.4969	0.4322	0.4646	- .308	12000.	- .308		
44073	0.5089	0.4438	0.4763	- .304	12038.	- .304		
44656	0.5164	0.4564	0.4864	- .307	12074.	- .307		
45241	0.5265	0.4698	0.4982	- .307	12038.	- .307		
45886	0.5320	0.4825	0.5073	- .303	12056.	- .303		
46269	0.5408	0.4963	0.5196	- .306	12019.	- .306		
46783	0.5535	0.5080	0.5307	- .302	12056.	- .302		
47193	0.5659	0.5206	0.5433	- .306	12056.	- .306		
47638	0.5768	0.5347	0.5558	- .307	12038.	- .307		
48120	0.5883	0.5449	0.5666	- .306	12056.	- .306		
48476	0.6006	0.5545	0.5776	- .300	12075.	- .300		
48803	0.6100	0.5692	0.5896	- .304	12038.	- .304		
49179	0.6209	0.5836	0.6022	- .305	12075.	- .305		
49486	0.6335	0.5982	0.6158	- .303	12056.	- .303		
49828	0.6434	0.6143	0.6298	- .308	12056.	- .308		
50203	0.6550	0.6310	0.6430	- .305	12038.	- .305		
50815	0.6643	0.6501	0.6572	- .306	12056.	- .306		
50887	0.6756	0.6682	0.6719	- .306	12019.	- .306		
51228	0.6844	0.6843	0.6843	- .305	12056.	- .305		
51531	0.6953	0.7000	0.6976	- .306	12019.	- .306		
51703	0.7087	0.7187	0.7137	- .307	12038.	- .307		
51940	0.7193	0.7244	0.7268	- .307	12019.	- .307		
52144	0.7352	0.7479	0.7416	- .309	12019.	- .309		
52416	0.7502	0.7590	0.7546	- .304	12138.	- .304		

TABLE 5-24. CRACK GROWTH DATA SPECIMEN GT160KAB49-27 S/N 3

CYCLE #	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
39071	0.2415	0.2611	0.2513	7219	-504
86672	0.2510	0.2784	0.2647	7219	-496
127653	0.2604	0.2931	0.2767	7200	-503
156865	0.2700	0.3034	0.2867	7256	-501
178247	0.2794	0.3104	0.2949	7219	-501
192658	0.2869	0.3161	0.3025	7238	-505
203312	0.2965	0.3212	0.3098	7181	-507
214577	0.3061	0.3253	0.3167	7256	-499
224633	0.3178	0.3290	0.3234	7219	-504
234411	0.3274	0.3323	0.3298	7200	-506
247666	0.3371	0.3376	0.3373	7228	-503
261432	0.3465	0.3422	0.3444	7219	-504
273553	0.3561	0.3472	0.3517	7215	-501
277542	0.3656	0.3507	0.3582	8369	-503
281077	0.3754	0.3582	0.3668	8369	-508
284927	0.3851	0.3656	0.3753	8350	-509
289113	0.3948	0.3742	0.3845	8331	-514
297101	0.4046	0.3932	0.3989	8531	-512
305144	0.4136	0.4153	0.4145	8531	-515
311974	0.4234	0.4320	0.4277	8513	-515
319974	0.4330	0.4543	0.4437	8550	-502
326842	0.4427	0.4736	0.4581	8831	-490
332255	0.4525	0.4678	0.4700	8794	-493
336514	0.4619	0.5005	0.4812	8831	-492
339762	0.4717	0.5172	0.4944	8831	-496
342250	0.4813	0.5292	0.5053	8775	-489
345431	0.4911	0.5428	0.5169	8813	-491
347713	0.5007	0.5553	0.5280	8888	-485
351095	0.5105	0.5629	0.5367	8775	-491
351644	0.5232	0.5597	0.5465	8775	-489
353334	0.5412	0.5713	0.5562	8813	-500
355356	0.5697	0.5936	0.5774	8775	-486
356410	0.5817	0.6177	0.5997	8794	-490
357411	0.5820	0.6284	0.6051	8813	-491
358228	0.5952	0.6525	0.6238	8813	-489
359272	0.6066	0.6643	0.6354	8775	-489
360019	0.6163	0.6814	0.6488	8775	-486
360926	0.6277	0.6963	0.6620	8775	-494
361288	0.6381	0.7160	0.6770	8794	-490
361713	0.6492	0.7261	0.6876	8813	-491
362257	0.6608	0.7379	0.6993	8775	-489
362904	0.6720	0.7471	0.7096	8775	-490
363443	0.6843	0.7692	0.7267	8775	-487
363978	0.6953	0.7837	0.7400	8775	-491
364473	0.7069	0.8019	0.7544	8775	-489
364912	0.7184	0.8174	0.7679	8775	-490
365243	0.7295	0.8400	0.7847	8775	-492
365683	0.7415	0.8586	0.7999	8775	-492
366019	0.7539	0.8770	0.8154	8775	-487
366459	0.7609	0.8955	0.8282	8775	-487

TABLE 5-25. CRACK GROWTH DATA SPECIMEN GT160KAB49-27 S/N 4

CYCLE #	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO	
	LEFT	RIGHT	AVERAGE			
2310	0.2106	0.2085	0.2096	12168.	-497	12113.
3769	0.2175	0.2108	0.2141	12131	-499	12131.
5303	0.2246	0.2134	0.2190	12131.	-499	12113.
6823	0.2317	0.2154	0.2235	12094.	-498	12131.
8143	0.2386	0.2178	0.2282	12131.	-493	12131.
9635	0.2459	0.2210	0.2335	12113.	-497	12131.
11344	0.2531	0.2247	0.2389	12094.	-502	12113.
12926	0.2604	0.2280	0.2442	12113.	-497	12169.
14214	0.2673	0.2306	0.2489	12113.	-500	12113.
16340	0.2744	0.2351	0.2548	12169	-498	12131.
17266	0.2827	0.2361	0.2594	12131.	-499	12150.
19012	0.2900	0.2399	0.2649	12094.	-498	12113.
20035	0.2974	0.2433	0.2703	12094.	-499	12131.
21002	0.3047	0.2472	0.2760	12113.	-498	12113.
21864	0.3128	0.2507	0.2818	12131.	-498	12094.
22796	0.3208	0.2532	0.2870	12150.	-497	12094.
24040	0.3287	0.2568	0.2928	12150.	-494	12094.
25356	0.3366	0.2626	0.2996	12150.	-497	12094.
26739	0.3446	0.2690	0.3068	12094.	-499	12113.
28449	0.3527	0.2773	0.3150	12131.	-501	12131.
30840	0.3607	0.2863	0.3235	12131.	-496	12094.
32156	0.3687	0.3059	0.3373	12131.	-499	12113.
32890	0.3765	0.3169	0.3467	12169.	-495	12094.
33823	0.3842	0.3271	0.3556	12113.	-497	12094.
34827	0.3928	0.3348	0.3638	12131.	-498	12094.
35825	0.4006	0.3461	0.3734	12113.	-497	12113.
36563	0.4089	0.3577	0.3773	12113.	-498	12113.
37460	0.4166	0.3660	0.3913	12131.	-501	12131.
37564	0.4242	0.3792	0.3927	12094.	-500	12094.
38334	0.4326	0.3966	0.4146	12094.	-502	12094.
39459	0.4416	0.4076	0.4246	12075.	-503	12094.
40237	0.4503	0.4197	0.4350	12113.	-500	12094.
41173	0.4582	0.4287	0.4435	12113.	-500	12094.
42068	0.4664	0.4390	0.4527	12131.	-499	12113.
42925	0.4745	0.4498	0.4622	12131.	-502	12094.
43639	0.4827	0.4607	0.4717	12131.	-496	12113.
44356	0.4909	0.4798	0.4854	12150.	-495	12113.
44929	0.5000	0.4849	0.4924	12131.	-498	12113.
45592	0.5087	0.4972	0.5030	12113.	-494	12113.
46072	0.5172	0.5058	0.5115	12131.	-495	12094.
46759	0.5254	0.5141	0.5198	12094.	-501	12094.
47427	0.5337	0.5227	0.5282	12113.	-500	12094.
48048	0.5421	0.5316	0.5368	12131.	-498	12094.
48991	0.5506	0.5401	0.5454	12094.	-501	12094.
49746	0.5591	0.5486	0.5539	12113.	-501	12094.
50673	0.5676	0.5571	0.5624	12131.	-501	12094.
51319	0.5760	0.5655	0.5708	12150.	-500	12094.
51799	0.5844	0.5739	0.5792	12113.	-500	12094.
52133	0.5928	0.5823	0.5876	12131.	-500	12094.
52467	0.6012	0.5907	0.5959	12150.	-500	12094.
52801	0.6096	0.5991	0.6044	12113.	-500	12094.
53135	0.6180	0.6075	0.6128	12131.	-500	12094.
53469	0.6264	0.6159	0.6212	12150.	-500	12094.
53803	0.6348	0.6243	0.6296	12113.	-500	12094.
54137	0.6432	0.6327	0.6375	12131.	-500	12094.
54471	0.6516	0.6411	0.6464	12150.	-500	12094.
54805	0.6600	0.6495	0.6548	12113.	-500	12094.
55139	0.6684	0.6579	0.6632	12131.	-500	12094.
55473	0.6768	0.6663	0.6716	12150.	-500	12094.
55807	0.6852	0.6747	0.6799	12113.	-500	12094.
56141	0.6936	0.6831	0.6884	12131.	-500	12094.
56475	0.7020	0.6915	0.6968	12150.	-500	12094.
56809	0.7104	0.7000	0.7052	12113.	-500	12094.
57143	0.7188	0.7083	0.7136	12131.	-500	12094.
57477	0.7272	0.7167	0.7219	12150.	-500	12094.
57811	0.7356	0.7251	0.7304	12113.	-500	12094.
58145	0.7440	0.7335	0.7388	12131.	-500	12094.
58479	0.7524	0.7419	0.7472	12150.	-500	12094.
58813	0.7608	0.7503	0.7556	12113.	-500	12094.
59147	0.7692	0.7587	0.7640	12131.	-500	12094.
59481	0.7776	0.7671	0.7724	12150.	-500	12094.
59815	0.7860	0.7755	0.7808	12113.	-500	12094.
60149	0.7944	0.7839	0.7892	12131.	-500	12094.
60483	0.8028	0.7923	0.7976	12150.	-500	12094.
60817	0.8112	0.8007	0.8059	12113.	-500	12094.
61151	0.8196	0.8091	0.8144	12131.	-500	12094.
61485	0.8280	0.8175	0.8228	12150.	-500	12094.
61819	0.8364	0.8259	0.8312	12113.	-500	12094.
62153	0.8448	0.8343	0.8396	12131.	-500	12094.
62487	0.8532	0.8427	0.8479	12150.	-500	12094.
62821	0.8616	0.8511	0.8564	12113.	-500	12094.
63155	0.8700	0.8595	0.8648	12131.	-500	12094.
63489	0.8784	0.8679	0.8732	12150.	-500	12094.
63823	0.8868	0.8763	0.8816	12113.	-500	12094.
64157	0.8952	0.8847	0.8899	12131.	-500	12094.
64491	0.9036	0.8931	0.8984	12150.	-500	12094.
64825	0.9120	0.9015	0.9068	12113.	-500	12094.
65159	0.9204	0.9099	0.9152	12131.	-500	12094.
65493	0.9288	0.9183	0.9236	12150.	-500	12094.
65827	0.9372	0.9267	0.9319	12113.	-500	12094.
66161	0.9456	0.9351	0.9404	12131.	-500	12094.
66495	0.9540	0.9435	0.9488	12150.	-500	12094.
66829	0.9624	0.9519	0.9572	12113.	-500	12094.
67163	0.9708	0.9603	0.9656	12131.	-500	12094.
67497	0.9792	0.9687	0.9740	12150.	-500	12094.
67831	0.9876	0.9771	0.9824	12113.	-500	12094.
68165	0.9960	0.9855	0.9908	12131.	-500	12094.
68499	1.0044	0.9939	1.0000	12150.	-500	12094.
68833	1.0128	1.0023	1.0076	12113.	-500	12094.
69167	1.0212	1.0107	1.0159	12131.	-500	12094.
69501	1.0296	1.0191	1.0244	12150.	-500	12094.
69835	1.0380	1.0275	1.0328	12113.	-500	12094.
70169	1.0464	1.0359	1.0412	12131.	-500	12094.
70503	1.0548	1.0443	1.0496	12150.	-500	12094.
70837	1.0632	1.0527	1.0579	12113.	-500	12094.
71171	1.0716	1.0611	1.0664	12131.	-500	12094.
71505	1.0800	1.0695	1.0748	12150.	-500	12094.
71839	1.0884	1.0779	1.0832	12113.	-500	12094.
72173	1.0968	1.0863	1.0916	12131.	-500	12094.
72507	1.1052	1.0947	1.1000	12150.	-500	12094.
72841	1.1136	1.1031	1.1084	12113.	-500	12094.
73175	1.1220	1.1115	1.1168	12131.	-500	12094.
73509	1.1304	1.1199	1.1252	12150.	-500	12094.
73843	1.1388	1.1283	1.1336	12113.	-500	12094.
74177	1.1472	1.1367	1.1420	12131.	-500	12094.
74511	1.1556	1.1451	1.1504	12150.	-500	12094.
74845	1.1640	1.1535	1.1588	12113.	-500	12094.
75179	1.1724	1.1619	1.1672	12131.	-500	12094.
75513	1.1808	1.1703	1.1756	12150.	-500	12094.
75847	1.1892	1.1787	1.1840	12113.	-500	12094.
76181	1.1976	1.1871	1.1924	12131.	-500	12094.
76515	1.2060	1.1955	1.2008	12150.	-500	12094.
76849	1.2144	1.2039	1.2112	12113.	-500	12094.
77183	1.2228	1.2123	1.2176	12131.	-500	12094.
77517	1.2312	1.2207	1.2259	12150.	-500	12094.
77851	1.2396	1.2291	1.2344	12113.	-500	12094.
78185	1.2480	1.2375	1.2428	12131.	-500	12094.
78519	1.2564	1.2459	1.2512	12150.	-500	12094.
78853	1.2648	1.2543	1.2596	12113.	-500	12094.
79187	1.2732	1.2627	1.2679	12131.	-500	12094.
79521	1.2816	1.2711	1.2764	12150.	-500	12094.
79855	1.2900	1.2795	1.2848	12113.	-500	12094.
80189	1.2984	1.2879	1.2932	12131.	-500	12094.
80523	1.3068	1.2963	1.3016	12150.	-500	12094.
80857	1.3152	1.3047	1.3099	12113.	-500	12094.
81191	1.3236	1.3131	1.3184	12131.	-500	12094.
81525	1.3320	1.3215	1.3268	12150.	-500	12094.
81859	1.3404	1.3299	1.3352	12113.	-500	12094.
82193	1.3488	1.3383	1.3436	12131.	-500	12094.
82527	1.3572	1.3467	1.3519	12150.	-500	12094.
82861	1.3656	1.3551	1.3604	12113.	-500	12094.
83195	1.3740	1.3635	1.3688	12131.	-500	12094.
83529	1.3824	1.3719	1.3772	12150.	-500	12094.
83863	1.3908	1.3803	1.3856	12113.	-500	12094.
84197	1.3992	1.3887	1.3940	12131.	-500	12094.
84531	1.4076	1.3971	1.4024	12150.	-500	12094.
84865	1.4160	1.4055	1.4108	12113.	-500	12094.
85199	1.4244	1.4139	1.4192	12131.	-500	12094.
85533	1.4328	1.4223	1.4276	12150.	-500	12094.
85867	1.4412	1.4307	1.4359	12113.	-500	12094.
86201	1.4496	1.4391	1.4444	12131.	-500	12094.
86535	1.4580	1.4475	1.4528	12150.	-500	12094.
86869	1.4664	1.4559	1.4612	12113.	-500	12094.
87203	1.4748	1.4643	1.4696	12131.	-500	12094.
87537	1.4832	1.4727	1.4779	12150.	-500	12094.
87871	1.4916	1.4811	1.4864	12113.	-500	12094.
88205	1.5000	1.4895	1.4948	12131.	-500	12094.
88539	1.5084	1.4979	1.5032	12150.	-500	12094.
88873	1.5168	1.5063	1.5116	12113.	-500	12094.
89207	1.5252	1.5147	1.5199			

TABLE 5-26. CRACK GROWTH DATA SPECIMEN GT10KAB49-05 S/N 1

CYCLE	CRACK LENGTH (INS)		MAX. STRESS (PSI)	STRESS RATIO	
	LEFT	RIGHT		AVERAGE	
1	0.2840	0.2460	6751	0.350	0.350
3622	0.2868	0.2748	6751	0.350	0.350
7111	0.2902	0.2876	6751	0.350	0.350
27359	0.2968	0.2924	6695	0.350	0.350
26312	0.3032	0.3021	6695	0.350	0.350
44673	0.3119	0.3081	6676	0.350	0.350
31363	0.3163	0.3161	6713	0.350	0.350
34351	0.3229	0.3221	6676	0.350	0.350
44336	0.3297	0.3281	6713	0.350	0.350
76537	0.3361	0.3369	6695	0.350	0.350
75109	0.3433	0.3419	6713	0.350	0.350
31021	0.3497	0.3475	6695	0.350	0.350
44224	0.3553	0.3513	6713	0.350	0.350
81982	0.3593	0.3529	6676	0.350	0.350
49913	0.3649	0.3573	6695	0.350	0.350
94449	0.3727	0.3715	6713	0.350	0.350
97610	0.3781	0.3840	6713	0.350	0.350
3959	0.3942	0.3896	6695	0.350	0.350
53375	0.3998	0.3966	6695	0.350	0.350
53787	0.4076	0.4044	6695	0.350	0.350
09481	0.4082	0.4110	6676	0.350	0.350
11325	0.4123	0.4119	6695	0.350	0.350
12481	0.4168	0.4248	6713	0.350	0.350
14023	0.4238	0.4266	6676	0.350	0.350
20347	0.4340	0.4302	6713	0.350	0.350
22334	0.4379	0.4349	6676	0.350	0.350
23436	0.4432	0.4377	6695	0.350	0.350
27567	0.4511	0.4413	6695	0.350	0.350
29191	0.4611	0.4679	6695	0.350	0.350
30710	0.4633	0.4793	6676	0.350	0.350
31089	0.4711	0.4807	6676	0.350	0.350
33223	0.4807	0.4881	6676	0.350	0.350
34421	0.4939	0.4945	6676	0.350	0.350
35466	0.4971	0.5007	6695	0.350	0.350
44323	0.5033	0.5096	6676	0.350	0.350
44979	0.5116	0.5135	6676	0.350	0.350
49413	0.5200	0.5112	6676	0.350	0.350
53444	0.5264	0.5274	6676	0.350	0.350
53911	0.5324	0.5326	6676	0.350	0.350
54419	0.5388	0.5362	6676	0.350	0.350
55270	0.5440	0.5466	6676	0.350	0.350
56419	0.5570	0.5570	6676	0.350	0.350
56923	0.5612	0.5625	6695	0.350	0.350
57413	0.5700	0.5712	6695	0.350	0.350
58453	0.5844	0.5781	6676	0.350	0.350
58581	0.5922	0.5875	6676	0.350	0.350
58969	0.6003	0.5897	6695	0.350	0.350
59419	0.6089	0.6019	6676	0.350	0.350
59782	0.6172	0.6091	6657	0.350	0.350
60251	0.6251	0.6207	6676	0.350	0.350
60713	0.6331	0.6277	6639	0.350	0.350
6076	0.6267	0.6267	6676	0.350	0.350
6077	0.6267	0.6267	6676	0.350	0.350
6078	0.6267	0.6267	6676	0.350	0.350
6079	0.6267	0.6267	6676	0.350	0.350
6080	0.6267	0.6267	6676	0.350	0.350
6081	0.6267	0.6267	6676	0.350	0.350
6082	0.6267	0.6267	6676	0.350	0.350
6083	0.6267	0.6267	6676	0.350	0.350
6084	0.6267	0.6267	6676	0.350	0.350
6085	0.6267	0.6267	6676	0.350	0.350
6086	0.6267	0.6267	6676	0.350	0.350
6087	0.6267	0.6267	6676	0.350	0.350
6088	0.6267	0.6267	6676	0.350	0.350
6089	0.6267	0.6267	6676	0.350	0.350
6090	0.6267	0.6267	6676	0.350	0.350
6091	0.6267	0.6267	6676	0.350	0.350
6092	0.6267	0.6267	6676	0.350	0.350
6093	0.6267	0.6267	6676	0.350	0.350
6094	0.6267	0.6267	6676	0.350	0.350
6095	0.6267	0.6267	6676	0.350	0.350
6096	0.6267	0.6267	6676	0.350	0.350
6097	0.6267	0.6267	6676	0.350	0.350
6098	0.6267	0.6267	6676	0.350	0.350
6099	0.6267	0.6267	6676	0.350	0.350
6100	0.6267	0.6267	6676	0.350	0.350
6101	0.6267	0.6267	6676	0.350	0.350
6102	0.6267	0.6267	6676	0.350	0.350
6103	0.6267	0.6267	6676	0.350	0.350
6104	0.6267	0.6267	6676	0.350	0.350
6105	0.6267	0.6267	6676	0.350	0.350
6106	0.6267	0.6267	6676	0.350	0.350
6107	0.6267	0.6267	6676	0.350	0.350
6108	0.6267	0.6267	6676	0.350	0.350
6109	0.6267	0.6267	6676	0.350	0.350
6110	0.6267	0.6267	6676	0.350	0.350
6111	0.6267	0.6267	6676	0.350	0.350
6112	0.6267	0.6267	6676	0.350	0.350
6113	0.6267	0.6267	6676	0.350	0.350
6114	0.6267	0.6267	6676	0.350	0.350
6115	0.6267	0.6267	6676	0.350	0.350
6116	0.6267	0.6267	6676	0.350	0.350
6117	0.6267	0.6267	6676	0.350	0.350
6118	0.6267	0.6267	6676	0.350	0.350
6119	0.6267	0.6267	6676	0.350	0.350
6120	0.6267	0.6267	6676	0.350	0.350
6121	0.6267	0.6267	6676	0.350	0.350
6122	0.6267	0.6267	6676	0.350	0.350
6123	0.6267	0.6267	6676	0.350	0.350
6124	0.6267	0.6267	6676	0.350	0.350
6125	0.6267	0.6267	6676	0.350	0.350
6126	0.6267	0.6267	6676	0.350	0.350
6127	0.6267	0.6267	6676	0.350	0.350
6128	0.6267	0.6267	6676	0.350	0.350
6129	0.6267	0.6267	6676	0.350	0.350
6130	0.6267	0.6267	6676	0.350	0.350
6131	0.6267	0.6267	6676	0.350	0.350
6132	0.6267	0.6267	6676	0.350	0.350
6133	0.6267	0.6267	6676	0.350	0.350
6134	0.6267	0.6267	6676	0.350	0.350
6135	0.6267	0.6267	6676	0.350	0.350
6136	0.6267	0.6267	6676	0.350	0.350
6137	0.6267	0.6267	6676	0.350	0.350
6138	0.6267	0.6267	6676	0.350	0.350
6139	0.6267	0.6267	6676	0.350	0.350
6140	0.6267	0.6267	6676	0.350	0.350
6141	0.6267	0.6267	6676	0.350	0.350
6142	0.6267	0.6267	6676	0.350	0.350
6143	0.6267	0.6267	6676	0.350	0.350
6144	0.6267	0.6267	6676	0.350	0.350
6145	0.6267	0.6267	6676	0.350	0.350
6146	0.6267	0.6267	6676	0.350	0.350
6147	0.6267	0.6267	6676	0.350	0.350
6148	0.6267	0.6267	6676	0.350	0.350
6149	0.6267	0.6267	6676	0.350	0.350
6150	0.6267	0.6267	6676	0.350	0.350
6151	0.6267	0.6267	6676	0.350	0.350
6152	0.6267	0.6267	6676	0.350	0.350
6153	0.6267	0.6267	6676	0.350	0.350
6154	0.6267	0.6267	6676	0.350	0.350
6155	0.6267	0.6267	6676	0.350	0.350
6156	0.6267	0.6267	6676	0.350	0.350
6157	0.6267	0.6267	6676	0.350	0.350
6158	0.6267	0.6267	6676	0.350	0.350
6159	0.6267	0.6267	6676	0.350	0.350
6160	0.6267	0.6267	6676	0.350	0.350
6161	0.6267	0.6267	6676	0.350	0.350
6162	0.6267	0.6267	6676	0.350	0.350
6163	0.6267	0.6267	6676	0.350	0.350
6164	0.6267	0.6267	6676	0.350	0.350
6165	0.6267	0.6267	6676	0.350	0.350
6166	0.6267	0.6267	6676	0.350	0.350
6167	0.6267	0.6267	6676	0.350	0.350
6168	0.6267	0.6267	6676	0.350	0.350
6169	0.6267	0.6267	6676	0.350	0.350
6170	0.6267	0.6267	6676	0.350	0.350
6171	0.6267	0.6267	6676	0.350	0.350
6172	0.6267	0.6267	6676	0.350	0.350
6173	0.6267	0.6267	6676	0.350	0.350
6174	0.6267	0.6267	6676	0.350	0.350
6175	0.6267	0.6267	6676	0.350	0.350
6176	0.6267	0.6267	6676	0.350	0.350
6177	0.6267	0.6267	6676	0.350	0.350
6178	0.6267	0.6267	6676	0.350	0.350
6179	0.6267	0.6267	6676	0.350	0.350
6180	0.6267	0.6267	6676	0.350	0.350
6181	0.6267	0.6267	6676	0.350	0.350
6182	0.6267	0.6267	6676	0.350	0.350
6183	0.6267	0.6267	6676	0.350	0.350
6184	0.6267	0.6267	6676	0.350	0.350
6185	0.6267	0.6267	6676	0.350	0.350
6186	0.6267	0.6267	6676	0.350	0.350
6187	0.6267	0.6267	6676	0.350	0.350
6188	0.6267	0.6267	6676	0.350	0.350
6189	0.6267	0.6267	6676	0.350	0.350
6190	0.6267	0.6267	6676	0.350	0.350
6191	0.6267	0.6267	6676	0.350	0.350
6192	0.6267	0.6267	6676	0.350	0.350
6193	0.6267	0.6267	6676	0.350	0.350
6194	0.6267	0.6267	6676	0.350	0.350
6195	0.6267	0.6267	6676	0.350	0.350
6196	0.6267	0.6267	6676	0.350	0.350
6197	0.6267	0.6267	6676	0.350	0.350
6198	0.6267	0.6267	6676	0.350	0.350
6199	0.6267	0.6267	6676	0.350	0.350
6200	0.6267	0.6267	6676	0.350	0.350
6201	0.6267	0.6267	6676	0.350	0.350
6202	0.6267	0.6267	6676	0.350	0.350
6203	0.6267	0.6267	6676	0.350	0.350
6204	0.6267	0.6267	6676	0.350	0.350
6205	0.6267	0.6267	6676	0.350	0.350
6206	0.6267	0.6267	6676	0.350	0.350
6207	0.6267	0.6267	6676	0.350	0.350
6208	0.6267	0.6267	6676	0.350	0.350
6209	0.6267	0.6267	6676	0.350	0.350
6210	0.6267	0.6267	6676	0.350	0.350
6211	0.6267	0.6267	6676	0.350	0.350
6212	0.6267	0.6267	6676	0.350	0.350
6213	0.6267	0.6267	6676	0.350	0.350
6214	0.6267	0.6267	6676	0.350	0.350
6215	0.6267	0.6267	6676	0.350	0.350
6216	0.6267	0.6267			

TABLE 5-27. CRACK GROWTH DATA SPECIMEN GT160KAB49-05 S/N 2

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	206704	0.5220	0.5480	0.5350	11441.	0.050
	LEFT	RIGHT								
1.										
57720	0.2540	0.2540	0.2515	0.050	206704	0.5220	0.5480	0.5350	11441.	0.050
108005	0.2578	0.2582	0.2580	0.050	206668	0.5236	0.5554	0.5395	11441.	0.050
130115	0.2666	0.2631	0.2643	0.050	207120	0.5266	0.5628	0.5448	11461.	0.050
137028	0.2753	0.2652	0.2698	0.050	207438	0.5352	0.5681	0.5516	11461.	0.050
141418	0.2841	0.2649	0.2745	0.050	207688	0.5404	0.5755	0.5579	11461.	0.050
144035	0.2925	0.2656	0.2791	0.050	207883	0.5420	0.5829	0.5634	11461.	0.050
145035	0.3009	0.2656	0.2832	0.050	208189	0.5523	0.5889	0.5704	11461.	0.050
151935	0.3093	0.2676	0.2883	0.050	208218	0.5611	0.5892	0.5732	11461.	0.050
154489	0.3184	0.2684	0.2934	0.050	208274	0.5699	0.5899	0.5799	11461.	0.050
160510	0.3268	0.2695	0.2982	0.050	208488	0.5783	0.5994	0.5851	11461.	0.050
164331	0.3352	0.2726	0.3039	0.050	208744	0.5843	0.5994	0.5918	11461.	0.050
170496	0.3440	0.2749	0.3164	0.050	209087	0.5922	0.6071	0.5997	11461.	0.050
172095	0.3460	0.2842	0.3151	0.050	209437	0.5974	0.6145	0.6060	11461.	0.050
172629	0.3468	0.2920	0.3194	0.050	209570	0.5994	0.6219	0.6107	11461.	0.050
172713	0.3472	0.2997	0.3235	0.050	209668	0.5998	0.6293	0.6146	11461.	0.050
173961	0.3588	0.3071	0.3329	0.050	209820	0.6018	0.6367	0.6193	11461.	0.050
175293	0.3592	0.3145	0.3318	0.050	209945	0.6106	0.6395	0.6251	11461.	0.050
175996	0.3496	0.3223	0.3319	0.050	210039	0.6190	0.6413	0.6301	11461.	0.050
177158	0.3504	0.3307	0.3405	0.050	210319	0.6274	0.6476	0.6375	11461.	0.050
178838	0.3564	0.3391	0.3427	0.050	210657	0.6326	0.6550	0.6438	11461.	0.050
180737	0.3612	0.3445	0.3538	0.050	210901	0.6353	0.6624	0.6499	11461.	0.050
182484	0.3647	0.3539	0.3593	0.050	211234	0.6389	0.6697	0.6563	11461.	0.050
184108	0.3667	0.3618	0.3642	0.050	211523	0.6429	0.6771	0.6600	11461.	0.050
186030	0.3675	0.3690	0.3683	0.050	211702	0.6513	0.6814	0.6663	11461.	0.050
187782	0.3683	0.3744	0.3710	0.050	211919	0.6585	0.6887	0.6734	11461.	0.050
189328	0.3719	0.3838	0.3779	0.050	212179	0.6681	0.6951	0.6816	11461.	0.050
191487	0.3735	0.3912	0.3833	0.050	212301	0.6769	0.6989	0.6879	11461.	0.050
192282	0.3771	0.3986	0.3878	0.050	212384	0.6852	0.7028	0.6940	11461.	0.050
193137	0.3771	0.4080	0.3913	0.050	212567	0.6936	0.7035	0.6984	11461.	0.050
194111	0.3855	0.4128	0.3991	0.050	212820	0.7020	0.7074	0.7047	11461.	0.050
195100	0.3891	0.4200	0.4046	0.050	212974	0.7104	0.7116	0.7110	11461.	0.050
195691	0.3911	0.4274	0.4092	0.050	213151	0.7072	0.7232	0.7132	11461.	0.050
196569	0.3951	0.4348	0.4149	0.050	213351	0.7104	0.7306	0.7203	11461.	0.050
197181	0.3991	0.4422	0.4208	0.050	213538	0.7128	0.7324	0.7234	11461.	0.050
198432	0.4035	0.4496	0.4275	0.050	213696	0.7222	0.7398	0.7298	11461.	0.050
199340	0.4122	0.4565	0.4344	0.050	213782	0.7222	0.7435	0.7322	11461.	0.050
200039	0.4230	0.4600	0.4419	0.050	213809	0.7266	0.7435	0.7350	11461.	0.050
202173	0.4314	0.4613	0.4465	0.050	213833	0.7292	0.7609	0.7467	11461.	0.050
203339	0.4398	0.4636	0.4517	0.050	213862	0.7326	0.7883	0.7609	11461.	0.050
204100	0.4434	0.4710	0.4582	0.050	213889	0.7330	0.7937	0.7803	11461.	0.050
204971	0.4541	0.4770	0.4656	0.050	213911	0.8014	0.7999	0.8006	11461.	0.050
205307	0.4569	0.4864	0.4707	0.050	213938	0.8098	0.8042	0.8080	11461.	0.050
205625	0.4625	0.4918	0.4772	0.050	214029	0.8138	0.8136	0.8137	11461.	0.050
205662	0.4709	0.4946	0.4827	0.050	214083	0.8221	0.8161	0.8191	11461.	0.050
206294	0.4741	0.5020	0.4880	0.050	214125	0.8301	0.8165	0.8243	11461.	0.050
206936	0.4805	0.5094	0.4949	0.050	214179	0.8385	0.8213	0.8299	11461.	0.050
208403	0.4845	0.5187	0.5008	0.050	214232	0.8469	0.8270	0.8349	11461.	0.050
208633	0.4881	0.5261	0.5041	0.050	214340	0.8545	0.8344	0.8416	11461.	0.050
208698	0.4917	0.5315	0.5116	0.050	214388	0.8636	0.8358	0.8439	11461.	0.050
208135	0.5000	0.5340	0.5170	0.050	214478	0.8736	0.8432	0.8534	11461.	0.050
208232	0.5184	0.5419	0.5219	0.050	214567	0.8820	0.8480	0.8604	11461.	0.050
208437	0.5168	0.5407	0.5287	0.050	214623	0.8924	0.8541	0.8672	11461.	0.050
					214715	0.8816	0.8614	0.8715	11461.	0.050
					214836	0.8876	0.8688	0.8782	11461.	0.050
					214902	0.8932	0.8762	0.8847	11461.	0.050
					214973	0.9028	0.8815	0.8911	11461.	0.050
					215078	0.9091	0.8829	0.8960	11461.	0.050
					215109	0.9175	0.8882	0.9029	11461.	0.050

TABLE 5-28. CRACK GROWTH DATA SPECIMEN GT160KAB49-05 S/N 3

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO					
	LEFT	RIGHT							
1.	0.4643	0.4058	0.4350	0.500	397764	0.7999	0.8312	0.3136	0.500
3-223	0.4733	0.4137	0.4435	0.500	398740	0.8085	0.8408	0.8246	0.500
52250	0.4796	0.4248	0.4517	0.500	399968	0.8162	0.8519	0.8331	0.500
79897	0.4871	0.4328	0.4600	0.500	-0.1111	0.8215	0.8631	0.8423	0.500
111628	0.4912	0.4439	0.4676	0.500	-0.206	0.8280	0.8727	0.8514	0.500
142293	0.4994	0.4593	0.4743	0.500	40202	0.8370	0.8799	0.8580	0.500
161043	0.5093	0.4730	0.4906	0.500					
188962	0.5079	0.4812	0.4945	0.500					
187060	0.5164	0.4866	0.4916	0.500					
202035	0.5197	0.4779	0.4988	0.500					
210252	0.5286	0.4859	0.5078	0.500					
225317	0.5313	0.4941	0.5155	0.500					
230977	0.5368	0.5103	0.5235	0.500					
240491	0.5452	0.5198	0.5320	0.500					
248238	0.5438	0.5241	0.5389	0.500					
254253	0.5624	0.5267	0.5448	0.500					
264424	0.5705	0.5367	0.5536	0.500					
266730	0.5793	0.5422	0.5608	0.500					
276763	0.5880	0.5498	0.5689	0.500					
285758	0.5966	0.5572	0.5769	0.500					
291671	0.6051	0.5663	0.5857	0.500					
292273	0.6136	0.5744	0.5942	0.500					
296494	0.6222	0.5826	0.6024	0.500					
293602	0.6319	0.5916	0.6118	0.500					
303081	0.6411	0.6007	0.6209	0.500					
309893	0.6502	0.6097	0.6299	0.500					
314401	0.6588	0.6183	0.6385	0.500					
318955	0.6677	0.6272	0.6474	0.500					
320844	0.6775	0.6366	0.6567	0.500					
330474	0.6842	0.6442	0.6642	0.500					
334421	0.6901	0.6509	0.6709	0.500					
340236	0.6946	0.6550	0.6750	0.500					
351527	0.6977	0.6582	0.6782	0.500					
354763	0.7039	0.6643	0.6843	0.500					
358969	0.7060	0.6683	0.6883	0.500					
359229	0.7088	0.6707	0.6907	0.500					
364761	0.7143	0.6763	0.6963	0.500					
365989	0.7166	0.6785	0.6985	0.500					
368342	0.7202	0.6806	0.7006	0.500					
370640	0.7243	0.6847	0.7047	0.500					
373090	0.7311	0.6899	0.7109	0.500					
376761	0.7364	0.6920	0.7124	0.500					
379759	0.7435	0.6985	0.7195	0.500					
383011	0.7472	0.7026	0.7226	0.500					
384223	0.7564	0.7138	0.7351	0.500					
386253	0.7611	0.7169	0.7373	0.500					
388431	0.7686	0.7233	0.7433	0.500					
391281	0.7782	0.7324	0.7507	0.500					
392743	0.7816	0.7353	0.7541	0.500					
394362	0.7902	0.7428	0.7615	0.500					
396269	0.7963	0.7490	0.7676	0.500					
397340	0.7991	0.7501	0.7696	0.500					

TABLE 5-29. CRACK GROWTH DATA SPECIMEN GT160KAB49-05 S/N 4

CYCLE #	LEFT	CRACK LENGTH (INS) RIGHT AVERAGE	MAX STRESS (PSI)	STRESS RATIO	231838	0.4637	0.5611	0.5239	11113.	0.497
0.	0.2320	0.2240	0.4280	0.0	231838	0.4637	0.5611	0.5239	11113.	0.497
10070.	0.2393	0.2264	0.4230	0.492	231927.	0.4911	0.5686	0.5300	11113.	0.497
26496.	0.2470	0.2280	0.4375	0.495	233373.	0.4983	0.5717	0.5350	11113.	0.497
47372.	0.2504	0.2357	0.4300	0.494	234040.	0.5055	0.5753	0.5404	11113.	0.497
64226.	0.2535	0.2433	0.4244	0.492	234971.	0.5099	0.5830	0.5464	11095.	0.497
70983.	0.2634	0.2464	0.4539	0.492	235752.	0.5171	0.5852	0.5511	11151.	0.495
76421.	0.2637	0.2528	0.4583	0.492	236426.	0.5218	0.5939	0.5579	11095.	0.497
88234.	0.2702	0.2583	0.4642	0.492	236933.	0.5252	0.6019	0.5634	11095.	0.494
94451.	0.2739	0.2659	0.4699	0.492	237661.	0.5324	0.6034	0.5679	11151.	0.495
101916.	0.2811	0.2699	0.4755	0.492	238222.	0.5396	0.6081	0.5738	11095.	0.499
113335.	0.2886	0.2747	0.4816	0.492	238657.	0.5467	0.6096	0.5782	11095.	0.499
115032.	0.2961	0.2765	0.4863	0.494	239621.	0.5536	0.6172	0.5854	11113.	0.498
121378.	0.3012	0.2841	0.4927	0.492	240172.	0.5556	0.6249	0.5902	11095.	0.497
125059.	0.3039	0.2921	0.4980	0.492	240787.	0.5628	0.6303	0.5964	11113.	0.498
134278.	0.3074	0.2998	0.5036	0.492	241667.	0.5699	0.6359	0.6034	11095.	0.499
140449.	0.3097	0.3075	0.5081	0.494	242374.	0.5771	0.6402	0.6086	11095.	0.499
145984.	0.3159	0.3104	0.5131	0.494	243943.	0.5819	0.6478	0.6148	11095.	0.499
152106.	0.3220	0.3162	0.5191	0.492	245904.	0.5832	0.6559	0.6195	11095.	0.497
158710.	0.3247	0.3242	0.5245	0.492	246454.	0.5849	0.6635	0.6242	11095.	0.499
162993.	0.3319	0.3290	0.5304	0.494	246803.	0.5921	0.6653	0.6287	11095.	0.499
163920.	0.3391	0.3311	0.5351	0.492	246508.	0.5989	0.6664	0.6327	11095.	0.501
165927.	0.3425	0.3338	0.5406	0.494	246238.	0.6061	0.6723	0.6392	11095.	0.499
171577.	0.3466	0.3465	0.5465	0.492	246834.	0.6139	0.6730	0.6434	11095.	0.499
174394.	0.3469	0.3541	0.5505	0.496	246803.	0.6139	0.6806	0.6473	11095.	0.497
177784.	0.3496	0.3621	0.5559	0.494	247317.	0.6211	0.6868	0.6539	11095.	0.501
181931.	0.3564	0.3696	0.5621	0.495	247590.	0.6269	0.6945	0.6607	11076.	0.500
184236.	0.3561	0.3774	0.5648	0.496	248094.	0.6323	0.7021	0.6672	11095.	0.500
184470.	0.3609	0.3851	0.5730	0.496	248639.	0.6340	0.7098	0.6719	11095.	0.501
189160.	0.3650	0.3927	0.5789	0.492	249162.	0.6412	0.7156	0.6784	11095.	0.501
190782.	0.3725	0.3942	0.5833	0.497	249537.	0.6466	0.7233	0.6850	11076.	0.502
193944.	0.3786	0.4022	0.5904	0.497	250056.	0.6531	0.7309	0.6920	11076.	0.502
195460.	0.3827	0.4102	0.5965	0.497	250127.	0.6541	0.7386	0.6964	11076.	0.502
198876.	0.3865	0.4179	0.6022	0.497	250713.	0.6606	0.7462	0.7034	11076.	0.502
199444.	0.3875	0.4253	0.6065	0.497	251356.	0.6671	0.7508	0.7089	11076.	0.502
202293.	0.3909	0.4352	0.6120	0.497	251667.	0.6719	0.7583	0.7151	11076.	0.502
204332.	0.3970	0.4408	0.6189	0.497	251812.	0.6797	0.7659	0.7192	11076.	0.502
206160.	0.4028	0.4485	0.6257	0.495	252260.	0.6797	0.7699	0.7248	11057.	0.504
209535.	0.4100	0.4547	0.6323	0.497	252556.	0.6841	0.7716	0.7309	11057.	0.503
210991.	0.4117	0.4627	0.6372	0.497	253005.	0.6859	0.7856	0.7357	11057.	0.503
213279.	0.4168	0.4704	0.6436	0.496	253603.	0.6899	0.7932	0.7416	11057.	0.503
214760.	0.4230	0.4780	0.6505	0.497	253791.	0.6971	0.7965	0.7468	11057.	0.503
216572.	0.4301	0.4835	0.6568	0.497	255163.	0.7043	0.7991	0.7517	11057.	0.503
218818.	0.4332	0.4911	0.6632	0.497	255493.	0.7087	0.8067	0.7577	11057.	0.502
222539.	0.4397	0.4973	0.6685	0.497	255506.	0.7159	0.8089	0.7624	11076.	0.504
221870.	0.4414	0.5057	0.6735	0.497	255962.	0.7210	0.8242	0.7726	11076.	0.502
224979.	0.4458	0.5134	0.6796	0.497	255782.	0.7431	0.8537	0.7984	11057.	0.503
226528.	0.4564	0.5241	0.6855	0.497	255932.	0.7431	0.8614	0.8041	11057.	0.504
227413.	0.4659	0.5323	0.6913	0.497	256123.	0.7496	0.8691	0.8093	11076.	0.504
228578.	0.4714	0.5400	0.7057	0.497	256298.	0.7568	0.8742	0.8155	11076.	0.502
229633.	0.4724	0.5480	0.7102	0.497	256399.	0.7593	0.8818	0.8207	11038.	0.503
230449.	0.4796	0.5545	0.7170	0.497	256516.	0.7612	0.8895	0.8253	11076.	0.503
					256678.	0.7694	0.8942	0.8313	11057.	0.504
					256868.	0.7742	0.9019	0.8380	11037.	0.504
					256998.	0.7800	0.9055	0.8447	11037.	0.507
					257152.	0.7841	0.9172	0.8506	11037.	0.504
					257268.	0.7847	0.9248	0.8548	11037.	0.506
					257327.	0.7858	0.9325	0.8591	11038.	0.507
					257406.	0.7875	0.9401	0.8638	11038.	0.507

TABLE 5-30. CRACK GROWTH DATA SPECIMEN GT160KAB49-25 S/N 1

[illegible]

TABLE 5-31. CRACK GROWTH DATA SPECIMEN GT160KAB49-25 S/N 2

CYCLE	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
1	0.2360	0.2300	0	0.217
318	0.3321	0.2388	0.2334	0.217
1267	0.2262	0.2475	0.2348	0.217
1669	0.2398	0.2563	0.2480	0.217
2404	0.2282	0.2642	0.2563	0.217
3098	0.2557	0.2759	0.2642	0.217
3709	0.2914	0.2817	0.2759	0.217
4657	0.2578	0.2952	0.2817	0.217
5004	0.2919	0.3033	0.2952	0.217
5258	0.2872	0.3121	0.2998	0.217
5368	0.2940	0.3208	0.3074	0.217
5920	0.3035	0.3279	0.3152	0.217
6198	0.3070	0.3371	0.3220	0.217
6652	0.3123	0.3458	0.3291	0.217
6996	0.3208	0.3475	0.3342	0.217
7362	0.3277	0.3511	0.3424	0.217
7805	0.3263	0.3617	0.3490	0.217
8121	0.3448	0.3679	0.3564	0.217
8462	0.3534	0.3734	0.3644	0.217
8740	0.3619	0.3796	0.3706	0.217
9087	0.3705	0.3846	0.3779	0.217
9296	0.3758	0.3942	0.3850	0.217
9591	0.3782	0.4029	0.3926	0.217
9937	0.3871	0.4092	0.3982	0.217
10261	0.4037	0.4128	0.4071	0.217
10411	0.4055	0.4175	0.4115	0.217
10676	0.4075	0.4243	0.4169	0.217
10903	0.4099	0.4330	0.4225	0.217
10946	0.4183	0.4384	0.4284	0.217
11143	0.4270	0.4425	0.4348	0.217
11307	0.4360	0.4519	0.4412	0.217
11563	0.4445	0.4579	0.4512	0.217
12080	0.4514	0.4667	0.4591	0.217
12277	0.4600	0.4721	0.4660	0.217
12523	0.4665	0.4809	0.4737	0.217
12770	0.4750	0.4896	0.4813	0.217
12936	0.4869	0.4984	0.4896	0.217
13099	0.4730	0.5046	0.4988	0.217
13293	0.4807	0.5114	0.4971	0.217
13507	0.4932	0.5225	0.5039	0.217
13667	0.4938	0.5224	0.5111	0.217
13866	0.4995	0.5311	0.5183	0.217
14017	0.5033	0.5359	0.5251	0.217
14213	0.5092	0.5446	0.5339	0.217
14403	0.5166	0.5501	0.5400	0.217
14678	0.5235	0.5578	0.5478	0.217
14849	0.5255	0.5604	0.5542	0.217
14973	0.5361	0.5692	0.5626	0.217
15103	0.5446	0.5763	0.5703	0.217
15264	0.5528	0.5846	0.5787	0.217
15424	0.5581	0.6134	0.5857	0.217

TABLE 5-32. CRACK GROWTH DATA SPECIMEN GT160KAB49-25 S/N 3

CYCLE	CRACK LENGTH (IN)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
1333	0.2535	0.2319	0.2437	114
1351	0.2646	0.2742	0.2492	306
1361	0.2710	0.2359	0.2545	304
1371	0.2816	0.2276	0.2596	306
1381	0.2871	0.2403	0.2647	307
1391	0.2876	0.2540	0.2708	307
1401	0.2884	0.2631	0.2767	307
1411	0.2919	0.2701	0.2826	306
1421	0.2942	0.2825	0.2884	306
1431	0.2966	0.2948	0.2941	300
1441	0.3011	0.3021	0.3000	301
1451	0.3037	0.3101	0.3078	303
1461	0.3062	0.3176	0.3147	306
1471	0.3087	0.3243	0.3214	306
1481	0.3112	0.3310	0.3280	304
1491	0.3137	0.3378	0.3349	301
1501	0.3162	0.3445	0.3416	303
1511	0.3187	0.3512	0.3487	303
1521	0.3212	0.3579	0.3558	304
1531	0.3237	0.3646	0.3629	304
1541	0.3262	0.3713	0.3698	304
1551	0.3287	0.3780	0.3767	304
1561	0.3312	0.3847	0.3836	304
1571	0.3337	0.3914	0.3905	304
1581	0.3362	0.3981	0.3976	304
1591	0.3387	0.4048	0.4041	304
1601	0.3412	0.4115	0.4110	304
1611	0.3437	0.4182	0.4181	304
1621	0.3462	0.4249	0.4248	304
1631	0.3487	0.4316	0.4315	304
1641	0.3512	0.4383	0.4382	304
1651	0.3537	0.4450	0.4449	304
1661	0.3562	0.4517	0.4516	304
1671	0.3587	0.4584	0.4583	304
1681	0.3612	0.4651	0.4650	304
1691	0.3637	0.4718	0.4717	304
1701	0.3662	0.4785	0.4784	304
1711	0.3687	0.4852	0.4851	304
1721	0.3712	0.4919	0.4918	304
1731	0.3737	0.4986	0.4985	304
1741	0.3762	0.5053	0.5052	304
1751	0.3787	0.5120	0.5119	304
1761	0.3812	0.5187	0.5186	304
1771	0.3837	0.5254	0.5253	304
1781	0.3862	0.5321	0.5320	304
1791	0.3887	0.5388	0.5387	304
1801	0.3912	0.5455	0.5454	304
1811	0.3937	0.5522	0.5521	304
1821	0.3962	0.5589	0.5588	304
1831	0.3987	0.5656	0.5655	304
1841	0.4012	0.5723	0.5722	304
1851	0.4037	0.5790	0.5789	304
1861	0.4062	0.5857	0.5856	304
1871	0.4087	0.5924	0.5923	304
1881	0.4112	0.5991	0.5990	304
1891	0.4137	0.6058	0.6057	304
1901	0.4162	0.6125	0.6124	304
1911	0.4187	0.6192	0.6191	304
1921	0.4212	0.6259	0.6258	304
1931	0.4237	0.6326	0.6325	304
1941	0.4262	0.6393	0.6392	304
1951	0.4287	0.6460	0.6459	304
1961	0.4312	0.6527	0.6526	304
1971	0.4337	0.6594	0.6593	304
1981	0.4362	0.6661	0.6660	304
1991	0.4387	0.6728	0.6727	304
2001	0.4412	0.6795	0.6794	304
2011	0.4437	0.6862	0.6861	304
2021	0.4462	0.6929	0.6928	304
2031	0.4487	0.6996	0.6995	304
2041	0.4512	0.7063	0.7062	304
2051	0.4537	0.7130	0.7129	304
2061	0.4562	0.7197	0.7196	304
2071	0.4587	0.7264	0.7263	304
2081	0.4612	0.7331	0.7330	304
2091	0.4637	0.7398	0.7397	304
2101	0.4662	0.7465	0.7464	304
2111	0.4687	0.7532	0.7531	304
2121	0.4712	0.7599	0.7598	304
2131	0.4737	0.7666	0.7665	304
2141	0.4762	0.7733	0.7732	304
2151	0.4787	0.7800	0.7799	304
2161	0.4812	0.7867	0.7866	304
2171	0.4837	0.7934	0.7933	304
2181	0.4862	0.8001	0.7999	304
2191	0.4887	0.8068	0.8067	304
2201	0.4912	0.8135	0.8134	304
2211	0.4937	0.8202	0.8201	304
2221	0.4962	0.8269	0.8268	304
2231	0.4987	0.8336	0.8335	304
2241	0.5012	0.8403	0.8402	304
2251	0.5037	0.8470	0.8469	304
2261	0.5062	0.8537	0.8536	304
2271	0.5087	0.8604	0.8603	304
2281	0.5112	0.8671	0.8670	304
2291	0.5137	0.8738	0.8737	304
2301	0.5162	0.8805	0.8804	304
2311	0.5187	0.8872	0.8871	304
2321	0.5212	0.8939	0.8938	304
2331	0.5237	0.9006	0.9005	304
2341	0.5262	0.9073	0.9072	304
2351	0.5287	0.9140	0.9139	304
2361	0.5312	0.9207	0.9206	304
2371	0.5337	0.9274	0.9273	304
2381	0.5362	0.9341	0.9340	304
2391	0.5387	0.9408	0.9407	304
2401	0.5412	0.9475	0.9474	304
2411	0.5437	0.9542	0.9541	304
2421	0.5462	0.9609	0.9608	304
2431	0.5487	0.9676	0.9675	304
2441	0.5512	0.9743	0.9742	304
2451	0.5537	0.9810	0.9809	304
2461	0.5562	0.9877	0.9876	304
2471	0.5587	0.9944	0.9943	304
2481	0.5612	1.0011	1.0010	304
2491	0.5637	1.0078	1.0077	304
2501	0.5662	1.0145	1.0144	304
2511	0.5687	1.0212	1.0211	304
2521	0.5712	1.0279	1.0278	304
2531	0.5737	1.0346	1.0345	304
2541	0.5762	1.0413	1.0412	304
2551	0.5787	1.0480	1.0479	304
2561	0.5812	1.0547	1.0546	304
2571	0.5837	1.0614	1.0613	304
2581	0.5862	1.0681	1.0680	304
2591	0.5887	1.0748	1.0747	304
2601	0.5912	1.0815	1.0814	304
2611	0.5937	1.0882	1.0881	304
2621	0.5962	1.0949	1.0948	304
2631	0.5987	1.1016	1.1015	304
2641	0.6012	1.1083	1.1082	304
2651	0.6037	1.1150	1.1149	304
2661	0.6062	1.1217	1.1216	304
2671	0.6087	1.1284	1.1283	304
2681	0.6112	1.1351	1.1350	304
2691	0.6137	1.1418	1.1417	304
2701	0.6162	1.1485	1.1484	304
2711	0.6187	1.1552	1.1551	304
2721	0.6212	1.1619	1.1618	304
2731	0.6237	1.1686	1.1685	304
2741	0.6262	1.1753	1.1752	304
2751	0.6287	1.1820	1.1819	304
2761	0.6312	1.1887	1.1886	304
2771	0.6337	1.1954	1.1953	304
2781	0.6362	1.2021	1.2020	304
2791	0.6387	1.2088	1.2087	304
2801	0.6412	1.2155	1.2154	304
2811	0.6437	1.2222	1.2221	304
2821	0.6462	1.2289	1.2288	304
2831	0.6487	1.2356	1.2355	304
2841	0.6512	1.2423	1.2422	304
2851	0.6537	1.2490	1.2489	304
2861	0.6562	1.2557	1.2556	304
2871	0.6587	1.2624	1.2623	304
2881	0.6612	1.2691	1.2690	304
2891	0.6637	1.2758	1.2757	304
2901	0.6662	1.2825	1.2824	304
2911	0.6687	1.2892	1.2891	304
2921	0.6712	1.2959	1.2958	304
2931	0.6737	1.3026	1.3025	304
2941	0.6762	1.3093	1.3092	304
2951	0.6787	1.3160	1.3159	304
2961	0.6812	1.3227	1.3226	304
2971	0.6837	1.3294	1.3293	304
2981	0.6862	1.3361	1.3360	304
2991	0.6887	1.3428	1.3427	304
3001	0.6912	1.3495	1.3494	304
3011	0.6937	1.3562	1.3561	304
3021	0.6962	1.3629	1.3628	304
3031	0.6987	1.3696	1.3695	304
3041	0.7012	1.3763	1.3762	304
3051	0.7037	1.3830	1.3829	304
3061	0.7062	1.3897	1.3896	304
3071	0.7087	1.3964	1.3963	304
3081	0.7112	1.4031	1.4030	304
3091	0.7137	1.4098	1.4097	304
3101	0.7162	1.4165	1.4164	304
3111	0.7187	1.4232	1.4231	304
3121	0.7212	1.4299	1.4298	304
3131	0.7237	1.4366	1.4365	304
3141	0.7262	1.4433	1.4432	304
3151	0.7287	1.4500	1.4499	304
3161	0.7312	1.4567	1.4566	304
3171	0.7337	1.4634	1.4633	304
3181	0.7362	1.4701	1.4700	304
3191	0.7387	1.4768	1.4767	304
3201	0.7412	1.4835	1.4834	304
3211	0.7437	1.4902	1.4901	304
3221	0.7462	1.4969	1.4968	304
3231	0.7487	1.5036	1.5035	304
3241	0.7512	1.5103	1.5102	304
3251	0.7537	1.5170	1.5169	304
3261	0.7562	1.5237	1.5236	304
3271	0.7587	1.5304	1.5303	304
3281	0.7612	1.5371	1.5370	304
3291	0.7637	1.5438	1.5437	304
3301	0.7662	1.5505	1.5504	304
3311	0.7687	1.5572	1.5571	304
3321	0.7712	1.5639	1.5638	304
3331	0.7737	1.5706	1.5705	304
3341	0.7762	1.5773	1.5772	304
3351	0.7787	1.5840	1.5839	304
3361	0.7812	1.5907	1.5906	304
3371	0.7837	1.5974	1.5973	304
3381	0.7862	1.6041	1.6040	304
3391	0.7887	1.6108	1.6107	304
3401	0.7912	1.6175	1.6174	304
3411	0.7937	1.6242	1.6241	304
3421	0.7962	1.6309	1.6308	304
3431	0.7987	1.6376	1.6375	304
3441	0.8012	1.6443	1.6442	304
3451	0.8037	1.6510	1.6509	304
3461	0.8062	1.6577	1.6576	304
3471	0.8087	1.6644	1.6643	304
3481	0.8112	1.6711	1.6710	304
3491	0.8137	1.6778	1.6777	304
3501	0.8162	1.6845	1.6844	304
3511	0.8187	1.6912	1.6911	304
3521	0.8212	1.6979	1.6978	304
3531	0.8237	1.7046	1.7045	304
3541	0.8262	1.7113	1.7112	304
3551	0.8287	1.7180	1.7179	304
3561	0.8312	1.7247	1.7246	304
3571	0.8337	1.7314	1.7313	304
3581	0.8362	1.7381	1.7380	304
3591	0.8387	1.7448	1.7447	304
3601	0.8412	1.7515	1.7514	304
3611	0.8437	1.7582	1.7581	304

TABLE 5-34. CRACK GROWTH DATA SPECIMEN GT160KA849-11 S/N 1

SPECIMEN	LIFT	CRACK LENGTH (INS)	AVERAGE	MAX STRESS, PSI	STRESS RATIO	Normal fully legume reproduction	
						1952	1953
3-10	0.2072	0.3175	0.3886	6823	0.930	1.0325	0.9915
3-11	0.4064	0.3926	0.4010	6857	0.947	1.0630	1.0062
3-12	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-13	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-14	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-15	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-16	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-17	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-18	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-19	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-20	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-21	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-22	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-23	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-24	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-25	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-26	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-27	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-28	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-29	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-30	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-31	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-32	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-33	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-34	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-35	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-36	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-37	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-38	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-39	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-40	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-41	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-42	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-43	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-44	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-45	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-46	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-47	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-48	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-49	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-50	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-51	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-52	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-53	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232
3-54	0.2277	0.4011	0.3719	6877	0.932	1.0761	1.0232

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general public begins reproduction

TABLE 5-35. CRACK GROWTH DATA SPECIMEN 67, 68

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
729	0.3154	0.3003	11890	0.048
1376	0.3330	0.3380	11873	0.044
2060	0.3498	0.3571	11907	0.047
2753	0.3618	0.3764	11907	0.050
3314	0.3765	0.3963	11941	0.050
3928	0.3936	0.4147	11941	0.048
4482	0.4107	0.4310	11924	0.050
5030	0.4293	0.4396	11954	0.050
5647	0.4405	0.4600	11941	0.050
5964	0.4599	0.4762	11924	0.048
6377	0.4767	0.4919	11941	0.050
7032	0.4889	0.5108	11954	0.050
7409	0.5069	0.5293	11941	0.050
7823	0.5235	0.5459	11941	0.051
8408	0.5392	0.5637	11924	0.050
8977	0.5566	0.5731	11941	0.050
9567	0.5749	0.5941	11924	0.050
9918	0.5936	0.6032	11907	0.052
10266	0.6180	0.6221	11941	0.050
10744	0.6271	0.6402	11941	0.051
11165	0.6330	0.6531	11941	0.050
11682	0.6380	0.6725	11956	0.051
12012	0.6704	0.6918	11941	0.051
12519	0.6921	0.7064	11941	0.051
12901	0.7065	0.7238	11941	0.049
13207	0.7141	0.7401	11941	0.051
13570	0.7206	0.7516	11941	0.051
13881	0.7490	0.7691	11941	0.054
14299	0.7585	0.7858	11941	0.052
14709	0.7779	0.8016	11941	0.051
15129	0.7941	0.8200	11941	0.051
15532	0.8130	0.8330	11941	0.052
15932	0.8226	0.8542	11941	0.054
16333	0.8299	0.8509	11941	0.051
16732	0.8467	0.8617	11941	0.052
17134	0.8649	0.8934	11941	0.054
17532	0.8876	0.9120	11941	0.051
17933	0.8901	0.9106	11890	0.053
18334	0.9114	0.9312	11907	0.050
18734	0.9158	0.9431	11890	0.053
19132	0.9449	0.9672	11890	0.054

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permit fully legible reproduction

TABLE 5-36. CRACK GROWTH DATA SPECIMEN GT160KA849-i1 S/N 3

CIRCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
29101	0.2944	0.3171	0.3058	0.333
60046	0.3037	0.2316	0.3187	0.273
60047	0.3153	0.2468	0.3193	0.286
85013	0.3261	0.3619	0.3440	0.364
90622	0.3444	0.3749	0.3582	0.397
91329	0.3484	0.3965	0.3700	0.405
98869	0.3644	0.3994	0.3849	0.415
02493	0.3729	0.4131	0.3940	0.426
06992	0.3843	0.4305	0.4045	0.436
99535	0.4001	0.4439	0.4205	0.447
12310	0.4127	0.4562	0.4344	0.460
13773	0.4205	0.4705	0.4455	0.473
19178	0.4353	0.4818	0.4587	0.487
12050	0.4511	0.4944	0.4747	0.495
24273	0.4644	0.5028	0.4841	0.505
28801	0.4783	0.5238	0.5010	0.533
28252	0.4939	0.5412	0.5153	0.540
30709	0.5077	0.5566	0.5311	0.557
34102	0.5255	0.5723	0.5469	0.575
37520	0.5379	0.5878	0.5579	0.591
57041	0.5494	0.5993	0.5746	0.597
59190	0.5649	0.6133	0.5901	0.605
57573	0.5812	0.6312	0.6062	0.639
57521	0.5944	0.6445	0.6204	0.647
60055	0.6100	0.6532	0.6341	0.654
67293	0.6249	0.6702	0.6478	0.670
48650	0.6365	0.6864	0.6615	0.685
48123	0.6383	0.7034	0.6708	0.703
50027	0.6529	0.7144	0.6841	0.714
51746	0.6705	0.7304	0.7005	0.734
58320	0.6862	0.7414	0.7118	0.748
54163	0.7019	0.7496	0.7257	0.767
33196	0.7098	0.7534	0.7376	0.760
50569	0.7177	0.7819	0.7583	0.787
57573	0.7315	0.7941	0.7628	0.794
38851	0.7444	0.7998	0.7736	0.787
59813	0.7535	0.8140	0.7847	0.7904
60532	0.7539	0.8323	0.7961	0.7916
61261	0.7728	0.8415	0.8086	0.7944
65336	0.7915	0.8488	0.8201	0.787
64157	0.8027	0.8642	0.8319	0.787
60947	0.8144	0.8529	0.8435	0.794
68013	0.8328	0.8912	0.8620	0.787
60949	0.8408	0.9090	0.8749	0.787
67531	0.8493	0.9261	0.8878	0.7921
66601	0.8563	0.9385	0.9024	0.790
68775	0.8823	0.9492	0.9137	0.780
70843	0.9089	0.9643	0.9346	0.794
71915	0.9150	0.9847	0.9549	0.790
74465	0.9183	1.0219	0.9601	0.790
72222	0.9297	1.0194	0.9746	0.794
70851	0.9468	1.0343	0.9906	0.787
29101	0.2944	0.3171	0.3058	0.333
60046	0.3037	0.2316	0.3187	0.273
60047	0.3153	0.2468	0.3193	0.286
85013	0.3261	0.3619	0.3440	0.364
90622	0.3444	0.3749	0.3582	0.397
91329	0.3484	0.3965	0.3700	0.405
98869	0.3644	0.3994	0.3849	0.415
02493	0.3729	0.4131	0.3940	0.426
06992	0.3843	0.4305	0.4045	0.436
99535	0.4001	0.4439	0.4205	0.447
12310	0.4127	0.4562	0.4344	0.460
13773	0.4205	0.4705	0.4455	0.473
19178	0.4353	0.4818	0.4587	0.487
12050	0.4511	0.4944	0.4747	0.495
24273	0.4644	0.5028	0.4841	0.505
28801	0.4783	0.5238	0.5010	0.533
28252	0.4939	0.5412	0.5153	0.5

TABLE 5-38. CRACK GROWTH DATA SPECIMEN GT160KAB49-31 S/N 1

CYCLE #	CLACK LENGTH (INS)		YAL STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
3141	0.3426	0.3205	3493.	- .587
3509	0.3534	0.3335	6905.	- .300
3525	0.3668	0.3541	6855.	- .319
7988	0.3788	0.3571	6905.	- .302
9652	0.3971	0.3795	6922.	- .299
12085	0.4169	0.3730	6939.	- .305
13893	0.4305	0.3773	6905.	- .307
15518	0.4442	0.3907	6905.	- .304
16394	0.4578	0.3668	6889.	- .302
18780	0.4772	0.4090	6905.	- .300
19684	0.4756	0.4225	6939.	- .300
16576	0.4864	0.4237	6905.	- .309
1729	0.5004	0.4423	6922.	- .301
19158	0.5147	0.4538	6905.	- .304
20296	0.5282	0.4669	6872.	- .306
22150	0.5304	0.4845	6829.	- .305
23256	0.5633	0.4961	6755.	- .309
2517	0.5767	0.5096	6739.	- .312
25313	0.5864	0.5225	6759.	- .312
26271	0.6029	0.5352	6755.	- .314
27293	0.6166	0.5644	6755.	- .309
28242	0.6203	0.5949	6755.	- .309
28842	0.6440	0.5865	6755.	- .308
29871	0.6607	0.5759	6722.	- .309
31218	0.6759	0.5927	6739.	- .310
31558	0.6912	0.6473	6722.	- .302
32266	0.7051	0.6135	6789.	- .314
33001	0.7194	0.6184	6739.	- .311
33614	0.7316	0.6326	6755.	- .309
34533	0.7465	0.6464	6755.	- .314
35120	0.7616	0.6539	6739.	- .313
35897	0.7760	0.6687	6722.	- .313
36551	0.7904	0.6808	6755.	- .308
37170	0.8446	0.6894	6739.	- .314
37888	0.8181	0.7021	6722.	- .313
38438	0.8303	0.7169	6722.	- .313
38956	0.8439	0.7325	6755.	- .309
39680	0.8584	0.7314	6772.	- .308
40161	0.8748	0.7485	6739.	- .312
40711	0.8832	0.7604	6755.	- .309
41365	0.8983	0.7675	6755.	- .306
41811	0.9085	0.7811	6755.	- .309
42430	0.9273	0.7931	6789.	- .305
42723	0.9422	0.8000	6755.	- .309
43592	0.9575	0.8081	6772.	- .308
43803	0.9712	0.8222	6755.	- .309
44353	0.9842	0.8103	6739.	- .314
44764	0.9999	0.8416	6755.	- .309
45244	1.0148	0.8503	6739.	- .314
45691	1.0284	0.8666	6755.	- .309
46171	1.0428	0.8784	6755.	- .316
46535	0.9927	0.9771	6739.	- .309

TABLE 5-41. CRACK GROWTH DATA SPECIMEN GT160KAB49-31 S/N 4

CYCLE NO.	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
102	0.2981	0.2113	0.2567	11559	-497
210	0.3103	0.2207	0.2665	11693	-501
320	0.3225	0.2329	0.2785	11810	-490
430	0.3347	0.2451	0.2910	11910	-492
539	0.3471	0.2576	0.3023	12076	-493
648	0.3595	0.2699	0.3147	12126	-490
756	0.3720	0.2820	0.3270	12110	-493
865	0.3846	0.2945	0.3395	12193	-494
973	0.3972	0.3069	0.3521	12210	-492
1082	0.4098	0.3193	0.3646	12126	-491
1191	0.4224	0.3317	0.3770	12110	-490
1300	0.4350	0.3441	0.3895	12093	-491
1409	0.4476	0.3565	0.4021	12093	-492
1518	0.4602	0.3689	0.4145	12160	-488
1627	0.4728	0.3813	0.4271	12110	-492
1736	0.4854	0.3937	0.4395	12110	-491
1845	0.4980	0.4061	0.4507	12126	-488
1954	0.5106	0.4185	0.4645	12126	-490
2063	0.5232	0.4309	0.4771	12110	-492
2172	0.5358	0.4433	0.4895	12093	-494
2281	0.5484	0.4557	0.5021	12110	-491
2390	0.5610	0.4681	0.5145	12126	-490
2499	0.5736	0.4805	0.5271	12110	-492
2608	0.5862	0.4929	0.5401	12093	-494
2717	0.5988	0.5053	0.5525	12110	-490
2826	0.6114	0.5177	0.5645	12110	-491
2935	0.6240	0.5301	0.5770	12093	-494
3044	0.6366	0.5425	0.5895	12110	-492
3153	0.6492	0.5549	0.6021	12110	-490
3262	0.6618	0.5673	0.6145	12093	-492
3371	0.6744	0.5797	0.6271	12110	-490
3480	0.6870	0.5921	0.6395	12110	-491
3589	0.6996	0.6045	0.6521	12093	-494
3698	0.7122	0.6169	0.6645	12110	-490
3807	0.7248	0.6293	0.6771	12110	-491
3916	0.7374	0.6417	0.6895	12093	-494
4025	0.7500	0.6541	0.7021	12110	-490
4134	0.7626	0.6665	0.7145	12093	-492
4243	0.7752	0.6789	0.7271	12110	-490
4352	0.7878	0.6913	0.7395	12110	-491
4461	0.8004	0.7037	0.7521	12093	-494
4570	0.8130	0.7161	0.7645	12110	-490
4679	0.8256	0.7285	0.7771	12110	-491
4788	0.8382	0.7409	0.7895	12093	-494
4897	0.8508	0.7533	0.8021	12110	-490
5006	0.8634	0.7657	0.8145	12110	-491
5115	0.8760	0.7781	0.8271	12093	-494
5224	0.8886	0.7905	0.8395	12110	-490
5333	0.9012	0.8029	0.8521	12110	-491
5442	0.9138	0.8153	0.8645	12093	-494
5551	0.9264	0.8277	0.8771	12110	-490
5660	0.9390	0.8401	0.8895	12110	-491
5769	0.9516	0.8525	0.9021	12093	-494
5878	0.9642	0.8649	0.9145	12110	-490
5987	0.9768	0.8773	0.9271	12110	-491
6096	0.9894	0.8897	0.9395	12093	-494
6205	1.0020	0.9021	0.9521	12110	-490
6314	1.0146	0.9145	0.9645	12110	-491
6423	1.0272	0.9269	0.9771	12093	-494
6532	1.0398	0.9393	0.9895	12110	-490
6641	1.0524	0.9517	1.0021	12110	-491
6750	1.0650	0.9641	1.0145	12093	-494
6859	1.0776	0.9765	1.0271	12110	-490
6968	1.0902	0.9889	1.0395	12110	-491
7077	1.1028	1.0013	1.0521	12093	-494
7186	1.1154	1.0137	1.0645	12110	-490
7295	1.1280	1.0261	1.0771	12110	-491
7404	1.1406	1.0385	1.0895	12093	-494
7513	1.1532	1.0509	1.1021	12110	-490
7622	1.1658	1.0633	1.1145	12110	-491
7731	1.1784	1.0757	1.1271	12093	-494
7840	1.1910	1.0881	1.1395	12110	-490
7949	1.2036	1.1005	1.1521	12110	-491
8058	1.2162	1.1129	1.1645	12093	-494
8167	1.2288	1.1253	1.1771	12110	-490
8276	1.2414	1.1377	1.1895	12110	-491
8385	1.2540	1.1501	1.2021	12093	-494
8494	1.2666	1.1625	1.2145	12110	-490
8603	1.2792	1.1749	1.2271	12110	-491
8712	1.2918	1.1873	1.2395	12093	-494
8821	1.3044	1.1997	1.2521	12110	-490
8930	1.3170	1.2121	1.2645	12110	-491
9039	1.3296	1.2245	1.2771	12093	-494
9148	1.3422	1.2369	1.2895	12110	-490
9257	1.3548	1.2493	1.3021	12110	-491
9366	1.3674	1.2617	1.3145	12093	-494
9475	1.3800	1.2741	1.3271	12110	-490
9584	1.3926	1.2865	1.3395	12110	-491
9693	1.4052	1.2989	1.3521	12093	-494
9802	1.4178	1.3113	1.3645	12110	-490
9911	1.4304	1.3237	1.3771	12110	-491
10020	1.4430	1.3361	1.3895	12093	-494
10129	1.4556	1.3485	1.4021	12110	-490
10238	1.4682	1.3609	1.4145	12110	-491
10347	1.4808	1.3733	1.4271	12093	-494
10456	1.4934	1.3857	1.4395	12110	-490
10565	1.5060	1.3981	1.4521	12110	-491
10674	1.5186	1.4105	1.4645	12093	-494
10783	1.5312	1.4229	1.4771	12110	-490
10892	1.5438	1.4353	1.4895	12110	-491
10901	1.5564	1.4477	1.5021	12093	-494
11010	1.5690	1.4601	1.5145	12110	-490
11119	1.5816	1.4725	1.5271	12110	-491
11228	1.5942	1.4849	1.5395	12093	-494
11337	1.6068	1.4973	1.5521	12110	-490
11446	1.6194	1.5097	1.5645	12110	-491
11555	1.6320	1.5221	1.5771	12093	-494
11664	1.6446	1.5345	1.5895	12110	-490
11773	1.6572	1.5469	1.6021	12110	-491
11882	1.6698	1.5593	1.6145	12093	-494
11991	1.6824	1.5717	1.6271	12110	-490
12000	1.6950	1.5841	1.6395	12110	-491
12109	1.7076	1.5965	1.6521	12093	-494
12218	1.7202	1.6089	1.6645	12110	-490
12327	1.7328	1.6213	1.6771	12110	-491
12436	1.7454	1.6337	1.6895	12093	-494
12545	1.7580	1.6461	1.7021	12110	-490
12654	1.7706	1.6585	1.7145	12110	-491
12763	1.7832	1.6709	1.7271	12093	-494
12872	1.7958	1.6833	1.7395	12110	-490
12981	1.8084	1.6957	1.7521	12110	-491
13090	1.8210	1.7081	1.7645	12093	-494
13199	1.8336	1.7205	1.7771	12110	-490
13308	1.8462	1.7329	1.7895	12110	-491
13417	1.8588	1.7453	1.8021	12093	-494
13526	1.8714	1.7577	1.8145	12110	-490
13635	1.8840	1.7701	1.8271	12110	-491
13744	1.8966	1.7825	1.8395	12093	-494
13853	1.9092	1.7949	1.8521	12110	-490
13962	1.9218	1.8073	1.8645	12110	-491
14071	1.9344	1.8197	1.8771	12093	-494
14180	1.9470	1.8321	1.8895	12110	-490
14289	1.9596	1.8445	1.9021	12110	-491
14398	1.9722	1.8569	1.9145	12093	-494
14507	1.9848	1.8693	1.9271	12110	-490
14616	1.9974	1.8817	1.9395	12110	-491
14725	2.0100	1.8941	1.9521	12093	-494
14834	2.0226	1.9065	1.9645	12110	-490
14943	2.0352	1.9189	1.9771	12110	-491
15052	2.0478	1.9313	1.9895	12093	-494
15161	2.0604	1.9437	2.0021	12110	-490
15270	2.0730	1.9561	2.0145	12110	-491
15379	2.0856	1.9685	2.0271	12093	-494
15488	2.0982	1.9809	2.0395	12110	-490
15597	2.1108	1.9933	2.0521	12110	-491
15706	2.1234	2.0057	2.0645	12093	-494
15815	2.1360	2.0181	2.0771	12110	-490
15924	2.1486	2.0305	2.0895	12110	-491
16033	2.1612	2.0429	2.1021	12093	-494
16142	2.1738	2.0553	2.1145	12110	-490
16251	2.1864	2.0677	2.1271	12110	-491
16360	2.1990	2.0801	2.1395	12093	-494
16469	2.2116	2.0925	2.1521	12110	-490
16578	2.2242	2.1049	2.1645	12110	-491
16687	2.2368	2.1173	2.1771	12093	-494
16796	2.2494	2.1297	2.1895	12110	-490
16905	2.2620	2.1421	2.2021	12110	-491
17014	2.2746	2.1545	2.2145	12093	-494
17123	2.2872	2.1669	2.2271	12110	-490
17232	2.2998	2.1793	2.2395	12110	-491
17341	2.3124	2.1917	2.2521	12093	-494
17450	2.3250	2.2041	2.2645	12110	-490
17559	2.3376	2.2165	2.2771	12110	-491
17668	2.3502	2.2289	2.2895	12093	-494
17777	2.3628	2.2413	2.3021	12110	-490
17886	2.3754	2.2537	2.3145	12110	-491
17995	2.3880	2.2661	2.3271	12093	-494
18104	2.4006	2.2785	2.3395	12110	-490
18213	2.4132	2.2909	2.3521	12110	-491
18322	2.4258	2.3033	2.3645	12093	-494
18431	2.4384	2.3157	2.3771	12110	-490
18540	2.4510	2.3281	2.3895	12110	-491
18649	2.4636	2.3405	2.4021	12093	-494
18758	2.4762	2.3529	2.4145	12110	-490
18867	2.4888	2.3653	2.4271	12110	-491
18976	2.5014	2.3777	2.4395	12093	-494
19085	2.5140	2.3901	2.4521	12110	-490
19194	2.5266	2.4025	2.4645	12110	-491
19303	2.5392	2.4149	2.4771	12093	-494
19412	2.5518	2.4273	2.4895	12110	-490
19521	2.5644	2.4397	2.5021	12110	-491
19630	2.5770	2.4521	2.5145	12093	-494
19739	2.5896	2.4645	2.5271	12110	-490
19848	2.6022	2.4769	2.5395	12110	-491
19957	2.6148	2.4893	2.5521	12093	-494
20066	2.6274	2.50			

TABLE 5-42. CRACK GROWTH DATA SPECIMEN GT160KAB49-13 S/N 1

CYCLE #	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
2	0.3690	0.3800	0.3745	-483	0.350
3041	0.3753	0.4020	0.3891	-462	0.350
8445	0.3870	0.4146	0.4008	-467	0.350
11250	0.4026	0.4195	0.4115	-462	0.350
146226	0.4276	0.4273	0.4275	-457	0.350
174783	0.4491	0.4391	0.4441	-442	0.350
202405	0.4725	0.4537	0.4631	-442	0.350
215406	0.4940	0.4635	0.4787	-442	0.350
227760	0.5052	0.4743	0.4902	-442	0.350
237922	0.5082	0.482	0.5022	-467	0.350
242911	0.5129	0.5143	0.5143	-450	0.350
250340	0.5307	0.519	0.5247	-451	0.350
256076	0.5379	0.5134	0.5286	-456	0.350
258444	0.5363	0.5149	0.5276	-457	0.350
260967	0.5551	0.5049	0.5650	-473	0.350
266125	0.5742	0.5191	0.5516	-483	0.350
273727	0.6033	0.6076	0.611	-473	0.350
278303	0.6229	0.6037	0.6134	-473	0.350
284446	0.638	0.6067	0.6602	-473	0.350
285726	0.6533	0.6843	0.6788	-478	0.350
296671	0.6753	0.7110	0.714	-478	0.350
301013	0.7218	0.7109	0.7088	-474	0.350
304635	0.7203	0.7389	0.7296	-474	0.350
304353	0.7253	0.7189	0.7226	-474	0.350
307756	0.7473	0.7306	0.7539	-478	0.350
312256	0.7615	0.7302	0.7660	-473	0.350
315405	0.7833	0.7190	0.7811	-477	0.350
316391	0.8043	0.7353	0.7948	-477	0.350
320307	0.8238	0.7936	0.8107	-477	0.350
320388	0.8330	0.7961	0.8295	-477	0.350
321999	0.8514	0.8373	0.8463	-477	0.350
324336	0.9179	0.8195	0.8637	-477	0.350
326144	0.9299	0.8269	0.8784	-477	0.350
328440	0.9514	0.8317	0.8915	-477	0.350
330325	0.9743	0.8479	0.9111	-477	0.350
332366	0.9529	0.8530	0.9259	-474	0.350
335632	1.0140	0.8530	0.9485	-479	0.350
336649	1.0350	0.9236	0.9793	-479	0.350
340102	1.0349	0.9563	0.9556	-474	0.350
341779	1.0607	0.9608	1.0137	-489	0.350
341667	1.0721	0.9822	1.0271	-479	0.350
342195	1.0935	1.0023	1.0459	-474	0.350
342752	1.1117	1.0223	1.0670	-473	0.350
342911	1.1222	1.0426	1.0755	-473	0.350

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TABLE 5-43. CRACK GROWTH DATA SPECIMEN GT160KA949-13 S/N 2

CYCLE #	CRACK LENGTH (INS)		MAX STRESS(MSI)	STRESS RATIO	S3614	0.762	0.7079	0.7521	10585.	0.050
	LEFT	RIGHT								
495.	0.3104	0.3212	0.3159	0.050	33614	0.762	0.7079	0.7521	10585.	0.050
980.	0.3239	0.3236	0.3238	0.050	33639	0.763	0.7193	0.7584	10585.	0.050
1965.	0.3365	0.3261	0.3313	0.050	33662	0.8068	0.8068	0.7637	10585.	0.050
4658.	0.3492	0.3303	0.3397	0.050	33713	0.8161	0.7232	0.7697	10585.	0.050
5443.	0.3618	0.3623	0.3621	0.050	33857	0.8255	0.8255	0.7772	10585.	0.050
7410.	0.3744	0.3537	0.3641	0.050	34035	0.8325	0.7381	0.7853	10596.	0.050
8059.	0.3865	0.3651	0.3758	0.050	34117	0.8330	0.7477	0.7903	10585.	0.050
11536.	0.3985	0.3823	0.3904	0.050	34335	0.8321	0.7700	0.8012	10585.	0.050
12193.	0.4027	0.3994	0.4010	0.050	34360	0.8325	0.7862	0.8094	10585.	0.050
12931.	0.4154	0.4099	0.4127	0.050	34290	0.8334	0.7954	0.8144	10585.	0.050
13478.	0.4290	0.4255	0.4273	0.050	34429	0.8422	0.8029	0.8228	10585.	0.050
14713.	0.4406	0.4287	0.4347	0.050	34422	0.8467	0.8125	0.8296	10585.	0.050
15930.	0.4533	0.4303	0.4418	0.050	34365	0.8507	0.8212	0.8362	10585.	0.050
16921.	0.4659	0.4450	0.4554	0.050	34681	0.8546	0.8309	0.8427	10585.	0.050
16556.	0.4792	0.4588	0.4690	0.050	35006	0.8613	0.8400	0.8507	10585.	0.050
17091.	0.4918	0.4661	0.4790	0.050	35153	0.8622	0.8501	0.8561	10585.	0.050
17594.	0.5044	0.4783	0.4914	0.050	35822	0.8715	0.8519	0.8617	10596.	0.050
18624.	0.5127	0.4854	0.5131	0.050	35918	0.8741	0.8610	0.8696	10574.	0.050
19624.	0.5213	0.5125	0.5169	0.050	36040	0.8825	0.8711	0.8768	10585.	0.050
20356.	0.5333	0.5272	0.5303	0.050	36154	0.8918	0.8724	0.8821	10585.	0.050
21213.	0.5424	0.5443	0.5433	0.050	36172	0.8918	0.8816	0.8867	10574.	0.050
21608.	0.5550	0.5492	0.5521	0.050	36298	0.9027	0.8908	0.8917	10585.	0.050
22732.	0.5643	0.5535	0.5589	0.050	36513	0.9025	0.8922	0.8999	10574.	0.050
23648.	0.5736	0.5574	0.5655	0.050	36674	0.9108	0.9065	0.9082	10574.	0.050
24944.	0.5780	0.5666	0.5723	0.050	36757	0.9162	0.9159	0.9159	10574.	0.050
25217.	0.5847	0.5758	0.5802	0.050	36788	0.9286	0.9192	0.9235	10574.	0.050
25797.	0.5913	0.5850	0.5881	0.050	36829	0.9378	0.9379	0.9379	10574.	0.050
26436.	0.6006	0.5920	0.5963	0.050	36943	0.9401	0.9371	0.9336	10585.	0.050
27287.	0.6099	0.5999	0.6049	0.050	36981	0.9498	0.9498	0.9498	10564.	0.050
28302.	0.6170	0.6091	0.6130	0.050	36999	0.9653	0.9288	0.9393	10574.	0.050
28836.	0.6201	0.6182	0.6192	0.050	37068	0.9708	0.9288	0.9471	10574.	0.050
29630.	0.6240	0.6274	0.6257	0.050	37090	0.9839	0.9293	0.9566	10574.	0.050
29803.	0.6333	0.6305	0.6319	0.050	37159	0.9836	0.9383	0.9621	10564.	0.050</

TABLE 5-44. CRACK GROWTH DATA SPECIMEN GT160KAB49-13 S/N 3

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TABLE 5-45. CRACK GROWTH DATA SPECIMEN GT160KAB49-13 S/N 4

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	
	LEFT	RIGHT			
12983	0.3140	0.3144	0.3152	0.500	58445
0.3290	0.3184	0.3237	0.3232	0.500	0.7295
0.3260	0.3189	0.3307	0.3302	0.500	0.7316
0.3562	0.3223	0.3393	0.3387	0.500	59776
0.3698	0.3263	0.3440	0.3435	0.500	59778
0.3828	0.3311	0.3523	0.3518	0.500	60348
0.3958	0.3362	0.3600	0.3595	0.500	60781
0.4087	0.3387	0.3660	0.3658	0.500	61081
0.4217	0.3411	0.3684	0.3682	0.500	61390
0.4347	0.3441	0.3694	0.3693	0.500	61500
0.4479	0.3451	0.3690	0.3689	0.500	61635
0.4613	0.3476	0.3700	0.3699	0.500	61728
0.4741	0.3480	0.3704	0.3703	0.500	61822
0.4861	0.3490	0.3716	0.3715	0.500	61937
0.4991	0.3514	0.3737	0.3736	0.500	62008
0.5121	0.3529	0.3749	0.3748	0.500	62281
0.5251	0.3549	0.3765	0.3764	0.500	62406
0.5381	0.3573	0.3780	0.3779	0.500	62606
0.5511	0.3600	0.3800	0.3799	0.500	62811
0.5641	0.3622	0.3822	0.3821	0.500	63016
0.5771	0.3649	0.3849	0.3848	0.500	63246
0.5901	0.3679	0.3889	0.3888	0.500	63467
0.6031	0.3719	0.3939	0.3938	0.500	63691
0.6161	0.3769	0.3999	0.3998	0.500	63941
0.6291	0.3819	0.4059	0.4058	0.500	64181
0.6421	0.3869	0.4119	0.4118	0.500	64430
0.6551	0.3919	0.4179	0.4178	0.500	64680
0.6681	0.3969	0.4239	0.4238	0.500	64939
0.6811	0.4019	0.4299	0.4298	0.500	65181
0.6941	0.4069	0.4359	0.4358	0.500	65430
0.7071	0.4119	0.4419	0.4418	0.500	65679
0.7201	0.4169	0.4479	0.4478	0.500	65939
0.7331	0.4219	0.4539	0.4538	0.500	66181
0.7461	0.4269	0.4599	0.4598	0.500	66430
0.7591	0.4319	0.4659	0.4658	0.500	66679
0.7721	0.4369	0.4719	0.4718	0.500	66939
0.7851	0.4419	0.4779	0.4778	0.500	67181
0.7981	0.4469	0.4839	0.4838	0.500	67430
0.8111	0.4519	0.4899	0.4898	0.500	67679
0.8241	0.4569	0.4959	0.4958	0.500	67939
0.8371	0.4619	0.5019	0.5018	0.500	68181
0.8501	0.4669	0.5079	0.5078	0.500	68430
0.8631	0.4719	0.5139	0.5138	0.500	68679
0.8761	0.4769	0.5199	0.5198	0.500	68939
0.8891	0.4819	0.5259	0.5258	0.500	69181
0.9021	0.4869	0.5319	0.5318	0.500	69430
0.9151	0.4919	0.5379	0.5378	0.500	69679
0.9281	0.4969	0.5439	0.5438	0.500	69939
0.9411	0.5019	0.5499	0.5498	0.500	70181
0.9541	0.5069	0.5559	0.5558	0.500	70430
0.9671	0.5119	0.5619	0.5618	0.500	70679
0.9801	0.5169	0.5679	0.5678	0.500	70939
0.9931	0.5219	0.5739	0.5738	0.500	71181
1.0061	0.5269	0.5799	0.5798	0.500	71430
1.0191	0.5319	0.5859	0.5858	0.500	71679
1.0321	0.5369	0.5919	0.5918	0.500	71939
1.0451	0.5419	0.5979	0.5978	0.500	72181
1.0581	0.5469	0.6039	0.6038	0.500	72430
1.0711	0.5519	0.6099	0.6098	0.500	72679
1.0841	0.5569	0.6159	0.6158	0.500	72939
1.0971	0.5619	0.6219	0.6218	0.500	73181
1.1101	0.5669	0.6279	0.6278	0.500	73430
1.1231	0.5719	0.6339	0.6338	0.500	73679
1.1361	0.5769	0.6399	0.6398	0.500	73939
1.1491	0.5819	0.6459	0.6458	0.500	74181
1.1621	0.5869	0.6519	0.6518	0.500	74430
1.1751	0.5919	0.6579	0.6578	0.500	74679
1.1881	0.5969	0.6639	0.6638	0.500	74939
1.2011	0.6019	0.6699	0.6698	0.500	75181
1.2141	0.6069	0.6759	0.6758	0.500	75430
1.2271	0.6119	0.6819	0.6818	0.500	75679
1.2401	0.6169	0.6879	0.6878	0.500	75939
1.2531	0.6219	0.6939	0.6938	0.500	76181
1.2661	0.6269	0.6999	0.6998	0.500	76430
1.2791	0.6319	0.7059	0.7058	0.500	76679
1.2921	0.6369	0.7119	0.7118	0.500	76939
1.3051	0.6419	0.7179	0.7178	0.500	77181
1.3181	0.6469	0.7239	0.7238	0.500	77430
1.3311	0.6519	0.7299	0.7298	0.500	77679
1.3441	0.6569	0.7359	0.7358	0.500	77939
1.3571	0.6619	0.7419	0.7418	0.500	78181
1.3701	0.6669	0.7479	0.7478	0.500	78430
1.3831	0.6719	0.7539	0.7538	0.500	78679
1.3961	0.6769	0.7599	0.7598	0.500	78939
1.4091	0.6819	0.7659	0.7658	0.500	79181
1.4221	0.6869	0.7719	0.7718	0.500	79430
1.4351	0.6919	0.7779	0.7778	0.500	79679
1.4481	0.6969	0.7839	0.7838	0.500	79939
1.4611	0.7019	0.7899	0.7898	0.500	80181
1.4741	0.7069	0.7959	0.7958	0.500	80430
1.4871	0.7119	0.8019	0.8018	0.500	80679
1.5001	0.7169	0.8079	0.8078	0.500	80939
1.5131	0.7219	0.8139	0.8138	0.500	81181
1.5261	0.7269	0.8199	0.8198	0.500	81430
1.5391	0.7319	0.8259	0.8258	0.500	81679
1.5521	0.7369	0.8319	0.8318	0.500	81939
1.5651	0.7419	0.8379	0.8378	0.500	82181
1.5781	0.7469	0.8439	0.8438	0.500	82430
1.5911	0.7519	0.8499	0.8498	0.500	82679
1.6041	0.7569	0.8559	0.8558	0.500	82939
1.6171	0.7619	0.8619	0.8618	0.500	83181
1.6301	0.7669	0.8679	0.8678	0.500	83430
1.6431	0.7719	0.8739	0.8738	0.500	83679
1.6561	0.7769	0.8799	0.8798	0.500	83939
1.6691	0.7819	0.8859	0.8858	0.500	84181
1.6821	0.7869	0.8919	0.8918	0.500	84430
1.6951	0.7919	0.8979	0.8978	0.500	84679
1.7081	0.7969	0.9039	0.9038	0.500	84939
1.7211	0.8019	0.9099	0.9098	0.500	85181
1.7341	0.8069	0.9159	0.9158	0.500	85430
1.7471	0.8119	0.9219	0.9218	0.500	85679
1.7601	0.8169	0.9279	0.9278	0.500	85939
1.7731	0.8219	0.9339	0.9338	0.500	86181
1.7861	0.8269	0.9399	0.9398	0.500	86430
1.7991	0.8319	0.9459	0.9458	0.500	86679
1.8121	0.8369	0.9519	0.9518	0.500	86939
1.8251	0.8419	0.9579	0.9578	0.500	87181
1.8381	0.8469	0.9639	0.9638	0.500	87430
1.8511	0.8519	0.9699	0.9698	0.500	87679
1.8641	0.8569	0.9759	0.9758	0.500	87939
1.8771	0.8619	0.9819	0.9818	0.500	88181
1.8901	0.8669	0.9879	0.9878	0.500	88430
1.9031	0.8719	0.9939	0.9938	0.500	88679
1.9161	0.8769	0.9999	0.9998	0.500	88939
1.9291	0.8819	1.0059	1.0058	0.500	89181
1.9421	0.8869	1.0119	1.0118	0.500	89430
1.9551	0.8919	1.0179	1.0178	0.500	89679
1.9681	0.8969	1.0239	1.0238	0.500	89939
1.9811	0.9019	1.0299	1.0298	0.500	90181
1.9941	0.9069	1.0359	1.0358	0.500	90430
2.0071	0.9119	1.0419	1.0418	0.500	90679
2.0201	0.9169	1.0479	1.0478	0.500	90939
2.0331	0.9219	1.0539	1.0538	0.500	91181
2.0461	0.9269	1.0599	1.0598	0.500	91430
2.0591	0.9319	1.0659	1.0658	0.500	91679
2.0721	0.9369	1.0719	1.0718	0.500	91939
2.0851	0.9419	1.0779	1.0778	0.500	92181
2.0981	0.9469	1.0839	1.0838	0.500	92430
2.1111	0.9519	1.0899	1.0898	0.500	92679
2.1241	0.9569	1.0959	1.0958	0.500	92939
2.1371	0.9619	1.1019	1.1018	0.500	93181
2.1501	0.9669	1.1079	1.1078	0.500	93430
2.1631	0.9719	1.1139	1.1138	0.500	93679
2.1761	0.9769	1.1199	1.1198	0.500	93939
2.1891	0.9819	1.1259	1.1258	0.500	94181
2.2021	0.9869	1.1319	1.1318	0.500	94430
2.2151	0.9919	1.1379	1.1378	0.500	94679
2.2281	0.9969	1.1439	1.1438	0.500	94939
2.2411	1.0019	1.1499	1.1498	0.500	95181
2.2541	1.0069	1.1559	1.1558	0.500	95430
2.2671	1.0119	1.1619	1.1618	0.500	95679
2.2801	1.0169	1.1679	1.1678	0.500	95939
2.2931	1.0219	1.1739	1.1738	0.500	96181
2.3061	1.0269	1.1799	1.1798	0.500	96430
2.3191	1.0319	1.1859	1.1858	0.500	96679
2.3321	1.0369	1.1919	1.1918	0.500	96939
2.3451	1.0419	1.1979	1.1978	0.500	97181
2.3581	1.0469	1.2039	1.2038	0.500	97430
2.3711	1.0519	1.2099	1.2098	0.500	97679
2.3841	1.0569	1.2159	1.2158	0.500	97939
2.3971	1.0619	1.2219	1.2218	0.500	98181
2.4101	1.0669	1.2279	1.2278	0.500	98430
2.4231	1.0719	1.2339	1.2338	0.500	98679
2.4361	1.0769	1.2399	1.2398	0.500	98939
2.4491	1.0819	1.2459	1.2458	0.500	99181
2.4621	1.0869	1.2519	1.2518	0.500	99430
2.4751	1.0919	1.2579	1.2578	0.500	99679
2.4881	1.0969	1.2639	1.2638	0.500	99939
2.5011	1.1019	1.2699	1.2698	0.500	100181
2.5141	1.1069	1.2759	1.2758	0.500	100430
2.5271	1.1119	1.2819	1.2818	0.500	100679
2.5401	1.1169	1.2879	1.2878	0.500	100939
2.5531	1.1219	1.2939	1.2938	0.500	101181
2.5661	1.1269	1.2999	1.2998	0.500	101430
2.5791	1.1319	1.3059	1.3058	0.500	101679
2.5921	1.1369	1.3119	1.3118	0.500	101939
2.6051	1.1419	1.3179	1.3178	0.500	102181
2.6181	1.1469	1.3239	1.3238	0.500	102430
2.6311	1.1519	1.3299	1.3298	0.500	102679
2.6441	1.1569	1.3359	1.3358	0.500	102939
2.6571	1.1619	1.3419	1.3418	0.50	

TABLE 5-46. CRACK GROWTH DATA SPECIMEN GT160KAB49-33 S/N 1

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
5510.	0.3798	0.3609	7062.	-0.300
9702.	0.3980	0.3732	7051.	-0.300
13940.	0.4158	0.3893	7062.	-0.300
17519.	0.4344	0.3969	7051.	-0.300
20130.	0.4488	0.4147	7051.	-0.300
22416.	0.4615	0.4300	7041.	-0.300
24827.	0.4793	0.4410	7051.	-0.300
28600.	0.4870	0.4592	7030.	-0.300
28954.	0.5031	0.4719	7041.	-0.300
31270.	0.5183	0.4871	7041.	-0.300
32822.	0.5302	0.5003	7041.	-0.300
34158.	0.5437	0.5155	7051.	-0.300
36153.	0.5615	0.5236	7041.	-0.300
37890.	0.5763	0.5380	7051.	-0.300
39254.	0.5886	0.5515	7051.	-0.300
41224.	0.6047	0.5647	7041.	-0.300
42864.	0.6195	0.5812	7030.	-0.300
44535.	0.6348	0.5977	7041.	-0.300
46156.	0.6534	0.6117	7041.	-0.300
47751.	0.6712	0.6197	7041.	-0.300
49294.	0.6865	0.6367	7051.	-0.300
51048.	0.7038	0.6494	7041.	-0.300
51999.	0.7170	0.6604	7041.	-0.300
52954.	0.7276	0.6782	7030.	-0.300
54150.	0.7458	0.6926	7041.	-0.300
55102.	0.7606	0.7057	7030.	-0.300
56457.	0.7784	0.7168	7030.	-0.300
57622.	0.7970	0.7290	7030.	-0.300
59482.	0.8144	0.7447	7030.	-0.300
60140.	0.8246	0.7625	7019.	-0.300
60952.	0.8377	0.7735	7009.	-0.300
61495.	0.8535	0.7820	7030.	-0.300
62468.	0.8733	0.7964	7030.	-0.300
63431.	0.8885	0.8108	7019.	-0.300
64401.	0.9042	0.8239	6998.	-0.300
65224.	0.9220	0.8366	7019.	-0.300
65826.	0.9398	0.8464	6998.	-0.300
66277.	0.9525	0.8591	7009.	-0.300
66914.	0.9733	0.8705	6998.	-0.300
67430.	0.9881	0.8773	6998.	-0.300
67997.	1.0046	0.8921	6987.	-0.300
68608.	1.0224	0.9027	6998.	-0.300
69030.	1.0402	0.9082	6987.	-0.300
69422.	1.0533	0.9260	6998.	-0.300
69872.	1.0694	0.9375	6987.	-0.300
70316.	1.0851	0.9519	6977.	-0.300
70579.	1.1029	0.9582	6977.	-0.300
70951.	1.1207	0.9676	6977.	-0.300
71225.	1.1385	0.9726	6966.	-0.300
71502.	1.1516	0.9866	6966.	-0.300

TABLE 5-47. CRACK GROWTH DATA SPECIMEN GT160KAB49-33 S/N 2

ITEM	CRACK LENGTH INCH	INSTR. AVERAGE	MAX. STRESS (PSI)	STRESS RATIO	25-37	0.5-30	0.5725	0.5737	10524
1	0.1220	0.1130	0.2235	0	25769	0.5845	0.5817	0.5831	10524
2	0.2076	0.1852	0.2259	0.47	29016	0.5920	0.5875	0.5898	10513
3	0.2471	0.2135	0.2270	0.70	29395	0.5942	0.5902	0.5952	10524
4	0.2334	0.2000	0.2422	0.52	29643	0.6003	0.6050	0.6026	10502
5	0.2334	0.2135	0.2422	0.52	29860	0.6079	0.6129	0.6104	10502
6	0.2676	0.2471	0.2573	0.63	30022	0.6154	0.6170	0.6162	10513
7	0.2756	0.2535	0.2573	0.66	30192	0.6230	0.6212	0.6221	10513
8	0.2756	0.2535	0.2573	0.66	30353	0.6288	0.6303	0.6295	10513
9	0.2756	0.2535	0.2573	0.66	30561	0.6318	0.6390	0.6364	10502
10	0.2756	0.2535	0.2573	0.66	30768	0.6414	0.6401	0.6437	10513
11	0.2756	0.2535	0.2573	0.66	30979	0.6464	0.6533	0.6508	10502
12	0.2756	0.2535	0.2573	0.66	31180	0.6504	0.6640	0.6572	10502
13	0.2756	0.2535	0.2573	0.66	31377	0.6565	0.6727	0.6646	10513
14	0.2756	0.2535	0.2573	0.66	31589	0.6640	0.6794	0.6717	10502
15	0.2756	0.2535	0.2573	0.66	31804	0.6705	0.6881	0.6793	10502
16	0.2756	0.2535	0.2573	0.66	32026	0.6781	0.6935	0.6858	10491
17	0.2756	0.2535	0.2573	0.66	32193	0.6860	0.7002	0.6931	10513
18	0.2756	0.2535	0.2573	0.66	32417	0.6932	0.7093	0.7013	10502
19	0.2756	0.2535	0.2573	0.66	32590	0.7008	0.7164	0.7066	10502
20	0.2756	0.2535	0.2573	0.66	32756	0.7083	0.7230	0.7157	10513
21	0.2756	0.2535	0.2573	0.66	32898	0.7159	0.7297	0.7228	10491
22	0.2756	0.2535	0.2573	0.66	33075	0.7227	0.7384	0.7306	10502
23	0.2756	0.2535	0.2573	0.66	33292	0.7303	0.7455	0.7379	10491
24	0.2756	0.2535	0.2573	0.66	33512	0.7361	0.7542	0.7451	10481
25	0.2756	0.2535	0.2573	0.66	33687	0.7407	0.7629	0.7518	10481
26	0.2756	0.2535	0.2573	0.66	33855	0.7483	0.7692	0.7587	10491
27	0.2756	0.2535	0.2573	0.66	33956	0.7555	0.7725	0.7640	10481
28	0.2756	0.2535	0.2573	0.66	34128	0.7621	0.7729	0.7680	10502
29	0.2756	0.2535	0.2573	0.66	34283	0.7706	0.7750	0.7728	10481
30	0.2756	0.2535	0.2573	0.66	34386	0.7746	0.7837	0.7791	10491
31	0.2756	0.2535	0.2573	0.66	34503	0.7800	0.7924	0.7862	10481
32	0.2756	0.2535	0.2573	0.66	34685	0.7839	0.8015	0.7926	10481
33	0.2756	0.2535	0.2573	0.66	34896	0.7904	0.8107	0.8006	10491
34	0.2756	0.2535	0.2573	0.66	34994	0.7962	0.8195	0.8078	10481
35	0.2756	0.2535	0.2573	0.66	35099	0.8037	0.8240	0.8139	10459
36	0.2756	0.2535	0.2573	0.66	35208	0.8113	0.8265	0.8189	10481
37	0.2756	0.2535	0.2573	0.66	35318	0.8171	0.8355	0.8262	10481
38	0.2756	0.2535	0.2573	0.66	35428	0.8246	0.8411	0.8329	10459
39	0.2756	0.2535	0.2573	0.66	35533	0.8322	0.8390	0.8356	10470
40	0.2756	0.2535	0.2573	0.66	35642	0.8397	0.8375	0.8385	10481
41	0.2756	0.2535	0.2573	0.66	35710	0.8477	0.8373	0.8425	10470
42	0.2756	0.2535	0.2573	0.66	35772	0.8552	0.8398	0.8475	10470
43	0.2756	0.2535	0.2573	0.66	35948	0.8628	0.8398	0.8515	10459
44	0.2756	0.2535	0.2573	0.66	36023	0.8704	0.8454	0.8571	10470
45	0.2756	0.2535	0.2573	0.66	36114	0.8768	0.8540	0.8654	10459
46	0.2756	0.2535	0.2573	0.66	36166	0.8844	0.8536	0.8700	10459
47	0.2756	0.2535	0.2573	0.66	36300	0.8920	0.8619	0.8769	10449
48	0.2756	0.2535	0.2573	0.66	36391	0.8995	0.8681	0.8838	10449
49	0.2756	0.2535	0.2573	0.66	36445	0.9071	0.8719	0.8893	10438
50	0.2756	0.2535	0.2573	0.66	36488	0.9166	0.8760	0.8953	10449
51	0.2756	0.2535	0.2573	0.66	36565	0.9222	0.8806	0.9014	10438
52	0.2756	0.2535	0.2573	0.66	36630	0.9298	0.8822	0.9062	10449
53	0.2756	0.2535	0.2573	0.66	36740	0.9373	0.8866	0.9121	10438
54	0.2756	0.2535	0.2573	0.66	36822	0.9449	0.8922	0.9186	10427
55	0.2756	0.2535	0.2573	0.66	37031	0.9506	0.9032	0.9264	10459

TABLE 5-48. CRACK GROWTH DATA SPECIMEN GT160KAB49-33 S/N 3

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
3-07.	0.2564	0.2687	7051.	- .500
8847.	0.2792	0.2849	7041.	- .500
13633.	0.2965	0.3050	7031.	- .500
18394.	0.3193	0.3207	7062.	- .500
23131.	0.3377	0.3413	7031.	- .500
25851.	0.3540	0.3565	7031.	- .500
29462.	0.3746	0.3760	7062.	- .500
33104.	0.3909	0.3923	7031.	- .500
36319.	0.4120	0.4118	7031.	- .500
39868.	0.4250	0.4331	7062.	- .500
42557.	0.4446	0.4492	7062.	- .500
44944.	0.4635	0.4699	7062.	- .500
47101.	0.4863	0.4877	7073.	- .500
50140.	0.5037	0.5078	7073.	- .500
52447.	0.5237	0.5246	7073.	- .500
54568.	0.5405	0.5432	7073.	- .500
56461.	0.5622	0.5604	7073.	- .500
58302.	0.5785	0.5788	7083.	- .500
60162.	0.5948	0.5978	7073.	- .500
61980.	0.6175	0.6132	7073.	- .500
63970.	0.6333	0.6360	7073.	- .500
65453.	0.6544	0.6538	7062.	- .500
67313.	0.6674	0.6786	7073.	- .500
68607.	0.6842	0.6934	7062.	- .500
70253.	0.7054	0.7166	7073.	- .500
71220.	0.7282	0.7285	7073.	- .500
72619.	0.7482	0.7507	7073.	- .500
73826.	0.7688	0.7681	7073.	- .500
74910.	0.7845	0.7909	7073.	- .500
76082.	0.8073	0.8088	7073.	- .500
76931.	0.8214	0.8321	7094.	- .500
77939.	0.8442	0.8467	7073.	- .500
78667.	0.8615	0.8679	7031.	- .500
79469.	0.8827	0.8831	7062.	- .500
80404.	0.8963	0.9004	7062.	- .500

TABLE 5-49. CRACK GROWTH DATA SPECIMEN GT160KAB49-33 S/N 4

CYCLE #	CRACK LENGTH (INS)		VA STRESS (PSI)	STRESS RATIO					
	LEFT	RIGHT							
1555	0.3159	0.2948	0.3053	11385	-200	0.9170	0.9181	0.9175	11385
2586	0.3251	0.3022	0.3137	11385	-96	0.9338	0.9273	0.9336	11385
3581	0.3351	0.3098	0.3227	11385	-300	0.9506	0.9506	0.9506	11385
4543	0.3467	0.3114	0.3310	11385	-500	0.9635	0.9819	0.9726	11385
5511	0.3571	0.3220	0.3395	11385	-499	0.9652	1.0019	0.9936	11385
6516	0.3662	0.3346	0.3503	11385	-499	1.0023	1.0285	1.0134	11385
7501	0.3730	0.3484	0.3587	11385	-500	1.0262	1.0617	1.0440	11385
8589	0.3823	0.3513	0.3669	11385	-501	1.0395	1.1006	1.0800	11385
9674	0.3942	0.3736	0.3749	11385	-98	1.0837	1.1457	1.1147	11385
10723	0.4014	0.3766	0.3900	11385	-500	1.1149	1.1840	1.1495	11385
11801	0.4131	0.3862	0.4006	11385	-500				
12885	0.4210	0.3983	0.4110	11385	-500				
13942	0.4319	0.4128	0.4223	11385	-498				
15025	0.4422	0.4245	0.4333	11385	-499				
16111	0.4543	0.4316	0.4431	11385	-500				
17206	0.4659	0.4417	0.4533	11385	-499				
18308	0.4748	0.4639	0.4733	11385	-499				
19433	0.4850	0.4774	0.4874	11385	-508				
20569	0.5069	0.4909	0.4984	11385	-500				
21731	0.5186	0.4975	0.5086	11385	-499				
22912	0.5300	0.5042	0.5191	11385	-499				
24119	0.5427	0.5217	0.5310	11385	-500				
25359	0.5533	0.5353	0.5436	11385	-501				
26699	0.5636	0.5456	0.5531	11385	-499				
28073	0.5637	0.5456	0.5531	11385	-500				
29467	0.5903	0.5709	0.5805	11385	-500				
30854	0.6043	0.5838	0.5941	11385	-499				
32241	0.6172	0.5952	0.6032	11385	-500				
33616	0.6254	0.6030	0.6149	11385	-499				
35007	0.6362	0.6196	0.6279	11385	-500				
36403	0.6501	0.6319	0.6403	11385	-500				
37802	0.6596	0.6487	0.6541	11385	-500				
39207	0.6731	0.6544	0.6661	11385	-500				
40611	0.6869	0.6687	0.6736	11385	-499				
42036	0.6973	0.6766	0.6870	11385	-500				
43460	0.7112	0.6913	0.7024	11385	-500				
44887	0.7259	0.7013	0.7136	11385	-499				
46322	0.7483	0.7180	0.7233	11385	-501				
47798	0.7481	0.7274	0.7380	11385	-502				
49298	0.7589	0.7389	0.7489	11385	-500				
50805	0.7669	0.7501	0.7584	11385	-498				
52399	0.7712	0.7559	0.7715	11385	-500				
53970	0.7907	0.7713	0.7846	11385	-499				
55593	0.8067	0.7974	0.8000	11385	-500				
57284	0.8202	0.8098	0.8150	11385	-500				
58943	0.8343	0.8146	0.8293	11385	-500				
60631	0.8427	0.8393	0.8410	11385	-500				
62370	0.8567	0.8490	0.8536	11385	-99				
64142	0.8677	0.8644	0.8677	11385	-99				
65913	0.8852	0.8870	0.8861	11385	-499				
67700	0.9018	0.9060	0.9076	11385	-97				

TABLE 5-50. CRACK GROWTH DATA SPECIMEN GT160KAB49-17 S/N 1

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
?	0.2450	0.2500	0.	0.050
12277	0.2531	0.2500	7136.	0.050
22818	0.2612	0.2500	7136.	0.050
36812	0.2686	0.2505	7124.	0.050
42514	0.2767	0.2510	7112.	0.050
50523	0.2852	0.2505	7112.	0.050
57242	0.2933	0.2510	7112.	0.050
52457	0.3014	0.2526	7100.	0.050
64880	0.3095	0.2547	7100.	0.050
70693	0.3184	0.2599	7112.	0.050
73390	0.3230	0.2713	7124.	0.050
75893	0.3311	0.2760	7148.	0.050
78781	0.3400	0.2832	7148.	0.050
81142	0.3481	0.2905	7124.	0.050
83718	0.3562	0.2978	7136.	0.050
85729	0.3647	0.3056	7124.	0.050
96910	0.3689	0.3170	7148.	0.357
88669	0.3770	0.3227	7124.	0.610
90617	0.3832	0.3336	7136.	0.050
92186	0.3913	0.3419	7136.	0.050
93215	0.3994	0.3492	7136.	0.050
95417	0.4052	0.3601	7136.	0.050
97162	0.4117	0.3674	7136.	0.050
98493	0.4199	0.3783	7136.	0.050
99856	0.4280	0.3876	7136.	0.050
100998	0.4359	0.3955	7124.	0.050
102187	0.4400	0.4068	7124.	0.050
103477	0.4481	0.4151	7136.	0.050
104780	0.4562	0.4240	7124.	0.050
106141	0.4643	0.4328	7112.	0.050
107396	0.4716	0.4437	7112.	0.050
108313	0.4797	0.4479	7124.	0.050
109304	0.4863	0.4593	7100.	0.050
110243	0.4944	0.4639	7124.	0.050
111193	0.4998	0.4749	7100.	0.050
112215	0.5079	0.4816	7100.	0.050
113156	0.5160	0.4878	7100.	0.050
113848	0.5199	0.4987	7100.	0.050
114537	0.5280	0.5050	7124.	0.050
115304	0.5349	0.5159	7124.	0.050
116366	0.5431	0.5232	7136.	0.050
117353	0.5512	0.5320	7112.	0.050
118169	0.5581	0.5429	7100.	0.050
119137	0.5666	0.5507	7076.	0.050
119999	0.5747	0.5600	7088.	0.050
120722	0.5828	0.5631	7088.	0.050
121586	0.5909	0.5704	7051.	0.050
122276	0.5983	0.5766	7063.	0.050
122908	0.6068	0.5863	7076.	0.050
123854	0.6149	0.5953	7031.	0.050
124424	0.6230	0.6047	7039.	0.050
125362	0.6318	0.6099	7039.	0.050
126034	0.6403	0.6192	7136.	0.050
126823	0.6485	0.6270	7136.	0.050
127397	0.6562	0.6379	7112.	0.050
127993	0.6643	0.6421	7100.	0.050
128606	0.6701	0.6530	7124.	0.050
129375	0.6774	0.6613	7112.	0.050
129789	0.6859	0.6670	7088.	0.050

TABLE 5-51. CRACK GROWTH DATA SPECIMEN GT160KAB49-17 S/W 2

[illegible]

TABLE 5-52. CRACK GROWTH DATA SPECIMEN GT160KAB49-17 S/N 3

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
2.	0.2830	0.2830	7270.	0.500
54186.	0.3033	0.3031	7270.	0.500
90874.	0.3215	0.3213	7258.	0.500
120096.	0.3407	0.3405	7258.	0.500
151385.	0.3772	0.3766	7258.	0.500
186668.	0.3865	0.3858	7258.	0.500
218870.	0.3807	0.3895	7258.	0.500
257594.	0.3816	0.4068	7245.	0.500
296478.	0.3911	0.4250	7258.	0.500
336899.	0.3953	0.4266	7245.	0.500
378128.	0.4103	0.4552	7245.	0.500
420581.	0.4233	0.4734	7258.	0.500
464339.	0.4416	0.4820	7245.	0.500
509162.	0.4573	0.4993	7245.	0.500
5547454.	0.4738	0.5105	7245.	0.500
601865.	0.4868	0.5226	7245.	0.500
646886.	0.5016	0.5407	7258.	0.500
6931663.	0.5164	0.5515	7245.	0.500
744506.	0.5298	0.5673	7258.	0.500
7918305.	0.5469	0.5796	7245.	0.500
836636.	0.5564	0.5978	7258.	0.500
884483.	0.5747	0.6081	7245.	0.500
928863.	0.5911	0.6238	7245.	0.500
9730343.	0.6043	0.6338	7245.	0.500
101785.	0.6226	0.6496	7245.	0.500
106013.	0.6365	0.6660	7245.	0.500
108646.	0.6547	0.6798	7245.	0.500
1140879.	0.6687	0.6954	7245.	0.500
1183269.	0.6843	0.7092	7245.	0.500
123789.	0.7026	0.7222	7245.	0.500
129166.	0.7122	0.7403	7233.	0.500
1346088.	0.7278	0.7576	7233.	0.500
1395934.	0.7435	0.7732	7245.	0.500
1432884.	0.7592	0.7904	7233.	0.500
147880.	0.7687	0.7939	7233.	0.500
153692.	0.7879	0.8181	7270.	0.500
157120.	0.8035	0.8310	7233.	0.500
158570.	0.8166	0.8492	7221.	0.500
159888.	0.8344	0.8656	7221.	0.500
161220.	0.8488	0.8786	7233.	0.500
162371.	0.8644	0.8967	7221.	0.500
163646.	0.8792	0.9140	7221.	0.500
164834.	0.8957	0.9304	7221.	0.500
165901.	0.9140	0.9442	7233.	0.500
166962.	0.9314	0.9589	7221.	0.500
16771.	0.9419	0.9762	7196	0.500
168650.	0.9592	0.9909	7209	0.500
169350.	0.9732	1.0074	7196.	0.500
169747.	0.9871	1.0159	7209	0.500
170326.	1.0054	1.0315	7196	0.500
170903.	1.0202	1.0484	7196	0.500
171525.	1.0375	1.0677	7196	0.500

TABLE 5-53. CRACK GROWTH DATA SPECIMEN GT160KAB49-17 S/N 4

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
2.	0.2300	0.2250	11204.	0.500
5237.	0.2323	0.2409	11204.	0.500
15567.	0.2535	0.2731	11204.	0.500
10648.	0.2671	0.2864	11204.	0.500
21656.	0.2732	0.3024	11204.	0.500
23078.	0.2988	0.3076	11204.	0.500
25477.	0.3043	0.3205	11204.	0.500
27296.	0.3187	0.3334	11204.	0.500
29333.	0.3331	0.3478	11204.	0.500
31208.	0.3482	0.3599	11204.	0.500
33048.	0.3634	0.3713	11204.	0.500
33878.	0.3702	0.3789	11204.	0.500
40017.	0.4240	0.4327	11204.	0.500
41560.	0.4388	0.4468	11204.	0.500
42967.	0.4536	0.4592	11204.	0.500
44255.	0.4695	0.4682	11204.	0.500
44814.	0.4741	0.4835	11204.	0.500
46123.	0.4777	0.4964	11204.	0.500
47374.	0.5003	0.5120	11204.	0.500
48418.	0.5114	0.5242	11204.	0.500
50139.	0.5415	0.5472	11204.	0.500
51063.	0.5540	0.5597	11108.	0.500
51959.	0.5684	0.5722	11108.	0.500
52973.	0.5832	0.5841	11108.	0.500
53875.	0.5961	0.5995	11108.	0.500
54490.	0.6113	0.6108	11108.	0.500
55192.	0.6262	0.6234	11096.	0.500
56021.	0.6406	0.6351	11096.	0.500
56644.	0.6552	0.6442	11108.	0.500
57100.	0.6602	0.6597	11096.	0.500
57694.	0.6736	0.6693	11096.	0.500
58241.	0.6825	0.6797	11096.	0.500
58943.	0.6954	0.6949	11084.	0.500
59685.	0.7106	0.7063	11084.	0.500
60156.	0.7242	0.7207	11071.	0.500
60657.	0.7401	0.7271	11071.	0.500
61065.	0.7551	0.7397	11084.	0.500
61536.	0.7684	0.7538	11071.	0.500
61753.	0.7765	0.7586	11071.	0.500
62071.	0.7877	0.7711	11060.	0.500
62487.	0.8006	0.7819	11071.	0.500
62866.	0.8128	0.7943	11060.	0.500
63293.	0.8272	0.8087	11084.	0.500
63663.	0.8354	0.8241	11060.	0.500
64232.	0.8476	0.8404	11071.	0.500
64609.	0.8595	0.8541	11120.	0.500
64790.	0.8872	0.8632	11132.	0.500
65133.	0.8999	0.8756	11120.	0.500
65553.	0.9084	0.8912	11120.	0.500
65556.	0.9183	0.9045	11132.	0.500
65708.	0.9334	0.9140	11108.	0.500
65934.	0.9409	0.9296	11120.	0.500
66064.	0.9491	0.9452	11120.	0.500

TABLE 5-54. CRACK GROWTH DATA SPECIMEN GT160KAB49-37 S/N 1

CYCLE #	CRACK LENGTH (INS.)		MAX STRESS (PSI)	STRESS RATIO	AVERAGE						
	LEFT	RIGHT									
111.	0.2693	0.3086	0.2890	7030.	-336	34238.	0.4350	0.3240	0.4895	6994.	-337
776.	0.2703	0.3105	0.2904	7018.	-336	31861.	0.4633	0.5311	0.4972	7006.	-333
1494.	0.2715	0.3134	0.2924	6994.	-337	32420.	0.4714	0.5388	0.5051	6994.	-337
1536.	0.2717	0.3148	0.2933	7030.	-337	32867.	0.4797	0.5431	0.5124	6982.	-334
2592.	0.2725	0.3195	0.2960	7018.	-338	33322.	0.4862	0.5500	0.5206	6994.	-332
3440.	0.2734	0.3233	0.2982	7030.	-336	34038.	0.4979	0.5566	0.5272	6994.	-337
3112.	0.2772	0.3301	0.3037	7006.	-337	34485.	0.5070	0.5651	0.5365	6994.	-339
3581.	0.2798	0.3321	0.3055	7030.	-336	35061.	0.5160	0.5731	0.5455	7006.	-338
6423.	0.2821	0.3364	0.3092	7018.	-336	35391.	0.5260	0.5822	0.5541	6982.	-336
6770.	0.2826	0.3382	0.3104	7030.	-336	35950.	0.5310	0.5910	0.5610	7006.	-335
6966.	0.2837	0.3395	0.3116	7006.	-335	36332.	0.5390	0.5977	0.5684	7006.	-337
7331.	0.2856	0.3433	0.3145	7006.	-335	36850.	0.5486	0.6051	0.5769	6994.	-335
7655.	0.2860	0.3442	0.3151	7006.	-337	37298.	0.5573	0.6137	0.5855	6970.	-335
7755.	0.2863	0.3446	0.3155	7018.	-338	38233.	0.5781	0.6262	0.6021	7006.	-335
7858.	0.2866	0.3448	0.3157	7030.	-337	38714.	0.5879	0.6349	0.6114	6982.	-338
8249.	0.2878	0.3462	0.3170	7006.	-334	39608.	0.6062	0.6649	0.6266	6994.	-336
8378.	0.2881	0.3470	0.3176	7018.	-337	40089.	0.6155	0.6542	0.6348	6982.	-335
8799.	0.2894	0.3493	0.3194	7006.	-337	40570.	0.6254	0.6626	0.6440	6994.	-335
8931.	0.2897	0.3500	0.3199	7030.	-334	41016.	0.6364	0.6718	0.6541	7018.	-333
9190.	0.2906	0.3515	0.3211	7030.	-339	41430.	0.6457	0.6799	0.6628	6982.	-338
9319.	0.2912	0.3526	0.3219	7018.	-334	41877.	0.6525	0.6881	0.6703	7006.	-335
9405.	0.2953	0.3557	0.3255	7006.	-338	42323.	0.6608	0.6965	0.6786	6994.	-337
10259.	0.2980	0.3572	0.3276	7042.	-336	42873.	0.6713	0.7011	0.6862	5994.	-336
11136.	0.3024	0.3635	0.3329	7030.	-334	43250.	0.6797	0.7090	0.6944	5994.	-335
12112.	0.3065	0.3698	0.3380	7018.	-337	43696.	0.6874	0.7195	0.7034	7006.	-335
12533.	0.3072	0.3723	0.3398	7006.	-336	44006.	0.6961	0.7220	0.7091	6982.	-333
13435.	0.3117	0.3774	0.3446	7006.	-338	44352.	0.7052	0.7283	0.7168	7006.	-335
14381.	0.3150	0.3822	0.3486	7006.	-335	44804.	0.7145	0.7361	0.7253	6982.	-336
15080.	0.3174	0.3865	0.3519	7012.	-338	45250.	0.7228	0.7453	0.7340	6982.	-334
15436.	0.3193	0.3880	0.3537	7006.	-337	45693.	0.7328	0.7551	0.7434	6994.	-337
15560.	0.3198	0.3883	0.3541	7006.	-338	45935.	0.7427	0.7591	0.7509	7006.	-338
15854.	0.3212	0.3902	0.3557	7006.	-337	46281.	0.7532	0.7655	0.7579	6994.	-337
16168.	0.3229	0.3918	0.3574	7030.	-336	46660.	0.7629	0.7659	0.7639	6994.	-337
16874.	0.3247	0.3930	0.3599	7018.	-338	46902.	0.7714	0.7704	0.7709	6994.	-334
18940.	0.3382	0.4104	0.3743	6994.	-337	47313.	0.7805	0.7778	0.7776	7006.	-335
10120.	0.3447	0.4185	0.3816	6970.	-337	47727.	0.7889	0.7810	0.7849	7006.	-337
11096.	0.3505	0.4272	0.3988	6994.	-337	48109.	0.7992	0.7899	0.7946	6982.	-336
12211.	0.3570	0.4353	0.3952	7006.	-336	48419.	0.8063	0.7975	0.8029	6994.	-334
13167.	0.3624	0.4421	0.4022	6982.	-334	48810.	0.8196	0.8053	0.8121	6994.	-336
14464.	0.3705	0.4556	0.4101	6994.	-337	49108.	0.8291	0.8110	0.8200	6982.	-336
15400.	0.3774	0.4571	0.4117	6982.	-337	49442.	0.8413	0.8165	0.8239	7018.	-333
16126.	0.3852	0.4633	0.4253	6994.	-336	49846.	0.8516	0.8229	0.8312	6994.	-337
16713.	0.3934	0.4689	0.4312	6994.	-335	50265.	0.8681	0.8399	0.8540	6982.	-334
17404.	0.4010	0.4758	0.4384	6994.	-335	50645.	0.8861	0.8599	0.8640	6982.	-336
17921.	0.4096	0.4793	0.4445	7078.	-335	50922.	0.8782	0.8499	0.8614	6982.	-334
18334.	0.4143	0.4876	0.4510	6994.	-336	51399.	0.8875	0.8506	0.8651	7006.	-333
18958.	0.4216	0.4962	0.4589	7018.	-334	51907.	0.9018	0.8582	0.8800	6982.	-338
19543.	0.4305	0.5036	0.4671	6994.	-334	52188.	0.9130	0.8645	0.8887	6970.	-333
10269.	0.4375	0.5122	0.4758	6982.	-336	52496.	0.9190	0.8744	0.8967	7006.	-333
	0.4375	0.5122	0.4758	6982.	-336	52737.	0.9298	0.8840	0.9069	6982.	-334
							0.9403	0.9338	0.9171	6982.	-334

TABLE 5-55. CRACK GROWTH DATA SPECIMEN GT160KAB49-37 S/N 2

CYCLE #	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
2783	0.2377	0.2458	0.2417	11901.	- .307
3058	0.2411	0.2636	0.2524	11877.	- .306
3507	0.2526	0.2808	0.2667	11889.	- .306
3991	0.2578	0.3022	0.2800	11865.	- .307
4370	0.2688	0.3218	0.2953	11853.	- .307
4680	0.2827	0.3460	0.3144	11889.	- .307
5068	0.2925	0.3647	0.3286	11877.	- .307
5381	0.3016	0.3809	0.3412	11877.	- .307
5726	0.3090	0.3981	0.3535	11877.	- .308
6024	0.3219	0.4137	0.3678	11889.	- .306
6377	0.3217	0.4325	0.3806	11889.	- .306
6866	0.3415	0.4491	0.3953	11901.	- .306
7179	0.3474	0.4657	0.4066	11889.	- .307
7401	0.3521	0.4842	0.4181	11913.	- .306
7747	0.3591	0.5058	0.4325	11889.	- .306
8090	0.3631	0.5232	0.4432	11877.	- .307
8537	0.3709	0.5424	0.4566	11877.	- .307
8950	0.3790	0.5589	0.4689	11877.	- .306
9119	0.3817	0.5744	0.4780	11877.	- .307
9535	0.3874	0.5944	0.4909	11889.	- .305
9912	0.3919	0.6122	0.5021	11877.	- .307
10255	0.4140	0.6266	0.5203	11889.	- .305
10539	0.4357	0.6388	0.5372	11901.	- .306
10733	0.4544	0.6635	0.5589	11877.	- .309
10834	0.4868	0.6690	0.5779	11889.	- .307
11075	0.5245	0.6918	0.6082	11877.	- .305
11175	0.5580	0.6994	0.6287	11901.	- .304
11379	0.5836	0.7157	0.6497	11865.	- .308
11618	0.6189	0.7318	0.6753	11889.	- .309
11857	0.6326	0.7531	0.6928	11877.	- .307
12165	0.6416	0.7724	0.7070	11865.	- .307
12411	0.6447	0.7950	0.7198	11877.	- .306
1255	0.6527	0.8193	0.7356	11889.	- .305
126	0.6930	0.8250	0.7595	11889.	- .305
1267	0.7233	0.8356	0.7794	11889.	- .306
12982	0.7569	0.9226	0.8397	11901.	- .307
13255	0.7878	0.9477	0.8677	11889.	- .305
13390	0.8211	0.9663	0.8937	11865.	- .308
13493	0.8624	0.9849	0.9237	11889.	- .305
13627	0.9214	1.0195	0.9704	11977.	- .308
13762	0.9548	1.0507	1.0027	11865.	- .307
13897	0.9784	1.0997	1.0390	11877.	- .308
13997	1.0990	1.1418	1.1199	11865.	- .309
14097	1.3047	1.2522	1.2785	11877.	- .306

TABLE 5-56. CRACK GROWTH DATA SPECIMEN GT160KAB49-37 S/N 3

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
3169.	0.2870	0.2814	6987.	-506
5272.	0.2946	0.2873	6975.	-509
7193.	0.3022	0.2926	6987.	-504
8729.	0.3098	0.2992	6987.	-508
10363.	0.3172	0.3044	6951.	-509
12317.	0.3244	0.3109	7023.	-507
14089.	0.3321	0.3184	6987.	-506
15579.	0.3398	0.3250	6987.	-508
17278.	0.3470	0.3335	6999.	-510
18731.	0.3547	0.3387	6975.	-510
20149.	0.3621	0.3468	6975.	-510
21532.	0.3697	0.3535	6975.	-509
22880.	0.3772	0.3610	6987.	-508
24124.	0.3830	0.3696	6987.	-508
25401.	0.3905	0.3766	6987.	-508
26713.	0.3977	0.3845	6975.	-505
27853.	0.4045	0.3900	6999.	-507
28820.	0.4078	0.3986	6975.	-507
29961.	0.4139	0.4072	6987.	-504
31040.	0.4215	0.4152	6975.	-505
32043.	0.4295	0.4227	6987.	-509
32923.	0.4373	0.4277	6987.	-503
33958.	0.4445	0.4357	6987.	-506
35041.	0.4514	0.4448	6987.	-509
35975.	0.4584	0.4515	6975.	-505
36944.	0.4662	0.4587	6975.	-505
37881.	0.4737	0.4650	6999.	-507
38505.	0.4815	0.4738	6999.	-507
39234.	0.4893	0.4822	6963.	-509
40348.	0.4971	0.4910	6975.	-507
41021.	0.5025	0.4995	6987.	-506
41693.	0.5089	0.5077	6963.	-509
42530.	0.5165	0.5101	6999.	-509
43108.	0.5224	0.5269	6987.	-508
43472.	0.5296	0.5348	6975.	-507
44437.	0.5370	0.5434	6987.	-504
45297.	0.5421	0.5527	6999.	-507
45729.	0.5496	0.5610	6975.	-509
46419.	0.5560	0.5717	6987.	-506
47113.	0.5641	0.5799	7014.	-504
47773.	0.5696	0.5886	6999.	-505
48431.	0.5772	0.5937	6987.	-506
48981.	0.5824	0.6025	6963.	-508
49253.	0.5906	0.6085	6999.	-505
49840.	0.5990	0.6177	6987.	-508
50494.	0.6069	0.6251	7083.	-521
50939.	0.6130	0.6342	6987.	-508
51419.	0.6195	0.6438	6963.	-508
51898.	0.6245	0.6561	6987.	-508
52413.	0.6318	0.6587	6975.	-507
52854.	0.6391	0.6700	7114.	-506
53445.	0.6449	0.6766	6999.	-505

TABLE 5-57. CRACK GROWTH DATA SPECIMEN GT160KAB49-37 S/N 4

STUDY #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	AVERAGE					
	LEFT	RIGHT								
115	0.3403	0.3403	60	-400	35923	0.6553	0.6826	0.6690	6999	-303
631	0.3566	0.2566	48	-230	35540	0.6636	0.6909	0.6773	6975	-309
1112	0.3742	0.3742	11434	-496	35162	0.6717	0.6971	0.6844	6975	-303
1559	0.3924	0.3924	11422	-497	36017	0.6795	0.7022	0.6908	6987	-303
2005	0.4117	0.4117	11446	-494	36568	0.6870	0.7103	0.6986	6987	-309
2382	0.4304	0.4304	11434	-496	37234	0.6959	0.7182	0.7070	6987	-309
2666	0.4476	0.4476	11434	-498	37941	0.7036	0.7252	0.7144	6963	-311
3001	0.4517	0.4517	11434	-498	38689	0.7119	0.7314	0.7217	6987	-306
3423	0.4695	0.4695	11422	-495	39383	0.7215	0.7367	0.7291	6963	-311
3695	0.4881	0.4881	11422	-496	39896	0.7296	0.7423	0.7359	6975	-309
3984	0.4893	0.4893	11422	-496	60133	0.7324	0.7522	0.7423	6975	-309
4096	0.4948	0.4948	11434	-495	60683	0.7418	0.7579	0.7498	6999	-307
4531	0.5028	0.5028	11422	-496	61093	0.7498	0.7635	0.7567	6975	-303
4715	0.5215	0.5215	11422	-497	61434	0.7546	0.7703	0.7624	6975	-307
5093	0.5400	0.5400	11434	-496	61740	0.7604	0.7795	0.7700	6975	-309
5356	0.5585	0.5585	11434	-494	62046	0.7649	0.7910	0.7780	6963	-309
5922	0.5753	0.5753	11446	-495	62145	0.7665	0.8129	0.7897	6975	-307
6022	0.5818	0.5818	11434	-495	62350	0.7706	0.8258	0.7982	6975	-309
6299	0.5937	0.5937	11434	-495	62656	0.7765	0.8423	0.8094	6975	-310
6708	0.6121	0.6121	11422	-496	62859	0.7805	0.8546	0.8175	6975	-312
7121	0.6309	0.6309	11410	-497	63303	0.7896	0.8667	0.8281	6963	-308
7429	0.6490	0.6490	11422	-496	63748	0.7979	0.8750	0.8365	6963	-308
7778	0.6720	0.6720	11422	-496	64158	0.8071	0.8806	0.8436	6939	-309
7918	0.6860	0.6860	11434	-495	64501	0.8170	0.8847	0.8508	6987	-308
8017	0.6817	0.6817	11434	-494	64912	0.8254	0.8902	0.8578	6987	-309
8286	0.6866	0.6866	11446	-496	65392	0.8338	0.8941	0.8640	6987	-304
8455	0.7039	0.7039	11434	-497	65733	0.8423	0.9012	0.8719	6975	-307
8638	0.7120	0.7120	11446	-494	66005	0.8497	0.9121	0.8809	6975	-307
8757	0.7166	0.7166	11422	-497	66416	0.8578	0.9226	0.8902	6975	-305
8926	0.7238	0.7238	11422	-496	66621	0.8655	0.9360	0.9008	6999	-305
9234	0.7427	0.7427	11422	-496	66755	0.8697	0.9340	0.9118	6963	-308
9446	0.7627	0.7627	11446	-494						
9610	0.7659	0.7659	11434	-496						
9811	0.7814	0.7814	11434	-495						
10119	0.7945	0.7945	11422	-495						
10355	0.8073	0.8073	11434	-495						
10526	0.8226	0.8226	11422	-494						
10626	0.8277	0.8277	11410	-496						
10762	0.8402	0.8402	11422	-497						
10861	0.8484	0.8484	11434	-494						
11094	0.8672	0.8672	11434	-496						
11198	0.8771	0.8771	11434	-496						
11299	0.8887	0.8887	11422	-494						
11368	0.9084	0.9084	11422	-495						
11363	0.9363	0.9363	11434	-494						
11941	0.9678	0.9678	11422	-495						
12078	1.0079	1.0079	11422	-494						
12221	1.0534	1.0534	11434	-496						
13367	1.1367	1.1367	11434	-495						

TABLE 5-58. CRACK GROWTH DATA SPECIMEN GT160KAB49-15 S/N 1

CYCLE ν	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT		
1.	0.4385	0.4385	6675.	0.050
3031.	0.4547	0.4547	6681.	0.050
3087.	0.4709	0.4709	6682.	0.050
5479.	0.4956	0.4956	6682.	0.050
6205.	0.5037	0.5037	6682.	0.050
9721.	0.5350	0.5350	6680.	0.050
10813.	0.5512	0.5512	6682.	0.050
12312.	0.5667	0.5667	6688.	0.050
13689.	0.5833	0.5833	6682.	0.050
14753.	0.5992	0.5992	6650.	0.050
16391.	0.6145	0.6145	6638.	0.050
17698.	0.6307	0.6307	6638.	0.050
18571.	0.6474	0.6474	6638.	0.050
20101.	0.6633	0.6633	6638.	0.050
21218.	0.6791	0.6791	6638.	0.050
22277.	0.6956	0.6956	6621.	0.050
22845.	0.7116	0.7116	6621.	0.050
25248.	0.7280	0.7280	6624.	0.050
26382.	0.7444	0.7444	6612.	0.050
27435.	0.7604	0.7604	6612.	0.050
28816.	0.7772	0.7772	6612.	0.050
29044.	0.7934	0.7934	6612.	0.050
29791.	0.8091	0.8091	6612.	0.050
30539.	0.8250	0.8250	6612.	0.050
31390.	0.8409	0.8409	6612.	0.050
32361.	0.8568	0.8568	6600.	0.050
33422.	0.8726	0.8726	6796.	0.050
34481.	0.8888	0.8888	6788.	0.050
35368.	0.9046	0.9046	6788.	0.050
36492.	0.9205	0.9205	6762.	0.050
37433.	0.9363	0.9363	6762.	0.050
38364.	0.9522	0.9522	6762.	0.050

TABLE 5-59. CRACK GROWTH DATA SPECIMEN GT160KAB49-15 S/N 2

CYCLE #	CRACK LENGTH (INS)			MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
2022.	0.2292	0.2840	0.2566	10729.	0.050
3111.	0.2448	0.3001	0.2724	10754.	0.050
4419.	0.2653	0.3172	0.2912	10729.	0.050
5374.	0.2844	0.3328	0.3086	10729.	0.050
6303.	0.3010	0.3480	0.3245	10779.	0.050
7249.	0.3171	0.3641	0.3406	10754.	0.050
8548.	0.3362	0.3797	0.3579	10779.	0.050
9449.	0.3547	0.3944	0.3745	10779.	0.050
10497.	0.3728	0.4119	0.3924	10754.	0.050
11357.	0.3909	0.4300	0.4104	10779.	0.050
12270.	0.4075	0.4486	0.4280	10779.	0.050
13204.	0.4265	0.4613	0.4439	10754.	0.050
14081.	0.4412	0.4795	0.4605	10766.	0.050
14985.	0.4573	0.4974	0.4774	10729.	0.050
15745.	0.4773	0.5097	0.4935	10716.	0.050
16471.	0.4969	0.5214	0.5091	10729.	0.050
16839.	0.5057	0.5419	0.5238	10729.	0.050
17534.	0.5262	0.5375	0.5319	10729.	0.050
18098.	0.5389	0.5780	0.5585	10729.	0.050
18525.	0.5516	0.5986	0.5751	10716.	0.050
19169.	0.5677	0.6186	0.5932	10729.	0.050
19848.	0.5887	0.6303	0.6095	10704.	0.050
20366.	0.6004	0.6508	0.6256	10716.	0.050
20836.	0.6136	0.6714	0.6425	10716.	0.050
21425.	0.6322	0.6899	0.6611	10704.	0.050
21932.	0.6527	0.7046	0.6786	10704.	0.050
22570.	0.6732	0.7148	0.6940	10704.	0.050
23291.	0.6937	0.7305	0.7121	10692.	0.050
23741.	0.7143	0.7388	0.7265	10704.	0.050
24202.	0.7348	0.7641	0.7395	10679.	0.050
24591.	0.7524	0.7612	0.7568	10704.	0.050
25153.	0.7714	0.7764	0.7739	10679.	0.050
25324.	0.7919	0.7827	0.7873	10679.	0.050
25975.	0.8120	0.7949	0.8035	10679.	0.050
26286.	0.8320	0.8062	0.8196	10679.	0.050
26601.	0.8515	0.8213	0.8364	10679.	0.050
26760.	0.8574	0.8418	0.8496	10679.	0.050
26983.	0.8662	0.8624	0.8643	10679.	0.050
27172.	0.8818	0.8795	0.8806	10679.	0.050
27320.	0.8857	0.9000	0.8929	10679.	0.050
27569.	0.9033	0.9054	0.9043	10679.	0.050
27791.	0.9131	0.9259	0.9195	10667.	0.050
28037.	0.9307	0.9435	0.9371	10667.	0.050
28209.	0.9390	0.9640	0.9515	10654.	0.050
28376.	0.9463	0.9845	0.9654	10654.	0.050
28433.	0.9585	1.0055	0.9820	10647.	0.050
28546.	0.9639	1.0363	1.0001	10654.	0.050
28808.	0.9844	1.0192	1.0018	10754.	0.050
28978.	0.9966	1.0333	1.0150	10704.	0.050
29222.	1.0049	1.0539	1.0294	10704.	0.050
29325.	1.0162	1.0754	1.0458	10692.	0.050
29476.	1.0299	1.0964	1.0631	10679.	0.050
29542.	1.0377	1.1169	1.0773	10679.	0.050
29761.	1.0313	1.1232	1.0823	10667.	0.050
29809.	1.0626	1.1447	1.1037	10679.	0.050
29848.	1.0694	1.1740	1.1217	10679.	0.050

TABLE 5-60. CRACK GROWTH DATA SPECIMEN GT160KAB49-15 S/N 3

CYCLE #	LEFT	CRACK LENGTH (INS)	MAX STRESS (PSI)	STRESS RATIO
19038	0.2876	0.2728	6999	0.4408
31042	0.2963	0.2821	6462	0.4431
37433	0.2963	0.2910	6462	0.4431
71343	0.3015	0.2998	6462	0.4431
91390	0.3123	0.3061	6462	0.4431
101005	0.3195	0.3120	6462	0.4431
100108	0.3287	0.3165	6462	0.4431
111878	0.3375	0.3154	6462	0.4431
115193	0.3462	0.3179	6462	0.4431
127979	0.3554	0.3224	6462	0.4431
135545	0.3644	0.3297	6462	0.4431
135916	0.3724	0.3364	6462	0.4431
167010	0.3728	0.3433	6462	0.4431
182934	0.3876	0.3529	6462	0.4431
189749	0.3930	0.3621	6462	0.4431
213638	0.3997	0.3710	6462	0.4431
225012	0.4089	0.3760	6462	0.4431
237531	0.4156	0.3849	6462	0.4431
254350	0.4231	0.3937	6462	0.4431
264207	0.4306	0.4004	6462	0.4431
274676	0.4365	0.4084	6462	0.4431
280744	0.4434	0.4163	6462	0.4431
297891	0.4494	0.4234	6462	0.4431
307094	0.4544	0.4294	6462	0.4431
313940	0.4632	0.4358	6462	0.4431
323243	0.4695	0.4433	6462	0.4431
331821	0.4764	0.4510	6462	0.4431
344804	0.4837	0.4598	6462	0.4431
353077	0.4924	0.4640	6462	0.4431
364321	0.4970	0.4723	6462	0.4431
373533	0.5018	0.4809	6462	0.4431
383646	0.5091	0.4897	6462	0.4431
396217	0.5183	0.4978	6462	0.4431
403880	0.5254	0.5034	6462	0.4431
414400	0.5334	0.5125	6462	0.4431
420008	0.5420	0.5213	6462	0.4431
426279	0.5512	0.5289	6462	0.4431
433616	0.5613	0.5381	6462	0.4431
439404	0.5701	0.5432	6462	0.4431
450321	0.5760	0.5520	6462	0.4431
458294	0.5818	0.5609	6462	0.4431
462757	0.5897	0.5697	6462	0.4431
465666	0.5985	0.5764	6462	0.4431
471930	0.6056	0.5832	6462	0.4431
479746	0.6127	0.5920	6462	0.4431
484034	0.6177	0.6009	6462	0.4431
489506	0.6232	0.6097	6462	0.4431
493578	0.6319	0.6144	6462	0.4431
497268	0.6382	0.6232	6462	0.4431
501215	0.6470	0.6299	6462	0.4431
504850	0.6542	0.6356	6462	0.4431
512181	0.6608	0.6423	6462	0.4431
517977	0.6695	0.6504	6462	0.4431
521530	0.6781	0.6589	6462	0.4431
523735	0.6866	0.6677	6462	0.4431
526883	0.6954	0.6767	6462	0.4431
531741	0.7047	0.6859	6462	0.4431
535321	0.7135	0.6954	6462	0.4431
537934	0.7215	0.7011	6462	0.4431
540910	0.7293	0.7065	6462	0.4431
543991	0.7370	0.7123	6462	0.4431
547564	0.7455	0.7183	6462	0.4431
551061	0.7532	0.7231	6462	0.4431
554740	0.7619	0.7285	6462	0.4431
558931	0.7704	0.7343	6462	0.4431
561139	0.7788	0.7408	6462	0.4431
563576	0.7871	0.7476	6462	0.4431
565794	0.7953	0.7547	6462	0.4431
568788	0.8034	0.7623	6462	0.4431
572740	0.8113	0.7704	6462	0.4431
576960	0.8190	0.7785	6462	0.4431
581215	0.8266	0.7866	6462	0.4431
585941	0.8341	0.7949	6462	0.4431
589581	0.8414	0.8034	6462	0.4431
594667	0.8484	0.8124	6462	0.4431
597634	0.8553	0.8216	6462	0.4431
599237	0.8621	0.8309	6462	0.4431
599968	0.8688	0.8401	6462	0.4431
599999	0.8754	0.8492	6462	0.4431
607634	0.8819	0.8584	6462	0.4431
608063	0.8883	0.8677	6462	0.4431
608934	0.8946	0.8771	6462	0.4431
610311	0.9008	0.8864	6462	0.4431
611464	0.9069	0.8952	6462	0.4431
612491	0.9129	0.9040	6462	0.4431
613191	0.9188	0.9129	6462	0.4431
614151	0.9246	0.9218	6462	0.4431
616178	0.9304	0.9307	6462	0.4431
617331	0.9361	0.9396	6462	0.4431
618433	0.9418	0.9485	6462	0.4431
619643	0.9474	0.9574	6462	0.4431
621026	0.9529	0.9663	6462	0.4431
621944	0.9584	0.9752	6462	0.4431
623344	0.9639	0.9841	6462	0.4431
625348	0.9694	0.9930	6462	0.4431
627348	0.9749	1.0019	6462	0.4431
629348	0.9804	1.0108	6462	0.4431
631343	0.9859	1.0197	6462	0.4431
633393	0.9914	1.0286	6462	0.4431
635394	0.9969	1.0375	6462	0.4431
637344	1.0024	1.0464	6462	0.4431
639344	1.0079	1.0553	6462	0.4431
641344	1.0134	1.0642	6462	0.4431
643344	1.0189	1.0731	6462	0.4431
645344	1.0244	1.0820	6462	0.4431
647344	1.0299	1.0909	6462	0.4431
649344	1.0354	1.0998	6462	0.4431
651344	1.0409	1.1087	6462	0.4431
653344	1.0464	1.1176	6462	0.4431
655344	1.0519	1.1265	6462	0.4431
657344	1.0574	1.1354	6462	0.4431
659344	1.0629	1.1443	6462	0.4431
661344	1.0684	1.1532	6462	0.4431
663344	1.0739	1.1621	6462	0.4431
665344	1.0794	1.1710	6462	0.4431
667344	1.0849	1.1799	6462	0.4431
669344	1.0904	1.1888	6462	0.4431
671344	1.0959	1.1977	6462	0.4431
673344	1.1014	1.2066	6462	0.4431
675344	1.1069	1.2155	6462	0.4431
677344	1.1124	1.2244	6462	0.4431
679344	1.1179	1.2333	6462	0.4431
681344	1.1234	1.2422	6462	0.4431
683344	1.1289	1.2511	6462	0.4431
685344	1.1344	1.2600	6462	0.4431
687344	1.1399	1.2689	6462	0.4431
689344	1.1454	1.2778	6462	0.4431
691344	1.1509	1.2867	6462	0.4431
693344	1.1564	1.2956	6462	0.4431
695344	1.1619	1.3045	6462	0.4431
697344	1.1674	1.3134	6462	0.4431
699344	1.1729	1.3223	6462	0.4431
701344	1.1784	1.3312	6462	0.4431
703344	1.1839	1.3401	6462	0.4431
705344	1.1894	1.3490	6462	0.4431
707344	1.1949	1.3579	6462	0.4431
709344	1.2004	1.3668	6462	0.4431
711344	1.2059	1.3757	6462	0.4431
713344	1.2114	1.3846	6462	0.4431
715344	1.2169	1.3935	6462	0.4431
717344	1.2224	1.4024	6462	0.4431
719344	1.2279	1.4113	6462	0.4431
721344	1.2334	1.4202	6462	0.4431
723344	1.2389	1.4291	6462	0.4431
725344	1.2444	1.4380	6462	0.4431
727344	1.2499	1.4469	6462	0.4431
729344	1.2554	1.4558	6462	0.4431
731344	1.2609	1.4647	6462	0.4431
733344	1.2664	1.4736	6462	0.4431
735344	1.2719	1.4825	6462	0.4431
737344	1.2774	1.4914	6462	0.4431
739344	1.2829	1.5003	6462	0.4431
741344	1.2884	1.5092	6462	0.4431
743344	1.2939	1.5181	6462	0.4431
745344	1.2994	1.5270	6462	0.4431
747344	1.3049	1.5359	6462	0.4431
749344	1.3104	1.5448	6462	0.4431
751344	1.3159	1.5537	6462	0.4431
753344	1.3214	1.5626	6462	0.4431
755344	1.3269	1.5715	6462	0.4431
757344	1.3324	1.5804	6462	0.4431
759344	1.3379	1.5893	6462	0.4431
761344	1.3434	1.5982	6462	0.4431
763344	1.3489	1.6071	6462	0.4431
765344	1.3544	1.6160	6462	0.4431
767344	1.3599	1.6249	6462	0.4431
769344	1.3654	1.6338	6462	0.4431
771344	1.3709	1.6427	6462	0.4431
773344	1.3764	1.6516	6462	0.4431
775344	1.3819	1.6605	6462	0.4431
777344	1.3874	1.6694	6462	0.4431
779344	1.3929	1.6783	6462	0.4431
781344	1.3984	1.6872	6462	0.4431
783344	1.4039	1.6961	6462	0.4431
785344	1.4094	1.7050	6462	0.4431
787344	1.4149	1.7139	6462	0.4431
789344	1.4204	1.7228	6462	0.4431
791344	1.4259	1.7317	6462	0.4431
793344	1.4314	1.7406	6462	0.4431
795344	1.4369	1.7495	6462	0.4431
797344	1.4424	1.7584	6462	0.4431
799344	1.4479	1.7673	6462	0.4431
801344	1.4534	1.7762	6462	0.4431
803344	1.4589	1.7851	6462	0.4431
805344	1.4644	1.7940	6462	0.4431
807344	1.4699	1.8029	6462	0.4431
809344	1.4754	1.8118	6462	0.4431
811344	1.4809	1.8207	6462	0.4431
813344	1.4864	1.8296	6462	0.4431
815344	1.4919	1.8385	6462	0.4431
817344	1.4974	1.8474	6462	0.4431
819344	1.5029	1.8563	6462	0.4431
821344	1.5084	1.8652	6462	0.4431
823344	1.5139	1.8741	6462	0.4431
825344	1.5194	1.8830	6462	0.4431
827344	1.5249	1.8919	6462	0.4431
829344	1.5304	1.9008	6462	0.4431
831344	1.5359	1.9097	6462	0.4431
833344	1.5414	1.9186	6462	0.4431
835344	1.5469	1.9275	6462	0.4431
837344	1.5524	1.9364	6462	0.4431
839344	1.5579	1.9453	6462	0.4431
841344	1.5634	1.9542	6462	0.4431
843344	1.5689	1.9631	6462	0.4431
845344	1.5744	1.9720	6462	0.4431
847344	1.5799	1.9809	6462	0.4431
849344	1.5854	1.9898	6462	0.4431
851344	1.5909	1.9987		

TABLE 5-62. CRACK GROWTH DATA SPECIMEN GT160KAB49-35 S/N 1

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈	C ₉	C ₁₀	C ₁₁	C ₁₂	C ₁₃	C ₁₄	C ₁₅	C ₁₆	C ₁₇	C ₁₈	C ₁₉	C ₂₀	C ₂₁	C ₂₂	C ₂₃	C ₂₄	C ₂₅	C ₂₆	C ₂₇	C ₂₈	C ₂₉	C ₃₀	C ₃₁	C ₃₂	C ₃₃	C ₃₄	C ₃₅	C ₃₆	C ₃₇	C ₃₈	C ₃₉	C ₄₀	C ₄₁	C ₄₂	C ₄₃	C ₄₄	C ₄₅	C ₄₆	C ₄₇	C ₄₈	C ₄₉	C ₅₀	C ₅₁	C ₅₂	C ₅₃	C ₅₄	C ₅₅	C ₅₆	C ₅₇	C ₅₈	C ₅₉	C ₆₀	C ₆₁	C ₆₂	C ₆₃	C ₆₄	C ₆₅	C ₆₆	C ₆₇	C ₆₈	C ₆₉	C ₇₀	C ₇₁	C ₇₂	C ₇₃	C ₇₄	C ₇₅	C ₇₆	C ₇₇	C ₇₈	C ₇₉	C ₈₀	C ₈₁	C ₈₂	C ₈₃	C ₈₄	C ₈₅	C ₈₆	C ₈₇	C ₈₈	C ₈₉	C ₉₀	C ₉₁	C ₉₂	C ₉₃	C ₉₄	C ₉₅	C ₉₆	C ₉₇	C ₉₈	C ₉₉	C ₁₀₀	C ₁₀₁	C ₁₀₂	C ₁₀₃	C ₁₀₄	C ₁₀₅	C ₁₀₆	C ₁₀₇	C ₁₀₈	C ₁₀₉	C ₁₁₀	C ₁₁₁	C ₁₁₂	C ₁₁₃	C ₁₁₄	C ₁₁₅	C ₁₁₆	C ₁₁₇	C ₁₁₈	C ₁₁₉	C ₁₂₀	C ₁₂₁	C ₁₂₂	C ₁₂₃	C ₁₂₄	C ₁₂₅	C ₁₂₆	C ₁₂₇	C ₁₂₈	C ₁₂₉	C ₁₃₀	C ₁₃₁	C ₁₃₂	C ₁₃₃	C ₁₃₄	C ₁₃₅	C ₁₃₆	C ₁₃₇	C ₁₃₈	C ₁₃₉	C ₁₄₀	C ₁₄₁	C ₁₄₂	C ₁₄₃	C ₁₄₄	C ₁₄₅	C ₁₄₆	C ₁₄₇	C ₁₄₈	C ₁₄₉	C ₁₅₀	C ₁₅₁	C ₁₅₂	C ₁₅₃	C ₁₅₄	C ₁₅₅	C ₁₅₆	C ₁₅₇	C ₁₅₈	C ₁₅₉	C ₁₆₀	C ₁₆₁	C ₁₆₂	C ₁₆₃	C ₁₆₄	C ₁₆₅	C ₁₆₆	C ₁₆₇	C ₁₆₈	C ₁₆₉	C ₁₇₀	C ₁₇₁	C ₁₇₂	C ₁₇₃	C ₁₇₄	C ₁₇₅	C ₁₇₆	C ₁₇₇	C ₁₇₈	C ₁₇₉	C ₁₈₀	C ₁₈₁	C ₁₈₂	C ₁₈₃	C ₁₈₄	C ₁₈₅	C ₁₈₆	C ₁₈₇	C ₁₈₈	C ₁₈₉	C ₁₉₀	C ₁₉₁	C ₁₉₂	C ₁₉₃	C ₁₉₄	C ₁₉₅	C ₁₉₆	C ₁₉₇	C ₁₉₈	C ₁₉₉	C ₂₀₀	C ₂₀₁	C ₂₀₂	C ₂₀₃	C ₂₀₄	C ₂₀₅	C ₂₀₆	C ₂₀₇	C ₂₀₈	C ₂₀₉	C ₂₁₀	C ₂₁₁	C ₂₁₂	C ₂₁₃	C ₂₁₄	C ₂₁₅	C ₂₁₆	C ₂₁₇	C ₂₁₈	C ₂₁₉	C ₂₂₀	C ₂₂₁	C ₂₂₂	C ₂₂₃	C ₂₂₄	C ₂₂₅	C ₂₂₆	C ₂₂₇	C ₂₂₈	C ₂₂₉	C ₂₃₀	C ₂₃₁	C ₂₃₂	C ₂₃₃	C ₂₃₄	C ₂₃₅	C ₂₃₆	C ₂₃₇	C ₂₃₈	C ₂₃₉	C ₂₄₀	C ₂₄₁	C ₂₄₂	C ₂₄₃	C ₂₄₄	C ₂₄₅	C ₂₄₆	C ₂₄₇	C ₂₄₈	C ₂₄₉	C ₂₅₀	C ₂₅₁	C ₂₅₂	C ₂₅₃	C ₂₅₄	C ₂₅₅	C ₂₅₆	C ₂₅₇	C ₂₅₈	C ₂₅₉	C ₂₆₀	C ₂₆₁	C ₂₆₂	C ₂₆₃	C ₂₆₄	C ₂₆₅	C ₂₆₆	C ₂₆₇	C ₂₆₈	C ₂₆₉	C ₂₇₀	C ₂₇₁	C ₂₇₂	C ₂₇₃	C ₂₇₄	C ₂₇₅	C ₂₇₆	C ₂₇₇	C ₂₇₈	C ₂₇₉	C ₂₈₀	C ₂₈₁	C ₂₈₂	C ₂₈₃	C ₂₈₄	C ₂₈₅	C ₂₈₆	C ₂₈₇	C ₂₈₈	C ₂₈₉	C ₂₉₀	C ₂₉₁	C ₂₉₂	C ₂₉₃	C ₂₉₄	C ₂₉₅	C ₂₉₆	C ₂₉₇	C ₂₉₈	C ₂₉₉	C ₃₀₀	C ₃₀₁	C ₃₀₂	C ₃₀₃	C ₃₀₄	C ₃₀₅	C ₃₀₆	C ₃₀₇	C ₃₀₈	C ₃₀₉	C ₃₁₀	C ₃₁₁	C ₃₁₂	C ₃₁₃	C ₃₁₄	C ₃₁₅	C ₃₁₆	C ₃₁₇	C ₃₁₈	C ₃₁₉	C ₃₂₀	C ₃₂₁	C ₃₂₂	C ₃₂₃	C ₃₂₄	C ₃₂₅	C ₃₂₆	C ₃₂₇	C ₃₂₈	C ₃₂₉	C ₃₃₀	C ₃₃₁	C ₃₃₂	C ₃₃₃	C ₃₃₄	C ₃₃₅	C ₃₃₆	C ₃₃₇	C ₃₃₈	C ₃₃₉	C ₃₄₀	C ₃₄₁	C ₃₄₂	C ₃₄₃	C ₃₄₄	C ₃₄₅	C ₃₄₆	C ₃₄₇	C ₃₄₈	C ₃₄₉	C ₃₅₀	C ₃₅₁	C ₃₅₂	C ₃₅₃	C ₃₅₄	C ₃₅₅	C ₃₅₆	C ₃₅₇	C ₃₅₈	C ₃₅₉	C ₃₆₀	C ₃₆₁	C ₃₆₂	C ₃₆₃	C ₃₆₄	C ₃₆₅	C ₃₆₆	C ₃₆₇	C ₃₆₈	C ₃₆₉	C ₃₇₀	C ₃₇₁	C ₃₇₂	C ₃₇₃	C ₃₇₄	C ₃₇₅	C ₃₇₆	C ₃₇₇	C ₃₇₈	C ₃₇₉	C ₃₈₀	C ₃₈₁	C ₃₈₂	C ₃₈₃	C ₃₈₄	C ₃₈₅	C ₃₈₆	C ₃₈₇	C ₃₈₈	C ₃₈₉	C ₃₉₀	C ₃₉₁	C ₃₉₂	C ₃₉₃	C ₃₉₄	C ₃₉₅	C ₃₉₆	C ₃₉₇	C ₃₉₈	C ₃₉₉	C ₄₀₀	C ₄₀₁	C ₄₀₂	C ₄₀₃	C ₄₀₄	C ₄₀₅	C ₄₀₆	C ₄₀₇	C ₄₀₈	C ₄₀₉	C ₄₁₀	C ₄₁₁	C ₄₁₂	C ₄₁₃	C ₄₁₄	C ₄₁₅	C ₄₁₆	C ₄₁₇	C ₄₁₈	C ₄₁₉	C ₄₂₀	C ₄₂₁	C ₄₂₂	C ₄₂₃	C ₄₂₄	C ₄₂₅	C ₄₂₆	C ₄₂₇	C ₄₂₈	C ₄₂₉	C ₄₃₀	C ₄₃₁	C ₄₃₂	C ₄₃₃	C ₄₃₄	C ₄₃₅	C ₄₃₆	C ₄₃₇	C ₄₃₈	C ₄₃₉	C ₄₄₀	C ₄₄₁	C ₄₄₂	C ₄₄₃	C ₄₄₄	C ₄₄₅	C ₄₄₆	C ₄₄₇	C ₄₄₈	C ₄₄₉	C ₄₅₀	C ₄₅₁	C ₄₅₂	C ₄₅₃	C ₄₅₄	C ₄₅₅	C ₄₅₆	C ₄₅₇	C ₄₅₈	C ₄₅₉	C ₄₆₀	C ₄₆₁	C ₄₆₂	C ₄₆₃	C ₄₆₄	C ₄₆₅	C ₄₆₆	C ₄₆₇	C ₄₆₈	C ₄₆₉	C ₄₇₀	C ₄₇₁	C ₄₇₂	C ₄₇₃	C ₄₇₄	C ₄₇₅	C ₄₇₆	C ₄₇₇	C ₄₇₈	C ₄₇₉	C ₄₈₀	C ₄₈₁	C ₄₈₂	C ₄₈₃	C ₄₈₄	C ₄₈₅	C ₄₈₆	C ₄₈₇	C ₄₈₈	C ₄₈₉	C ₄₉₀	C ₄₉₁	C ₄₉₂	C ₄₉₃	C ₄₉₄	C ₄₉₅	C ₄₉₆	C ₄₉₇	C ₄₉₈	C ₄₉₉	C ₅₀₀	C ₅₀₁	C ₅₀₂	C ₅₀₃	C ₅₀₄	C ₅₀₅	C ₅₀₆	C ₅₀₇	C ₅₀₈	C ₅₀₉	C ₅₁₀	C ₅₁₁	C ₅₁₂	C ₅₁₃	C ₅₁₄	C ₅₁₅	C ₅₁₆	C ₅₁₇	C ₅₁₈	C ₅₁₉	C ₅₂₀	C ₅₂₁	C ₅₂₂	C ₅₂₃	C ₅₂₄	C ₅₂₅	C ₅₂₆	C ₅₂₇	C ₅₂₈	C ₅₂₉	C ₅₃₀	C ₅₃₁	C ₅₃₂	C ₅₃₃	C ₅₃₄	C ₅₃₅	C ₅₃₆	C ₅₃₇	C ₅₃₈	C ₅₃₉	C ₅₄₀	C ₅₄₁	C ₅₄₂	C ₅₄₃	C ₅₄₄	C ₅₄₅	C ₅₄₆	C ₅₄₇	C ₅₄₈	C ₅₄₉	C ₅₅₀	C ₅₅₁	C ₅₅₂	C ₅₅₃	C ₅₅₄	C ₅₅₅	C ₅₅₆	C ₅₅₇	C ₅₅₈	C ₅₅₉	C ₅₆₀	C ₅₆₁	C ₅₆₂	C ₅₆₃	C ₅₆₄	C ₅₆₅	C ₅₆₆	C ₅₆₇	C ₅₆₈	C ₅₆₉	C ₅₇₀	C ₅₇₁	C ₅₇₂	C ₅₇₃	C ₅₇₄	C ₅₇₅	C ₅₇₆	C ₅₇₇	C ₅₇₈	C ₅₇₉	C ₅₈₀	C ₅₈₁	C ₅₈₂	C ₅₈₃	C ₅₈₄	C ₅₈₅	C ₅₈₆	C ₅₈₇	C ₅₈₈	C ₅₈₉	C ₅₉₀	C ₅₉₁	C ₅₉₂	C ₅₉₃	C ₅₉₄	C ₅₉₅	C ₅₉₆	C ₅₉₇	C ₅₉₈	C ₅₉₉	C ₆₀₀	C ₆₀₁	C ₆₀₂	C ₆₀₃	C ₆₀₄	C ₆₀₅	C ₆₀₆	C ₆₀₇	C ₆₀₈	C ₆₀₉	C ₆₁₀	C ₆₁₁	C ₆₁₂	C ₆₁₃	C ₆₁₄	C ₆₁₅	C ₆₁₆	C ₆₁₇	C ₆₁₈	C ₆₁₉	C ₆₂₀	C ₆₂₁	C ₆₂₂	C ₆₂₃	C ₆₂₄	C ₆₂₅	C ₆₂₆	C ₆₂₇	C ₆₂₈	C ₆₂₉	C ₆₃₀	C ₆₃₁	C ₆₃₂	C ₆₃₃	C ₆₃₄	C ₆₃₅	C ₆₃₆	C ₆₃₇	C ₆₃₈	C ₆₃₉	C ₆₄₀	C ₆₄₁	C ₆₄₂	C ₆₄₃	C ₆₄₄	C ₆₄₅	C ₆₄₆	C ₆₄₇	C ₆₄₈	C ₆₄₉	C ₆₅₀	C ₆₅₁	C ₆₅₂	C ₆₅₃	C ₆₅₄	C ₆₅₅	C ₆₅₆	C ₆₅₇	C ₆₅₈	C ₆₅₉	C ₆₆₀	C ₆₆₁	C ₆₆₂	C ₆₆₃	C ₆₆₄	C ₆₆₅	C ₆₆₆	C ₆₆₇	C ₆₆₈	C ₆₆₉	C ₆₇₀	C ₆₇₁	C ₆₇₂	C ₆₇₃	C ₆₇₄	C ₆₇₅	C ₆₇₆	C ₆₇₇	C ₆₇₈	C ₆₇₉	C ₆₈₀	C ₆₈₁	C ₆₈₂	C ₆₈₃	C ₆₈₄	C ₆₈₅	C ₆₈₆	C ₆₈₇	C ₆₈₈	C ₆₈₉	C ₆₉₀	C ₆₉₁	C ₆₉₂	C ₆₉₃	C ₆₉₄	C ₆₉₅	C ₆₉₆	C ₆₉₇	C ₆₉₈	C ₆₉₉	C ₇₀₀	C ₇₀₁	C ₇₀₂	C ₇₀₃	C ₇₀₄	C ₇₀₅	C ₇₀₆	C ₇₀₇	C ₇₀₈	C ₇₀₉	C ₇₁₀	C ₇₁₁	C ₇₁₂	C ₇₁₃	C ₇₁₄	C ₇₁₅	C ₇₁₆	C ₇₁₇	C ₇₁₈	C ₇₁₉	C ₇₂₀	C ₇₂₁	C ₇₂₂	C ₇₂₃	C ₇₂₄	C ₇₂₅	C ₇₂₆	C ₇₂₇	C ₇₂₈	C ₇₂₉	C ₇₃₀	C ₇₃₁	C ₇₃

TABLE 5-63. CRACK GROWTH DATA SPECIMEN GT160KAB49-35 S/N 2

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT AVERAGE		
571.	0.2384	0.2388	11190.	-300
1371.	0.2445	0.2498	11190.	-300
1891.	0.2503	0.2602	11190.	-300
2339.	0.2576	0.2723	11190.	-300
2960.	0.2689	0.2829	11165.	-304
3580.	0.2779	0.2943	11190.	-302
4168.	0.2859	0.3063	11165.	-303
4884.	0.2920	0.3175	11178.	-302
5478.	0.3032	0.3284	11178.	-305
6341.	0.3115	0.3396	11178.	-301
6716.	0.3170	0.3509	11178.	-302
7164.	0.3230	0.3627	11202.	-301
7717.	0.3305	0.3750	11190.	-302
8406.	0.3420	0.3836	11190.	-301
8749.	0.3468	0.3942	11190.	-302
9299.	0.3581	0.4030	11141.	-303
9849.	0.3698	0.4088	11141.	-303
10329.	0.3823	0.4196	11190.	-303
10741.	0.3876	0.4312	11141.	-301
11224.	0.3985	0.4454	11190.	-302
11739.	0.4104	0.4569	11178.	-302
11908.	0.4129	0.4687	11190.	-311
12076.	0.4213	0.5016	11190.	-299
12349.	0.4357	0.5231	11190.	-302
12517.	0.4432	0.5404	11190.	-299
12653.	0.4551	0.5673	11165.	-302
12787.	0.4745	0.5790	11165.	-299
12956.	0.4957	0.5896	11190.	-304
13055.	0.5318	0.6001	11178.	-301
13189.	0.5678	0.6179	11190.	-299
13323.	0.5921	0.6419	11165.	-304
13328.	0.6045	0.6650	11190.	-299
13697.	0.6174	0.6855	11178.	-300
13949.	0.6329	0.6975	11165.	-302
14276.	0.6506	0.7123	11178.	-299
14582.	0.6452	0.7266	11178.	-301
14924.	0.6611	0.7383	11178.	-300
15050.	0.6682	0.7617	11178.	-302
15297.	0.6572	0.7718	11190.	-300
15534.	0.6930	0.7858	11190.	-301
15688.	0.7086	0.7943	11178.	-301
15767.	0.7476	0.8060	11190.	-299
15866.	0.7686	0.8370	11190.	-301
15966.	0.8428	0.8157	11190.	-302
16087.	0.9002	0.8259	11190.	-301
16200.	0.9303	0.8377	11178.	-305
16299.	0.9395	0.8638	11178.	-301
16398.	0.9782	0.9725	11165.	-301
16497.	0.9968	1.0831	11165.	-303
16597.	1.0312	1.1275	11153.	-303
16698.	1.0548	1.1471	11165.	-301
16866.	1.0782	1.1671	11178.	-301

TABLE 5-64. CRACK GROWTH DATA SPECIMEN GT160KAB49-35 S/N 3

CYCLE #	CRACK LENGTH (INS)		MAX STRESS (PSI)	STRESS RATIO	AVERAGE
	LEFT	RIGHT			
3366.	0.2813	0.2711	6798.	- .303	
4634.	0.2926	0.2761	6823.	- .303	
5414.	0.2920	0.2905	6823.	- .303	
6111.	0.3106	0.3037	6823.	- .499	
7085.	0.3225	0.3197	6823.	- .301	
7707.	0.3367	0.3260	6798.	- .303	
8505.	0.3491	0.3367	6835.	- .300	
9370.	0.3562	0.3516	6823.	- .303	
10268.	0.3676	0.3661	6810.	- .304	
10542.	0.3829	0.3737	6835.	- .302	
11441.	0.3970	0.3884	6810.	- .300	
12210.	0.4076	0.4026	6810.	- .304	
13207.	0.4124	0.4127	6823.	- .303	
13376.	0.4311	0.4205	6798.	- .306	
14031.	0.4333	0.4324	6823.	- .303	
14269.	0.4485	0.4401	6798.	- .303	
15028.	0.4482	0.4546	6810.	- .304	
15239.	0.4599	0.4612	6835.	- .300	
15978.	0.4734	0.4630	6823.	- .499	
15953.	0.4907	0.4676	6798.	- .303	
17783.	0.4952	0.4826	6823.	- .306	
18334.	0.4910	0.4983	6823.	- .499	
18780.	0.5023	0.5088	6810.	- .302	
19018.	0.5095	0.5273	6798.	- .303	
19813.	0.5142	0.5561	6823.	- .303	
20675.	0.5229	0.5714	6823.	- .303	
21814.	0.5305	0.6868	6810.	- .302	
22710.	0.5364	0.7019	6823.	- .303	
23280.	0.5446	0.7162	6823.	- .303	
23304.	0.5561	0.7305	6823.	- .301	
24949.	0.5702	0.7358	6798.	- .303	
25248.	0.5813	0.7485	6823.	- .303	
27031.	0.5813	0.7563	6798.	- .308	
28015.	0.5951	0.7642	6810.	- .300	
28910.	0.6081	0.7701	6823.	- .499	
29905.	0.6198	0.7854	6847.	- .301	
30165.	0.6873	0.7939	6810.	- .300	
30396.	0.7433	0.7999	6810.	- .304	
30889.	0.7656	0.8020	6835.	- .300	
31962.	0.7733	0.8180	6798.	- .303	
32685.	0.8332	0.8326	6810.	- .302	
33235.	0.8020	0.8469	6810.	- .302	
33611.	0.8143	0.8599	6810.	- .302	
34163.	0.8246	0.8730	6798.	- .304	
34713.	0.8266	0.8890	6798.	- .303	
35366.	0.8316	0.8096	6810.	- .304	
35915.	0.8241	0.9320	6823.	- .302	
36498.	0.8246	0.9527	6810.	- .302	
37116.	0.8215	0.9634	6823.	- .301	
37623.	0.8344	0.9783	6798.	- .309	
37836.	0.8539	0.9822	6823.	- .301	

TABLE 5-65. CRACK GROWTH DATA SPECIMEN GT160KAB49-35 S/N 4

CYCLE #	CRACK LENGTH (INS)			MAX. STRESS (PSI)	STRESS RATIO
	LEFT	RIGHT	AVERAGE		
306.	0.2402	0.2495	0.2449	0.	0.0
1816.	0.2597	0.2490	0.2543	11868.	-506
3252.	0.2762	0.2620	0.2701	11856.	-507
4911.	0.2847	0.2864	0.2855	11856.	-508
6483.	0.2865	0.3102	0.2984	11868.	-507
7436.	0.2864	0.3340	0.3112	11856.	-505
8334.	0.2888	0.3564	0.3136	11868.	-506
9039.	0.2925	0.3623	0.3174	11856.	-506
10006.	0.2944	0.4066	0.3505	11856.	-506
11305.	0.2995	0.4303	0.3650	11868.	-507
12722.	0.3055	0.4543	0.3799	11868.	-507
13924.	0.3194	0.4767	0.3990	11868.	-507
14975.	0.3277	0.5025	0.4151	11856.	-507
15727.	0.3351	0.5263	0.4307	11856.	-507
16602.	0.3402	0.5501	0.4452	11880.	-505
17365.	0.3476	0.5751	0.4613	11856.	-506
18197.	0.3573	0.5896	0.4736	11868.	-507
18817.	0.3702	0.6137	0.4920	11856.	-506
19737.	0.3846	0.6329	0.5088	11856.	-506
20726.	0.4040	0.6494	0.5267	11868.	-507
20600.	0.4234	0.6636	0.5435	11856.	-506
20870.	0.4322	0.6874	0.5598	11868.	-505
21144.	0.4415	0.7112	0.5764	11868.	-505
21345.	0.4595	0.7350	0.5973	11856.	-505
21498.	0.4790	0.7509	0.6149	11868.	-506
21753.	0.4964	0.7657	0.6320	11868.	-508
22243.	0.4882	0.7895	0.6389	11856.	-506
22368.	0.5012	0.8031	0.6521	11856.	-506
22611.	0.5150	0.8298	0.6724	11856.	-505
22685.	0.5345	0.8400	0.6672	11856.	-506
22771.	0.5539	0.8490	0.7015	11856.	-506
22810.	0.5604	0.8557	0.7180	11856.	-506
22932.	0.5710	0.8950	0.7330	11856.	-506
23001.	0.5909	0.9069	0.7489	11856.	-509
23041.	0.6029	0.9318	0.7674	11856.	-506
23088.	0.6090	0.9948	0.8019	11856.	-505
23190.	0.6034	1.0186	0.8110	11856.	-507
23289.	0.6043	1.0224	0.8134	11843.	-507
23327.	0.9009	1.1638	1.0323	296.	-097

6.0 SINGLE-SHEAR LAP-JOINT TEST PROGRAM

The purpose of the single-shear lap-joint test program was to assess the capabilities of the state-of-the-art analytical methods to predict crack growth life of structural joints typical of those utilized in airframe structure.

6.1 TEST SPECIMENS

A total of eighteen (18) single-shear lap-joint specimens were tested. The specimens were made of 2024-T3XX and 7075-T6XX aluminum alloys to represent material used in lower skin Fighter/Trainer and Bomber/Cargo type aircraft, respectively. The specimens contained split skin joint spliced by a plate through two rows of fasteners at each side. The specimens configuration is shown in Figures 6-1 and 6-2 for 2024-T3XX and 7075-T6XX aluminum alloys respectively.

The specimens were pre-cracked prior to assembly. The initial flaw was induced by means of a saw-cut followed by the application of constant amplitude loading not exceeding 40% of the yield stress. The loading was applied until a corner flaw of 0.050 in. was achieved. The initial flaw was located at the edge of the center fastener hole in the second row of fasteners. The testing included three types of specimen. They included the following configuration:

- a. The base line was no interference, clamp-up or sealant.
- b. Clamp-up and interference fit only.
- c. Clamp-up, interference fit and sealant.

6.2 TEST DESCRIPTION

The testing was performed using a hydraulic, computer controlled MTS machine. Anti-buckling plates were installed on both sides of the specimens to prevent lateral instability during compressive loading. The testing was performed in a lab-air controlled environment. The loading frequency was approximately 3 Hz. The precracking as well as the testing was performed at the University of Dayton Research Lab, located in Dayton Ohio.

During the test, measurements of crack growth were made by means of visual aid. A record of the crack length is provided for each specimen. At the completion of each test, fractographic examinations were made to evaluate the extent of cracking. Drawings of the fracture surface cross section, are provided in this report.

6.3 LOADING SPECTRA

The specimens were subjected to three loading spectra:

- a. Constant amplitude loading spectrum.
- b. A-10A flight-by-flight loading spectrum.
- c. AMAVS flight-by-flight loading spectrum.

The 'A-10A' and the 'AMAVS' loading spectra contained marker band cycles. The description of the loading spectra may be found in Volume III of the report. The loading configurations for the various specimens are shown in Table 6-1.

6.4 TEST RESULTS

The test results of eighteen (18) single-shear lap-joint specimens are summarized in Table 6-1 and shown individually in Figures 6-8 through 6-25. For the majority of the specimens, the number of cycles to failure was consistent for similar specimen except specimens LJ-25 and LJ-26 which had a scatter factor of 2.0. These specimens were subjected to AMAVS loading spectrum and represented Group A of the testing. The low cycles to failure for specimen LJ-25 compared to LJ-26 may be attributed to the size of the initial flaw existing in LJ-25 prior to testing. The short life to failure for specimens LJ-3 through LJ-30 was caused by the relatively high applied loads which were close to the yield point of the material. The strain survey which was performed on specimen LJ-1 (Table 6-2) shows a fairly expected increase in stress level, on the order of 30% as the crack approaches the critical length. Subsequent to failure, the fracture surface of each specimen was examined using a low-power magnifying glass (Figure 6-1 through 6-18). The majority of the specimens show substantial cracking prior to failure with the exception of specimens LJ-27 through LJ-30. These specimens were made of 7075-T6XX aluminum alloys

and were subjected to the AMAVS loading spectrum. The net stress level for these specimens was 50.3 Ksi (extremely high for 70/5-T6XX material) which caused early failure.

6.5 FRACTOGRAPHIC ANALYSIS

Five (5) specimens were selected for fractographic examination under a high-power microscope. Specimens No.'s LJ-1, LJ-6, LJ-7, LJ-10 and LJ-25 were those selected for development of information on the initiation and growth of cracks (Figures 6-3 through 6-7). Marker band positions were also investigated on specimens No. LJ-7 and LJ-25, which were subjected to A-10A and AMAVS loading spectrum, respectively. In both cases some marker band striations were clearly visible. Also the initiation of secondary flaws occurred in adjacent holes, with the exception of specimen LJ-10 which had initiation at the faying surface. This may be attributed to a high degree of fastener clamp-up and the presence of sealant at the faying surface which could cause high load transfer through surface friction. Crack starter flaws can be seen in most fracture faces, except where compressive loads have caused local damage. In most of the specimens, additional independent cracks have initiated in other holes. The presence of multiple holes with multiple cracks makes uncertain the determination of a clearly defined a_{cr} since the segments of the cross section will tend to fail independently and sometimes sequentially.

The results of the examination are presented as diagrams of the physical cross section showing origin directions and the extent of crack growth. Selected comments are appended appropriate to each specimen followed by photos. Crack lengths can be directly derived from the diagrams and photos of marker bands, as well as the beginnings of fast fracture.

All diagrams are viewed with the joint nuts on the upper side. Growth in the plane strain (flat) mode, in the plane stress (slant) mode and rapid fracture are separated in the diagrams.

TABLE 6-1. SINGLE-SHEAR LAP-JOINT SPECIMENS SUMMARY TABLE

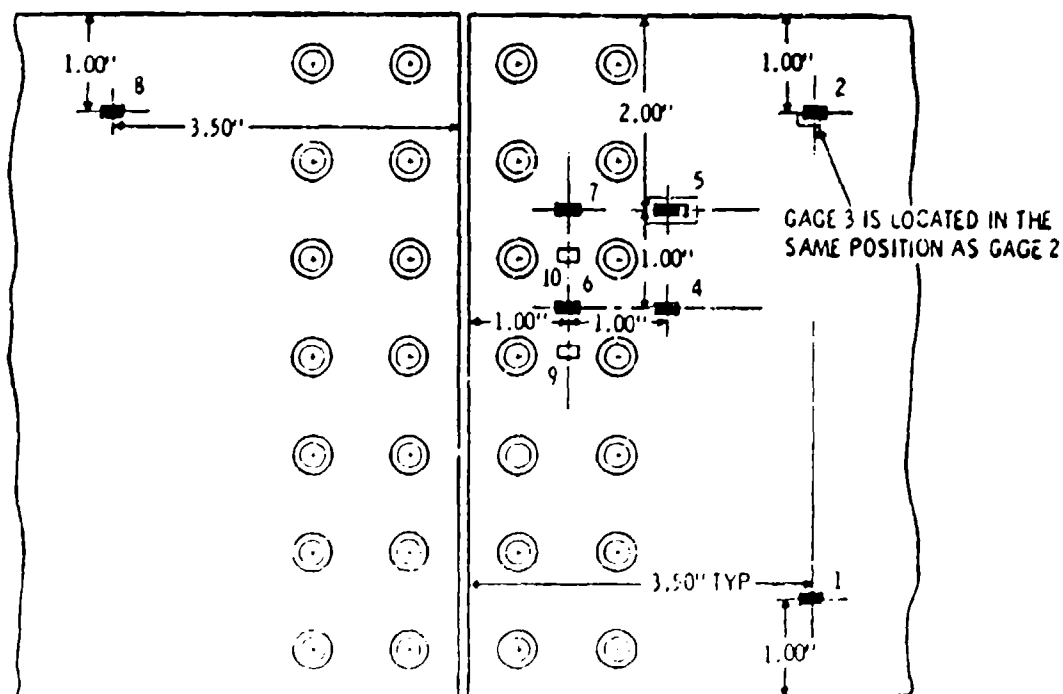
MATERIAL	SPECIMEN ID	TEST CONDITION	TYPE OF LOADING	GROSS STRESS (Ksi)	*CYCLES TO FAILURE
2024-T3	LJ 1 LJ 2	Clearance fit, no clamp-up, no sealant	Constant amplitude	17.0 max. 6.1 min.	44,200 46,300
	LJ 5 LJ 6	Interference fit, clamp-up, no sealant	Constant amplitude	17.0 max. 6.1 min.	94,700 98,700
	LJ 9 LJ 10	Interference fit, clamp-up sealant	Constant amplitude	17.0 max. 6.1 min.	69,910 88,300
	LJ 3 LJ 4	Clearance fit, no clamp-up, no sealant	A-10A spectrum	37.75 max.	42,086 47,102
	LJ 7 LJ 8	Interference fit, clamp-up no sealant	A-10A spectrum	37.75 max.	59,958 59,638
	LJ 11 LJ 12	Interference fit, clamp-up, sealant	A-10A spectrum	37.75 max.	41,037 41,693
7075-T6	LJ 25 LJ 26	Clearance fit, no clamp-up, no sealant	AMAVS spectrum	37.75 max.	3,559 7,215
	LJ 27 LJ 28	Interference fit, clamp-up, no sealant	AMAVS spectrum	37.75 max.	11,091 11,119
	LJ 29 LJ 30	Interference fit, clamp-up, sealant	AMAVS spectrum	37.75 max.	11,091 8,870

*1 life time of A-10 Spectrum = 185,400 cycles

1 life time of AMAVS Spectrum = 143,900 cycles

TABLE 6-2. STRAIN SURVEY DATA SPECIMEN LJ-1 ($\mu\epsilon$)
GROSS AREA = 1.316 IN²

LOAD (LBS)	CYCLES LAPSED	GAGE NO.										CRACK LENGTH (IN)
		1	2	3	4	5	6	7	8	9	10	
0	0			0	-1	-1	-1	-1	-2	-2	0	
22400	0	1786	1658	1374	674	612	849	886	1797	139	165	
0	0	-73	-73	71	-63	-59	-17	-16	-3	-11	-17	
15200	39800	1222	1146	1114	163	1124	126	1137	1090	146	276	
22400	39800	1859	1828	1525	291	1606	212	1625	1860	208	378	
22400	40800	1884	1852	1534	319	1727	231	1755	1858	188	377	
22400	41700	1921	1891	1547	360	1886	248	1926	1854	196	349	
22400	42400	1968	1937	1564	403	2047	263	2090	1848	216	314	0.345
22400	42800	2028	1994	1591	442	2189	270	2233	1844	245	285	0.404
22400	43700	2289	2223	1725	537	1666	254	1769	1811	210	192	4.08
22400	43900	2386	2252	1757	557	672	254	697	1765	218	141	4.153
22400	44000	2517	2341	1779	602	593	276	498	1771	267	135	
22400	44200	2659	2388	1768	666	638	277	409	1736	275	144	
0	44200	-37	-49	2	-41	-106	-36	-56	-100	179	144	



GAGES LOCATION

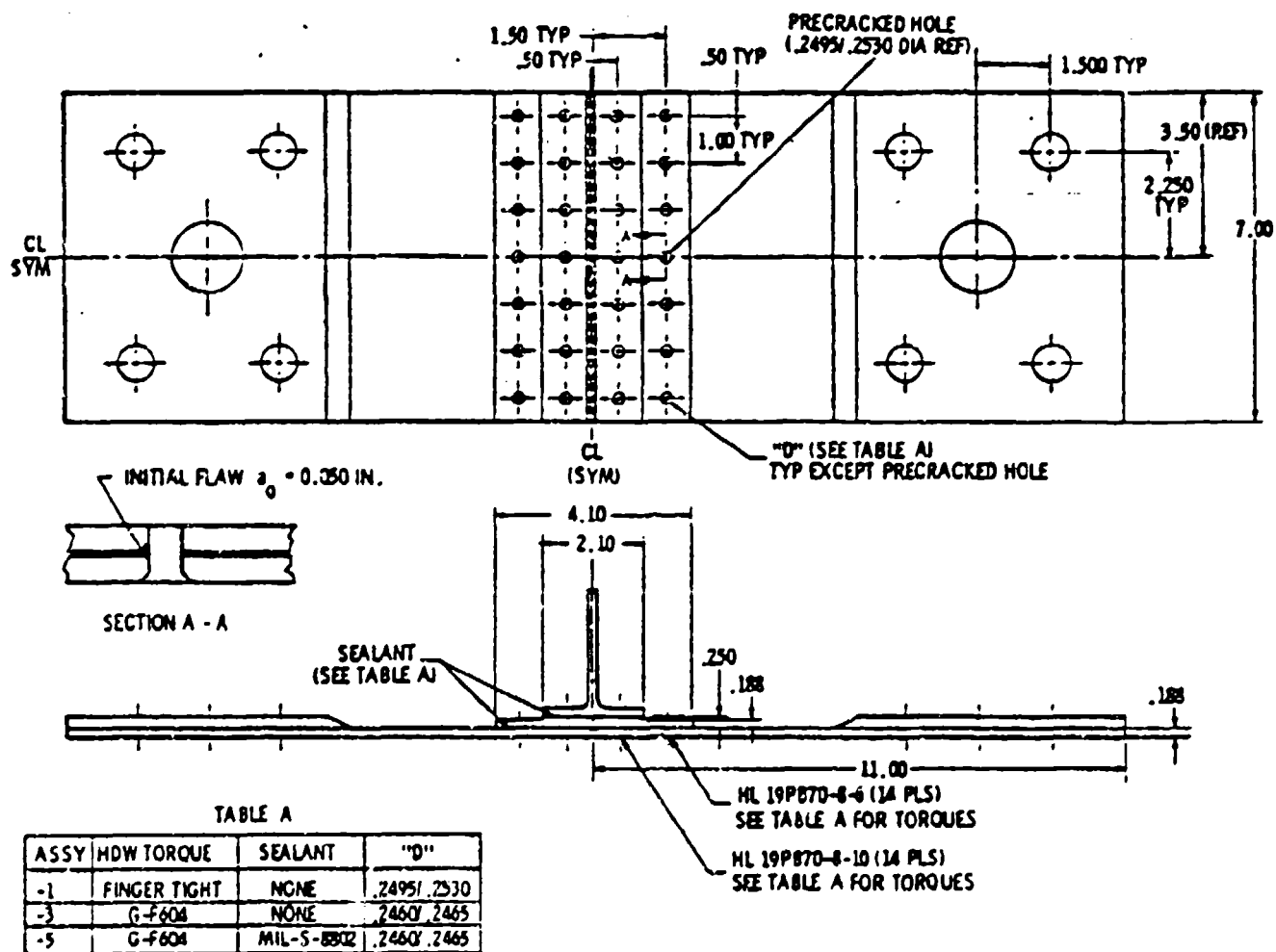


Figure 6-1. Single-Shear Lap-Joint Specimen Configuration Subjected to A-10 or Constant Amplitude Loading Spectrum

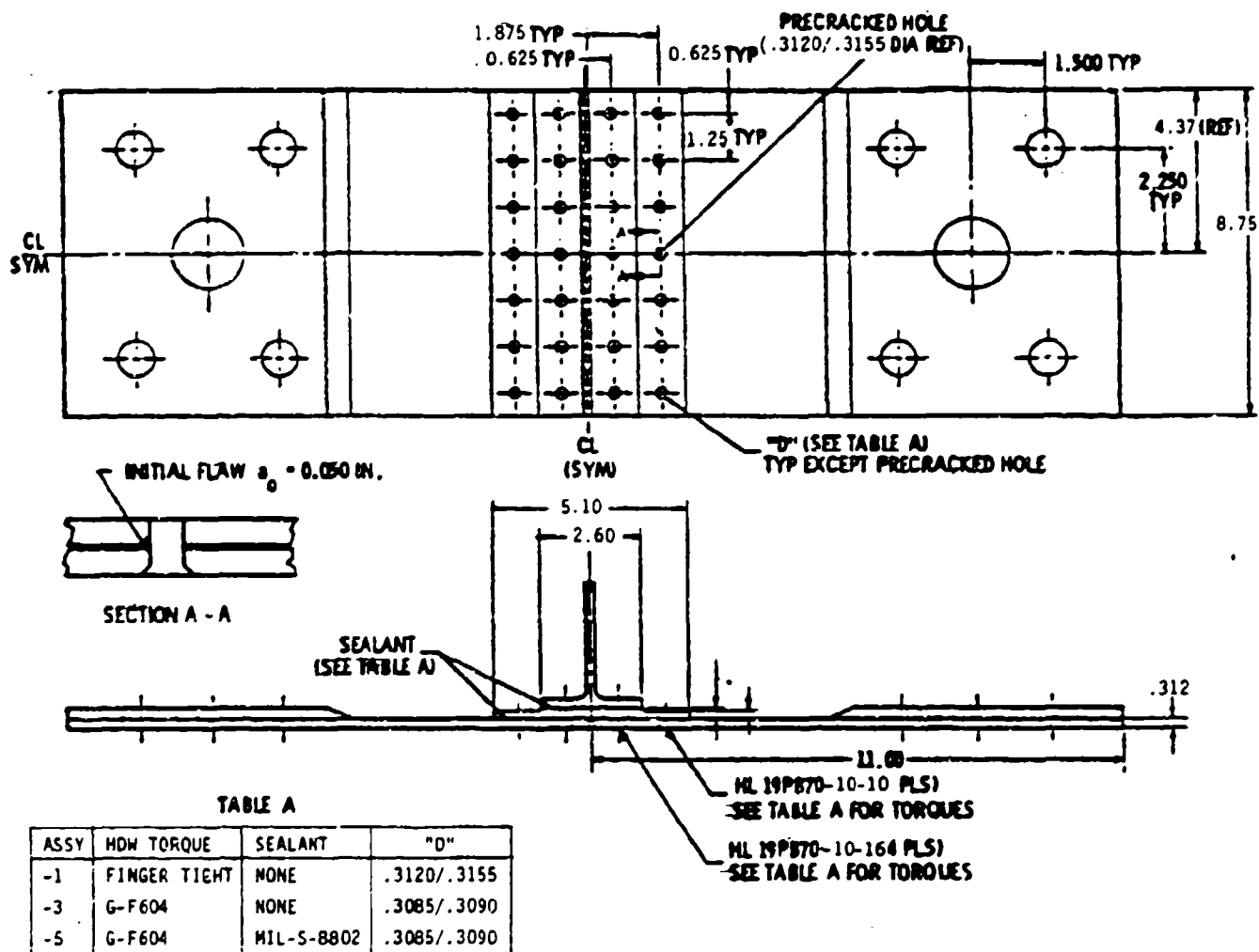


Figure 6-2. Single-Shear Lap-Joint Specimen Configuration Subjected to AMAVS Loading Spectrum

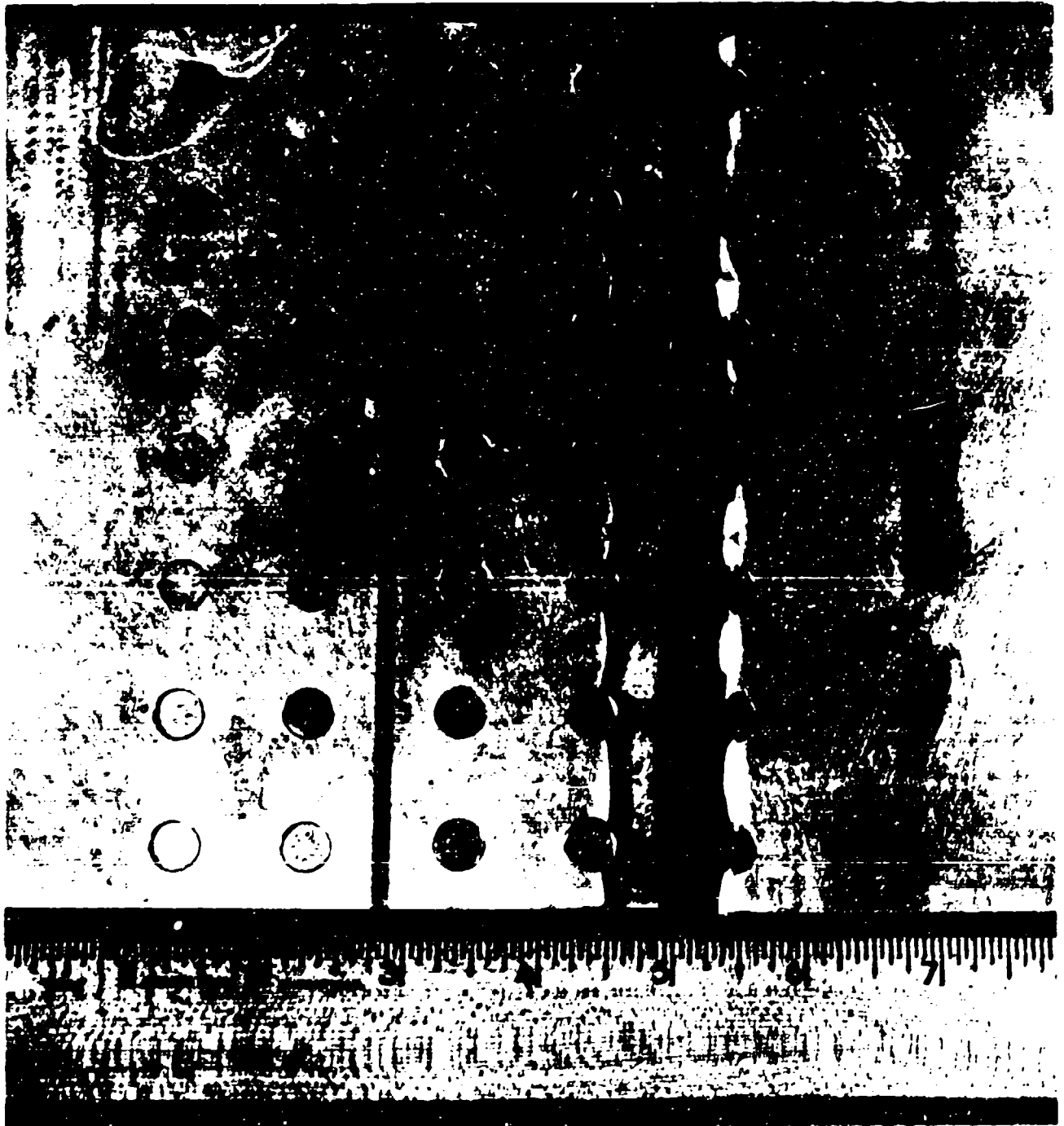
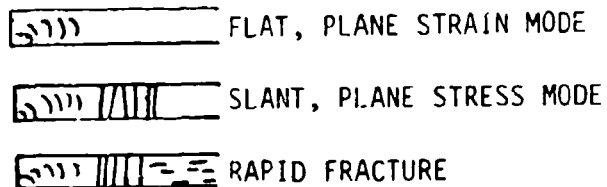


Figure 6-3. Single-Shear Lap-Joint Specimen Subsequent to Failure

SPECIMEN LJ-1

DIAGRAM KEY:



NOTES: NO UNUSUAL CONDITIONS

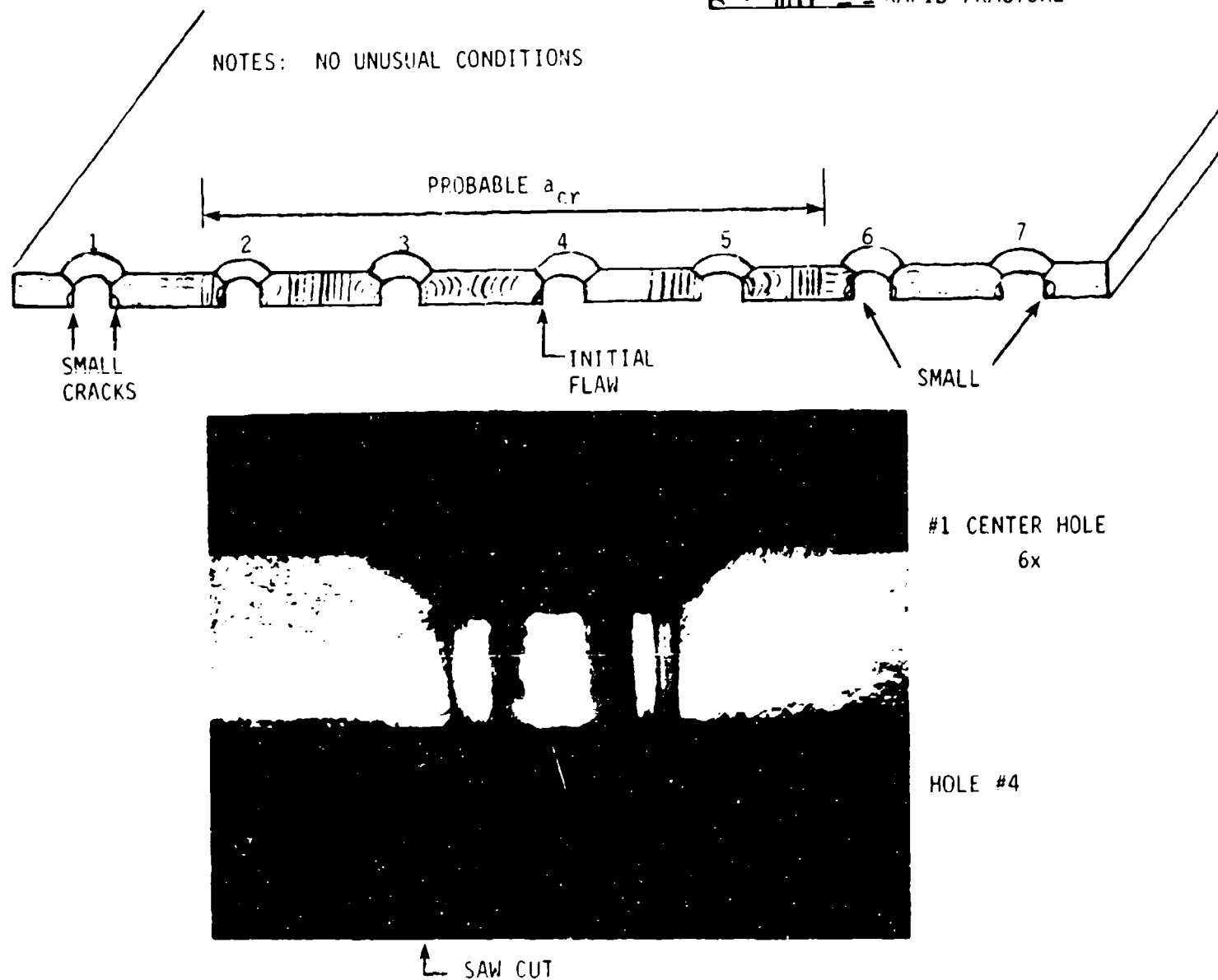


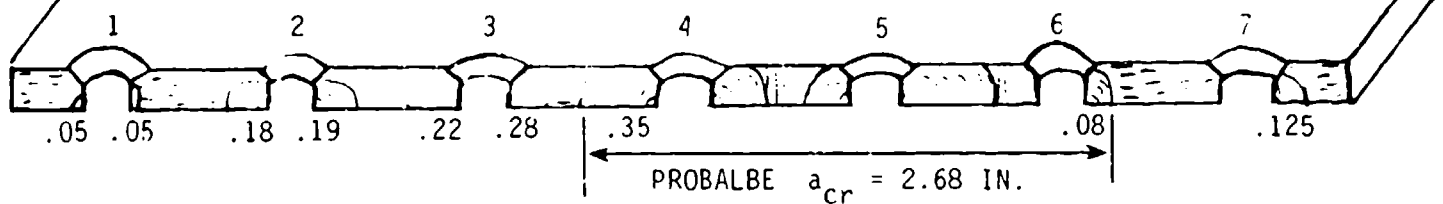
Figure 6-4. Fractographic Examination Specimen LJ-1

SPECIMEN
LJ-6
(SINGLE SHEAR)

KEY:

-  FLAT, PLANE STRAIN MODE
 SLANT, PLANE STRESS MODE
 RAPID FRACTURE

- NOTES: 1. VERY POOR QUALITY HOLES
2. CRACK FACES FRETTED-INDICATING COMPRESSION LOADS
3. CAN NOT DISCERN STARTER FALW DUE TO CRACK FACE FRETTING
4. PLATE SURFACES AROUND SOME HOLES ARE HEAVILY FRETTED
5. MOST INITIATION SITES ARE CAUSED BY FRETTING OFF THE HOLE CENTERS



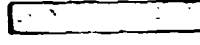
HOLE NO. 4

CRACK FACE FRETTING

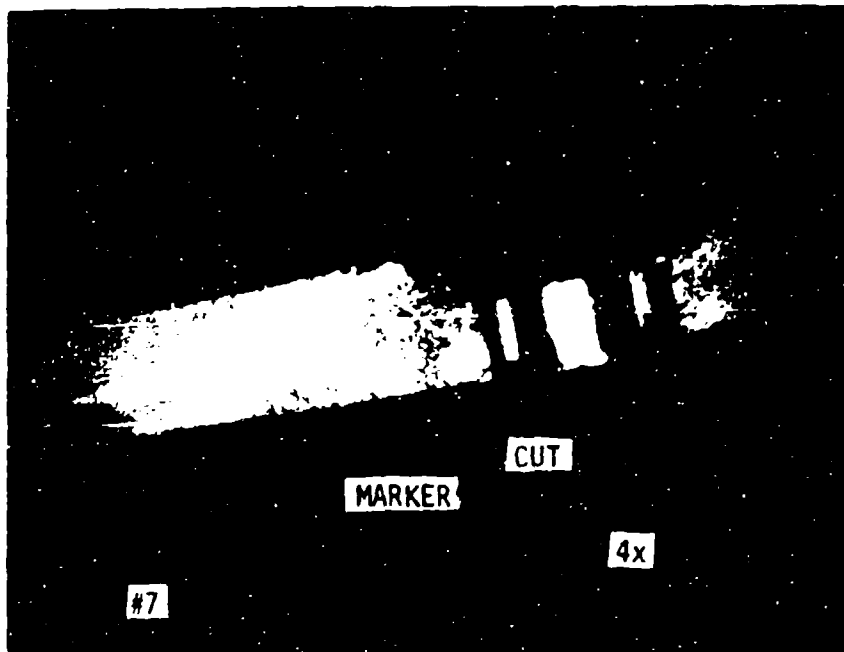
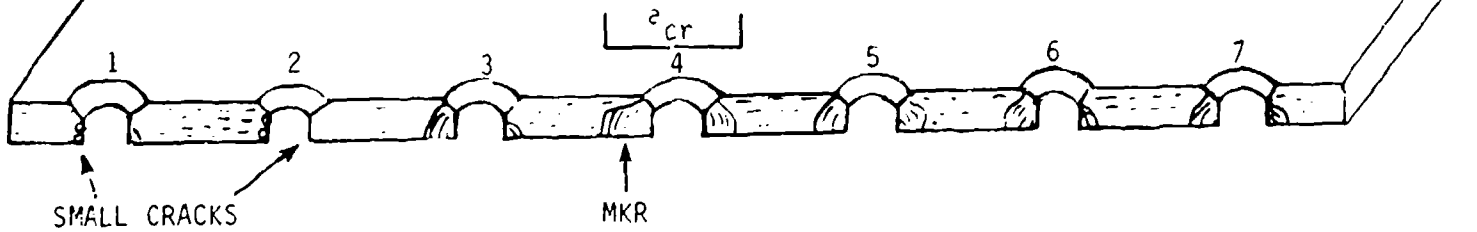
Figure 6-5. Fractographic Examination Specimen LJ-6

SPECIMEN LJ-7

KEY:

	FLAT, PLANE STRAIN MODE
	SLANT, PLANE STRESS MODE
	RAPID FRACTURE

- NOTES:
1. GOOD QUALITY HOLES
 2. CRACKS ARE CENTERED ON THE HOLES
 3. IT IS POSSIBLE THAT THERE WAS A SEQUENTIAL OPENING OF SECTION AROUND THE CENTER HOLE BEFORE FAILURE



HOLE NO. 4

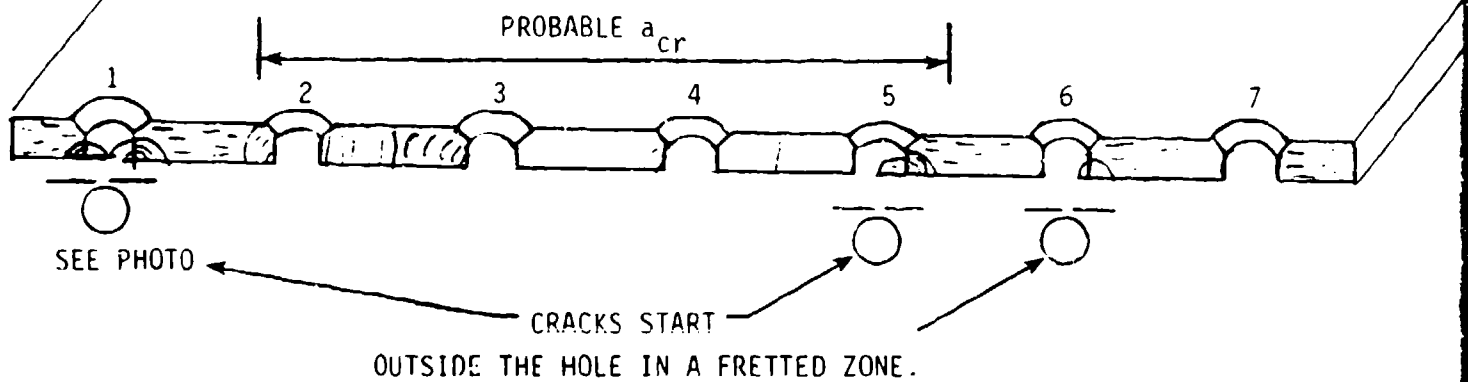
Figure 6-6. Fractographic Examination Specimen LJ-7

SPECIMEN LJ-10

KEY:

-  FLAT, PLANE STRAIN MODE
-  SLANT, PLANE STRESS MOD
-  RAPID FRACTURE

NOTES: 1. FRETTING ON THE MATING SURFACES AROUND HOLES LEADS TO CRACK INITIATION AWAY FROM HOLE. SEE PHOTO.

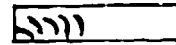


HOLE NO. 1

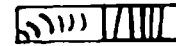
Figure 6-7. Fractographic Examination Specimen LJ-10

SPECIMEN LJ-25

KEY:



FLAT, PLANE STRAIN MODE

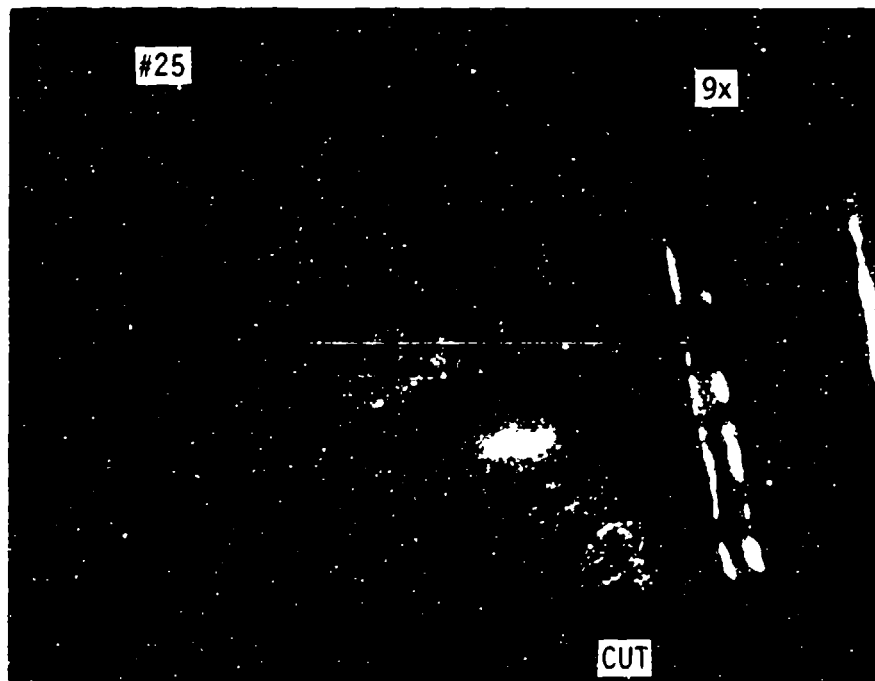
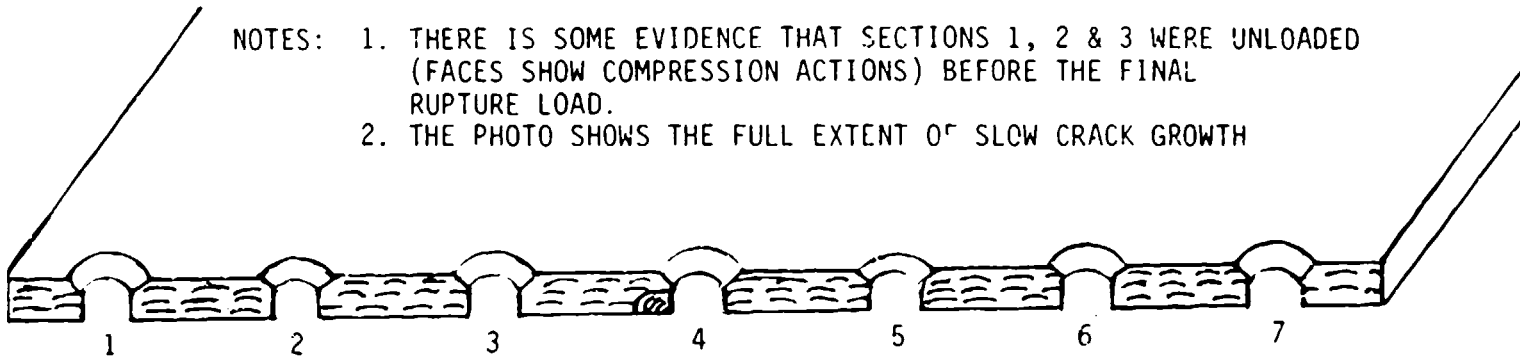


SLANT, PLANE STRESS MODE



RAPID FRACTURE

- NOTES: 1. THERE IS SOME EVIDENCE THAT SECTIONS 1, 2 & 3 WERE UNLOADED
(FACES SHOW COMPRESSION ACTIONS) BEFORE THE FINAL
RUPTURE LOAD.
2. THE PHOTO SHOWS THE FULL EXTENT OF SLOW CRACK GROWTH

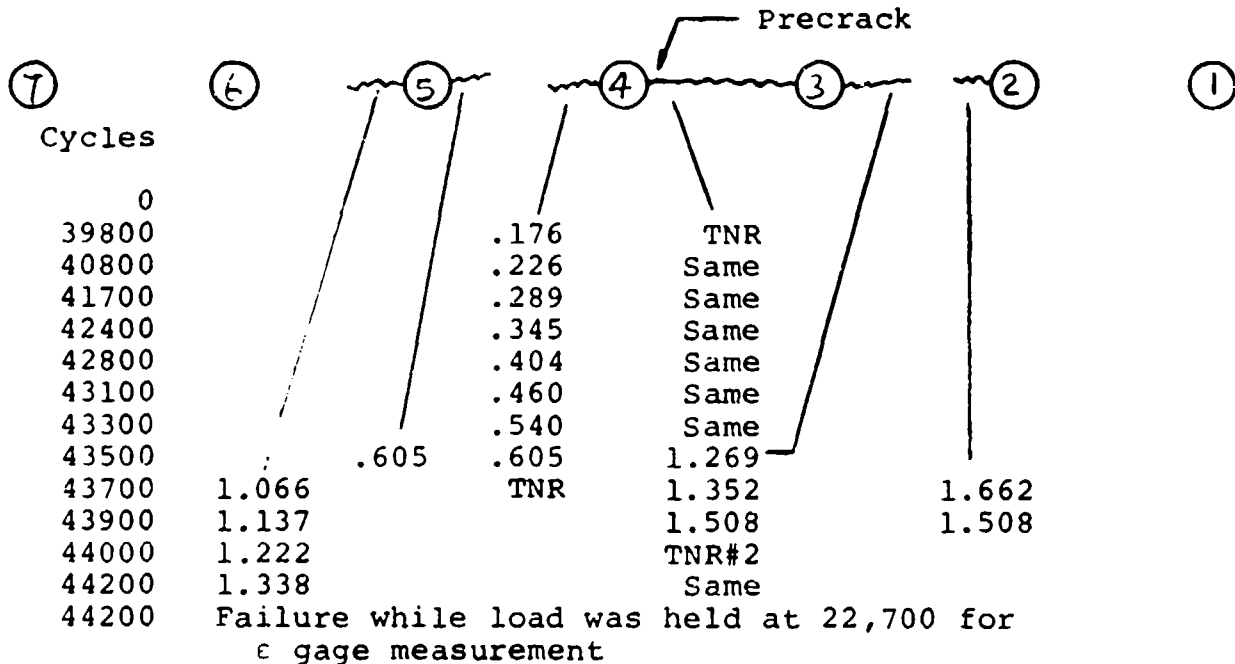


HOLE NO. 4

Figure 6-8. Fractographic Examination Specimen LJ-25

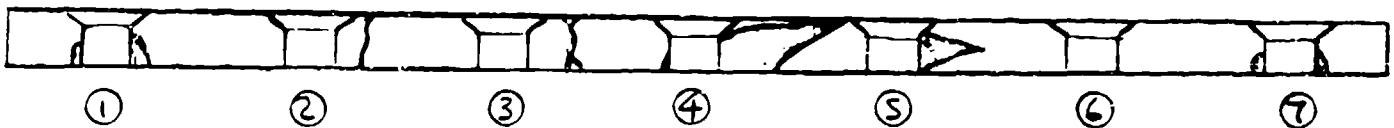
TABLE 6-3. CRACK MEASUREMENTS SPECIMEN LJ-1

SAMPLE NUMBER:	1	CYCLES TO FAILURE:	44,200
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	22.4/+8.0	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 3 Hz	HOLE DIAMETER:	0.251



TNR = Through Next Rivet

1. All measurements from left or right edge of precrack hole.



FAILURE SURFACE

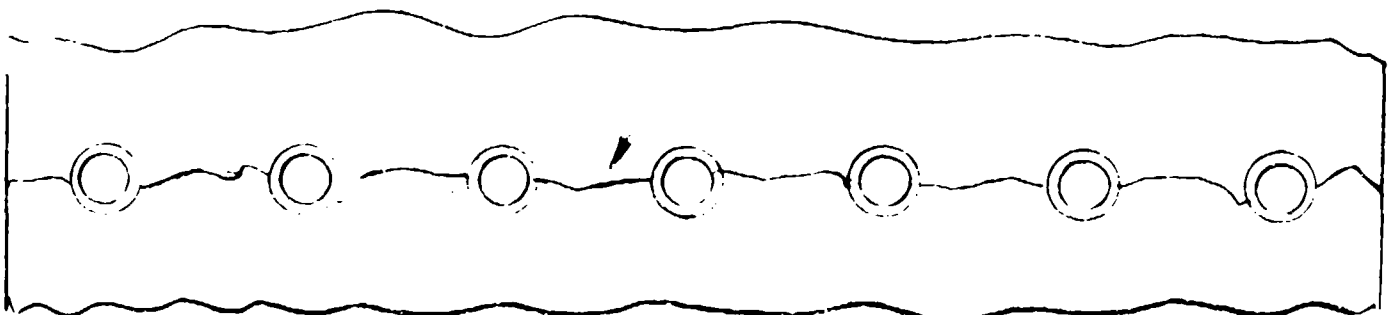
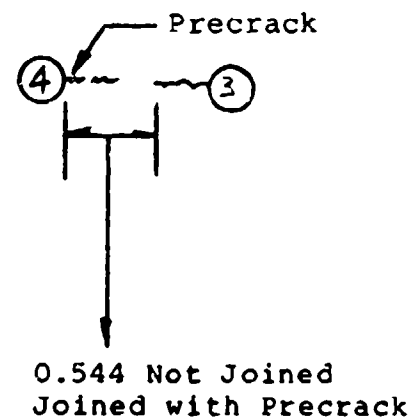


TABLE 6-4. CRACK MEASUREMENTS SPECIMEN LJ-2

SAMPLE NUMBER:	2	CYCLES TO FAILURE:	46,300
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	22.4/+8.0	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 3 Hz	HOLE DIAMETER:	0.250

CYCLES	DISTANCE FROM EDGE OF HOLE	
	FRONT	
	PRE-CRACK LEFT	HOLE RIGHT
0	0.000	0.000
27500	0.000	0.131
30500	0.000	0.184
33600	0.000	0.240
36100	0.000	0.293
39400	0.000	0.359
40600	0.000	0.489
42500	0.080	0.544
43400	0.147	TNR
44100	0.197	Same
45500	0.287	1.274
46100	0.353	1.401
46300	Failure	Failure



No other cracks. Only the skin with the precrack grew.

TNR = Through Next Rivet

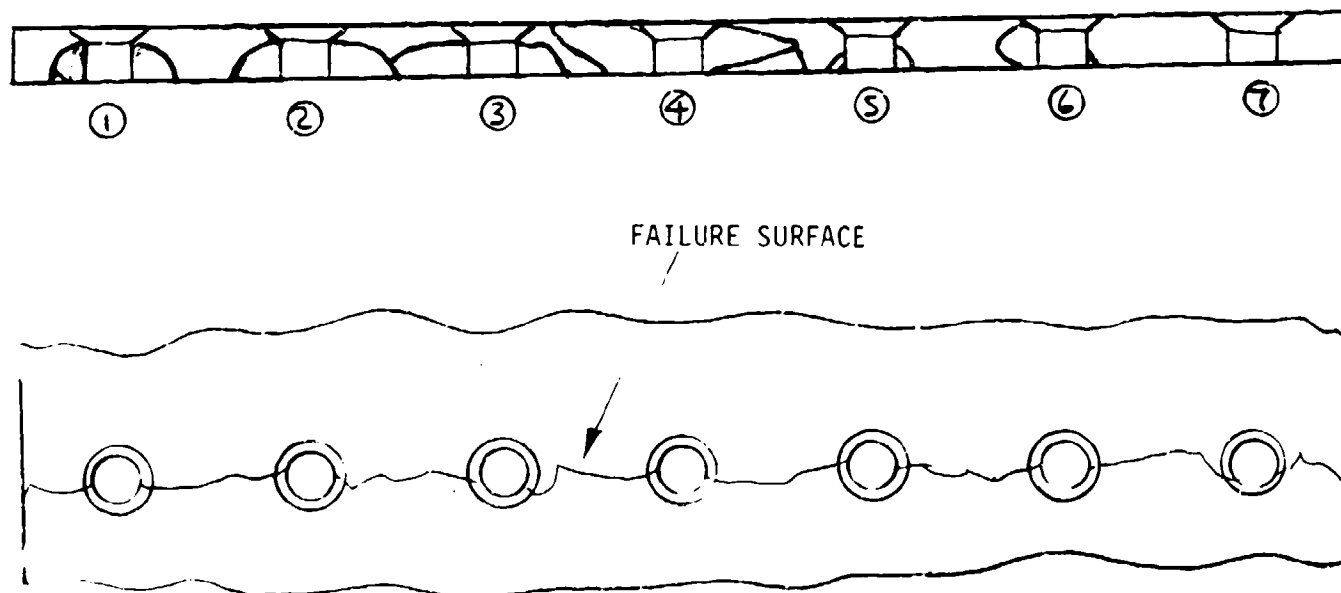


TABLE 6-5. CRACK MEASUREMENTS SPECIMEN LJ-3

SAMPLE NUMBER:	3	CYCLES TO FAILURE:	42,086
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	21.4
MAX LOAD (KIPS):	49.7	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER:	0.248

1. No crack growth data.
2. Failure at 42,086 cycles = 21.4% of life.
3. Failure was not at rivet line which had precrack hole.
4. Plastic zone at crack tip visible at 37,530 cycles but crack not visible.

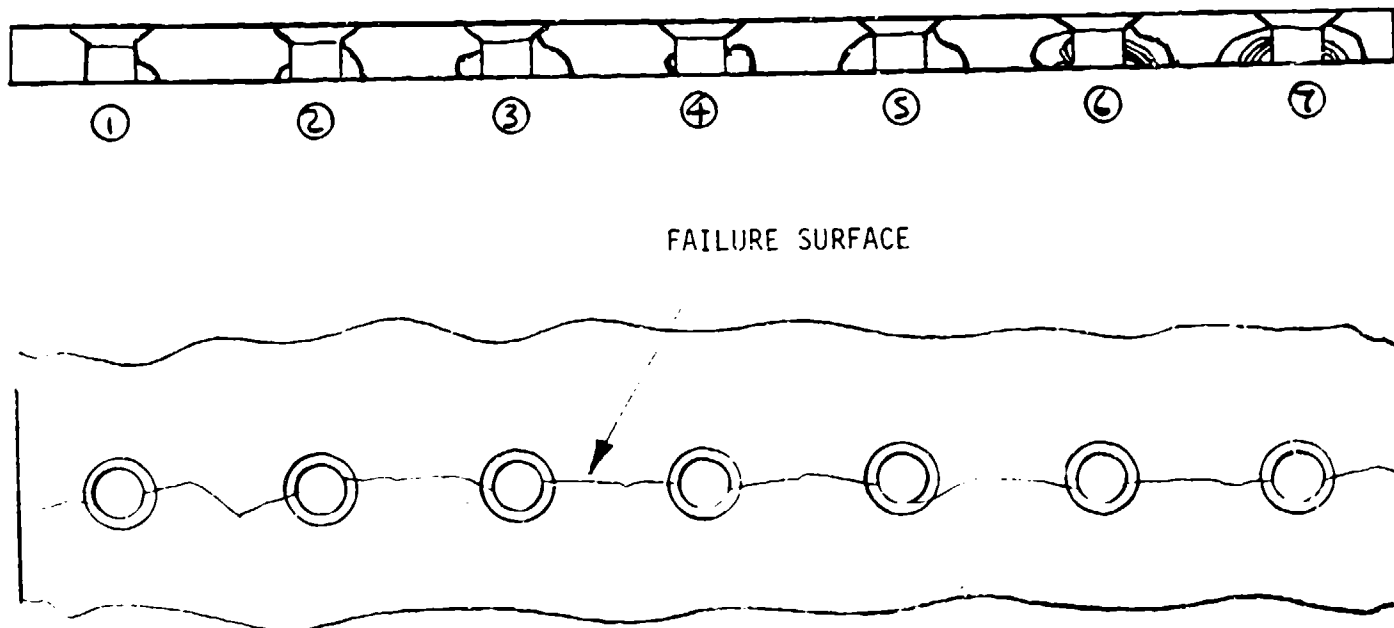
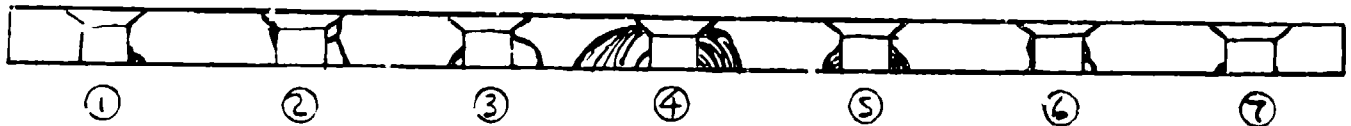


TABLE 6-6. CRACK MEASUREMENTS SPECIMEN LJ-4

SAMPLE NUMBER:	4	CYCLES TO FAILURE:	47,102
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	49.7	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER:	0.252

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE FRONT	
		PRE-CRACK HOLE LEFT	HOLE RIGHT
0	0	0.000	0.000
5	20	0.000	0.097
5.36	21.43	0.000	0.187
5.99	23.95	Failure	Failure



FAILURE SURFACE

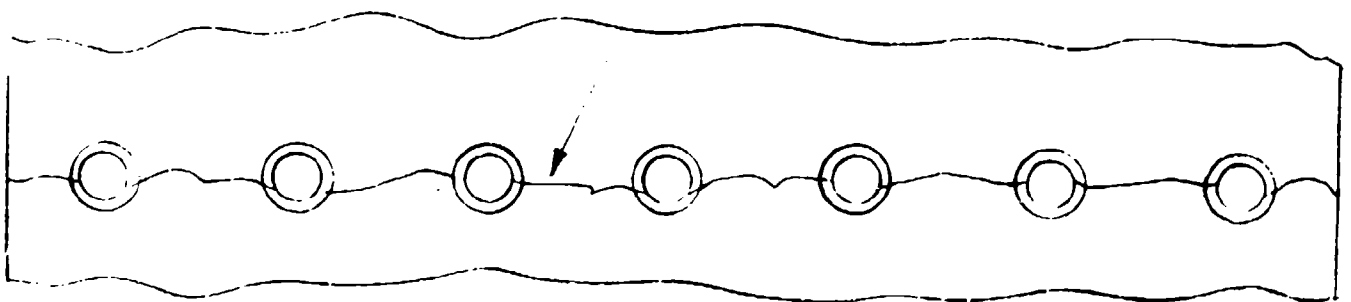
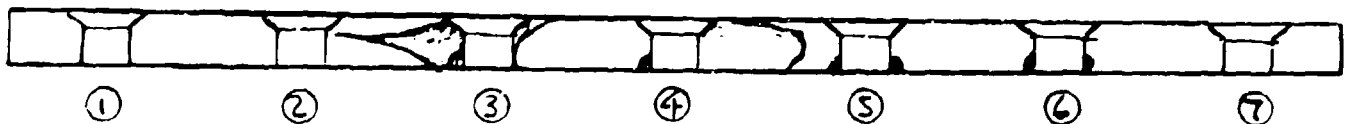


TABLE 6-7. CRACK MEASUREMENTS SPECIMEN LJ-5

SAMPLE NUMBER:	5	CYCLES TO FAILURE:	94,700
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	22.4/+8.0	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 3 Hz	HOLE DIAMETER:	0.255

		DISTANCE FROM EDGE OF HOLE FRONT	
		PRE-CRACK HOLE	
		LEFT	RIGHT
	CYCLES		
	0	0.000	0.000
	35500	0.000	0.000
	42200	0.000	0.085
	48900	0.000	0.179
	57800	0.000	0.283
	65300	0.000	0.384
	70600	0.000	0.482
	75500	0.000	0.586
	76900	0.000	0.682
	83900	0.129	TNR
	86100	0.221	Same
	88900	0.315	Same
	90800	0.409	Same
	92000	0.635	1.252
	92400	TNR	1.340
	93000	Same	1.449
	93500	Same	1.551
	93800	Same	1.646
	94000	1.193	1.742
	94300	1.298	TNR#2
TIP TO TIP	94500	1.404	Same
4 1/4"	94600	1503	Same
	94700	TNR#2	Same
	947++	Failure	Failure



TNR = Through Next Rivet

FAILURE SURFACE

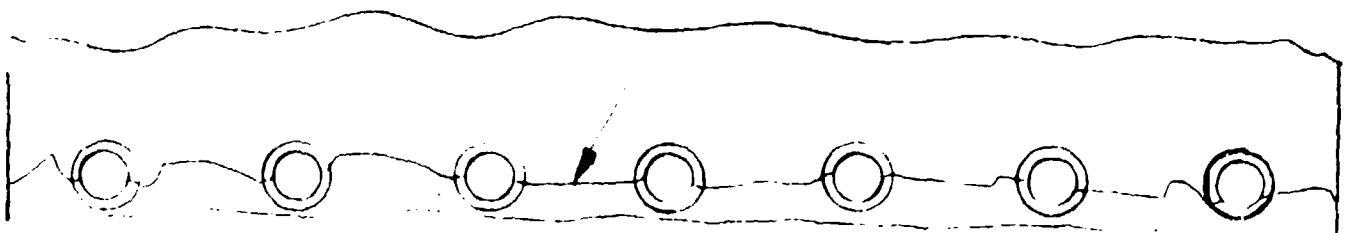


TABLE 6-8. CRACK MEASUREMENTS SPECIMEN LJ-6

SAMPLE NUMBER:	6	CYCLES TO FAILURE:	98,700***
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	22.4/+8.0	FINAL CRACK LENGTH	
SPECTRUM TYPE:	CA 3 Hz	HOLE DIAMETER:	0.250

CYCLES	DISTANCE FROM EDGE OF HOLE	
	FRONT	
	PRE-CRACK HOLE	
	LEFT	RIGHT
0	0.000	0
39500	0.000	0.123
48700	0.000	0.241
53500	0.000	0.301
57000	0.000	0.353
61400	0.000	0.404
63800	0.000	0.473
66300	0.000	0.535
67800	0.000	0.585
69100	0.000	TNR
93600	0.000	1.077
95900	0.000	1.170
97800	0.000	1.264
98600	0.000	1.410

*** Failure at rivet row without Precrack

TNR = Through Next Rivet

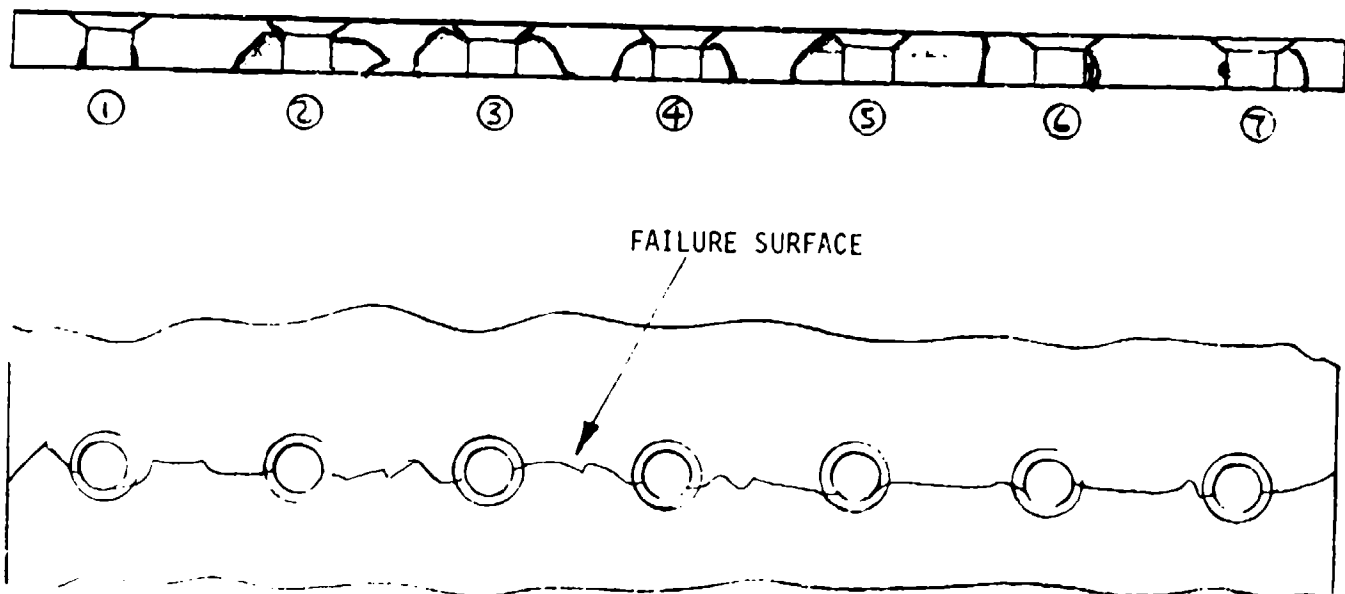


TABLE 6-9. CRACK MEASUREMENTS SPECIMEN LJ-7

SAMPLE NUMBER:	7	CYCLES TO FAILURE:	59,598
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	30.9
MAX LOAD (KIPS):	49.7	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER:	0.252

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE	
		FRONT	
		PRE-CRACK LEFT	HOLE RIGHT
0	0	0.000	0.000
1	4	0.000	0.000
2	8	0.000	0.000
3	12	0.000	0.000
4	16	0.000	0.000
5	20	0.000	0.000
6	24	0.000	0.000
7	28	0.000	0.081
7.74	30.94	Failure	Failure



FAILURE SURFACE

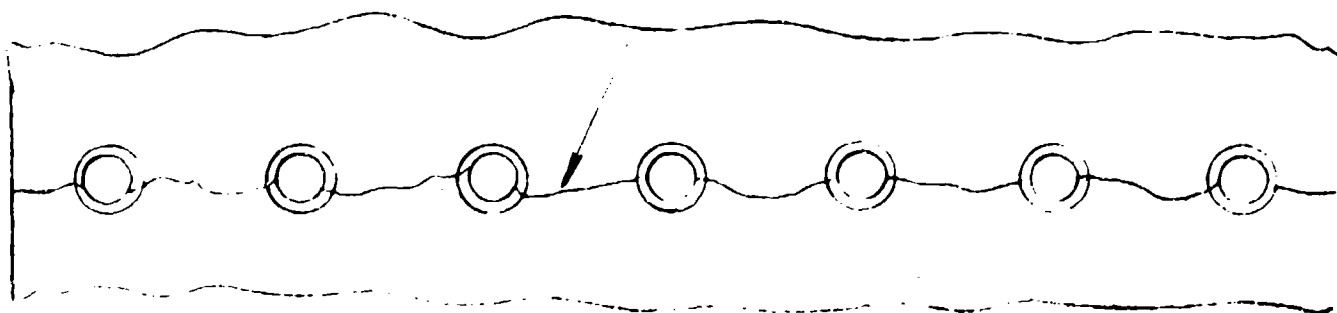
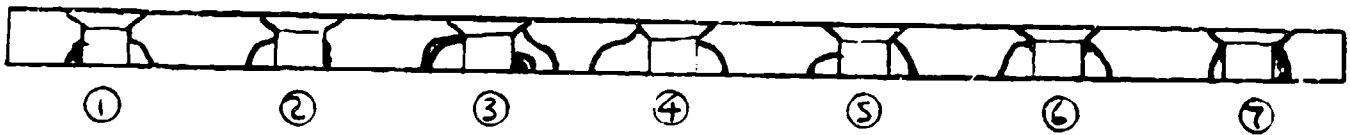


TABLE 6-10. CRACK MEASUREMENTS SPECIMEN LJ-8

SAMPLE NUMBER:	8	CYCLES TO FAILURE:	59,638
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	30.8
MAX LOAD (KIPS):	49.7	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 4 Hz	HOLE DIAMETER:	

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE	
		FRONT PRE-CRACK HOLE LEFT	RIGHT
7	28	0.000	0.096
7.36	29.44	0.000	0.133
	30.8	Failure	Failure



FAILURE SURFACE

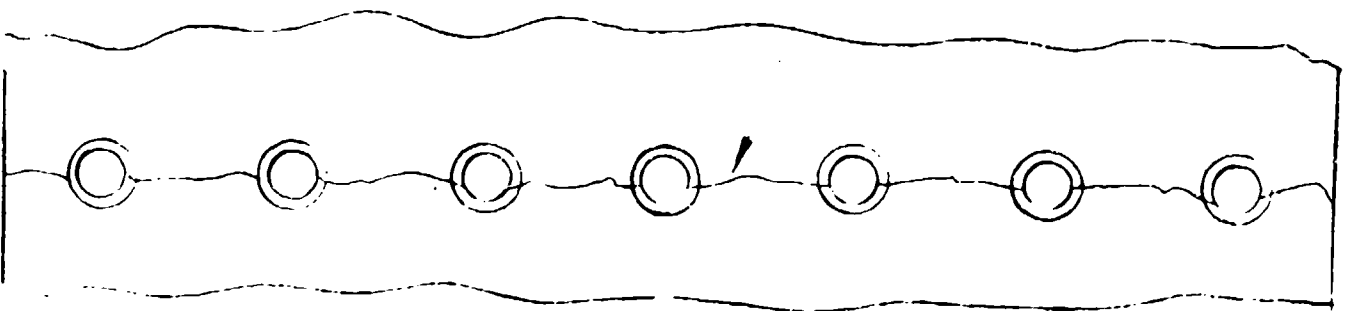


TABLE 6-11. CRACK MEASUREMENTS SPECIMEN LJ-9

SAMPLE NUMBER:	9	CYCLES TO FAILURE:	69,910
SPECIMEN TYPE:	SINGLE LAP JOINT	% O LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	22.4/+8.0	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 3 Hz	HOLE DIAMETER:	0.254

CYCLES	DISTANCE FROM EDGE OF HOLE FRONT		
	PRE-CRACK LEFT	HOLE RIGHT	
0	0.000	0.000	Precrack Next Rivet New Crack 0.656 0.640
34300	0.000	0.078	
42100	0.000	0.155	
50600	0.000	0.260	
55300	0.000	0.315	
60400	0.000	0.388	
63100	0.000	0.449	
65000	0.000	0.508	
66000	0.000	0.566	
66700	0.000	0.613	
67700	0.000	0.650	
69800	0.000	TNR	
69800	0.000	1.139	
69890	0.000	1.143	
69910	Failure	Failure	

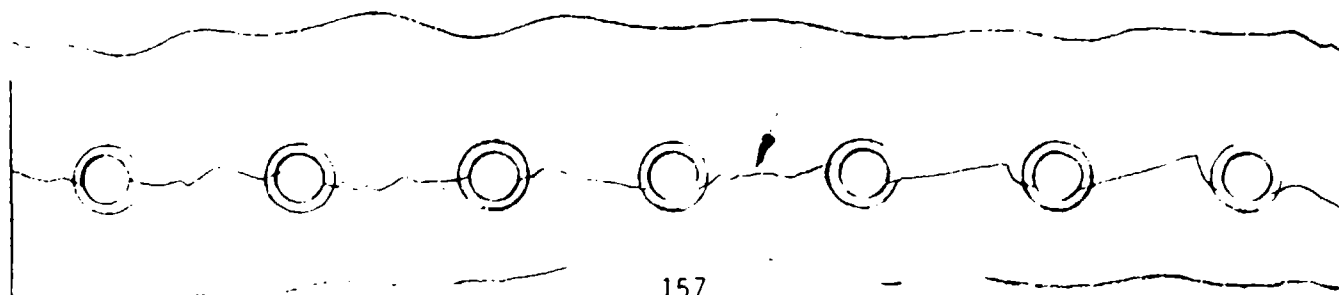
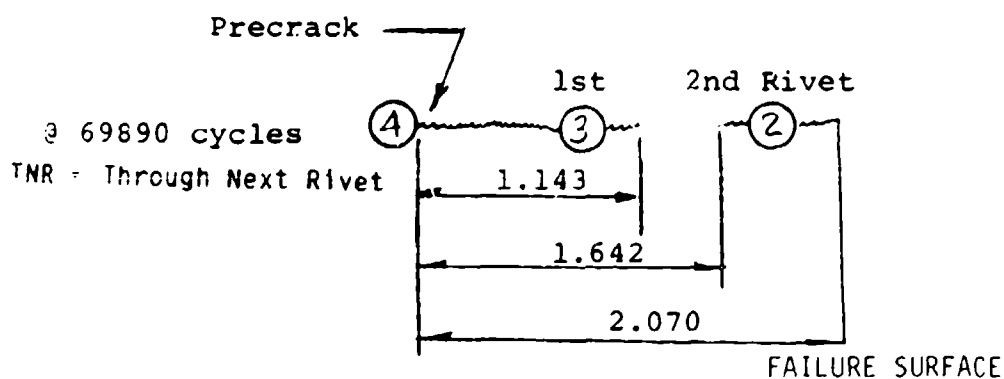
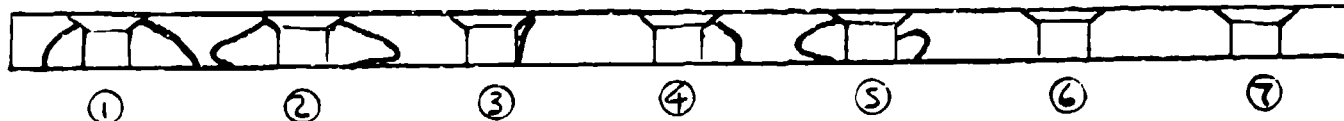
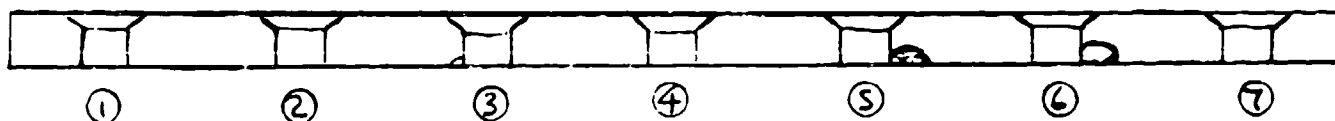


TABLE 6-12. CRACK MEASUREMENTS SPECIMEN LJ-10

SAMPLE NUMBER:	10	CYCLES TO FAILURE:	88,300
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	22.4/+8.0	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 3 Hz	HOLE DIAMETER:	0.253

CYCLES	DISTANCE FROM EDGE OF HOLE FRONT	
	PRE-CRACK HOLE	
	LEFT	RIGHT
0	0.000	0
32700	0.000	0.077
35000	0.000	0.114
40000	0.000	0.177
45600	0.000	0.217
54100	0.000	0.317
60400	0.000	0.417
65300	0.000	0.561
66100	0.000	0.615
66600	0.000	TNR
80700	0.000	1.035
82100	0.000	1.149
84000	0.000	1.251
85100	0.000	1.347
86000	0.165	1.485
86300	0.190	1.620
86900	0.303	TNR
37400	0.435	Same
87700	0.536	Same
87800	0.649	Same
87900	TNR	Same
88300	Failure	Failure



TNR = Through Next Rivet

FAILURE SURFACE

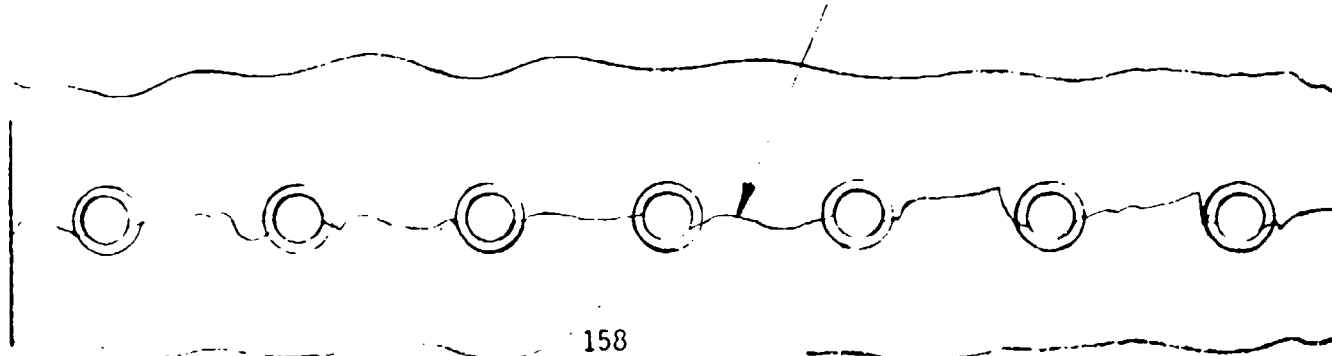


TABLE 6-13. CRACK MEASUREMENTS SPECIMEN LJ-11

SAMPLE NUMBER:	11	CYCLES TO FAILURE:	41,037
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	20.83
MAX LOAD (KIPS):	49.7	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 2 Hz	HOLE DIAMETER:	0.253

1. No visible cracks prior to failure.
2. Failure at 41,037 cycles which is 20.83% of life.

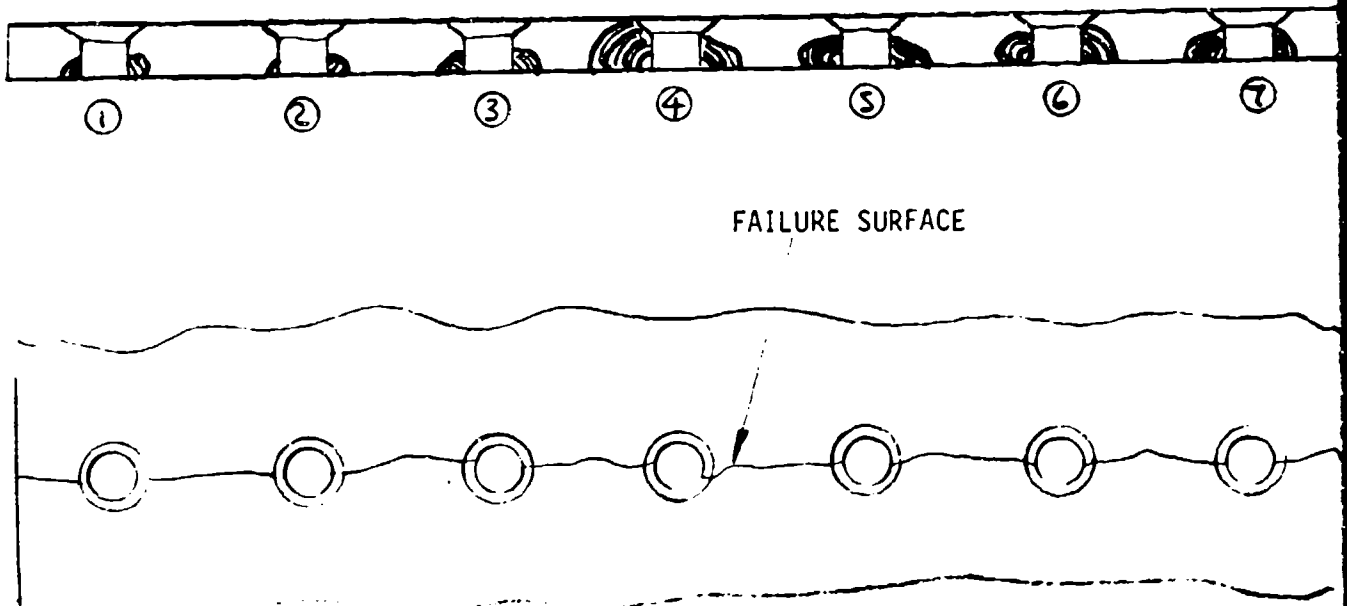
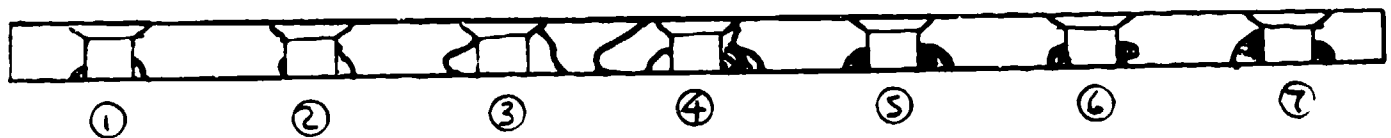


TABLE 6-14. CRACK MEASUREMENTS SPECIMEN LJ-12

SAMPLE NUMBER:	12	CYCLES TO FAILURE:	41,693
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	21.2
MAX LOAD (KIPS):	49.7	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER:	0.252

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE FRONT	
		PRE-CRACK LEFT	HOLE RIGHT
0	0	0.000	0.000
1	4	0.000	0.000
2	8	0.000	0.000
3	12	0.000	0.000
4	16	0.000	0.000
5	20	0.000	0.322
5.29	21.16	Failure	Failure



FAILURE SURFACE

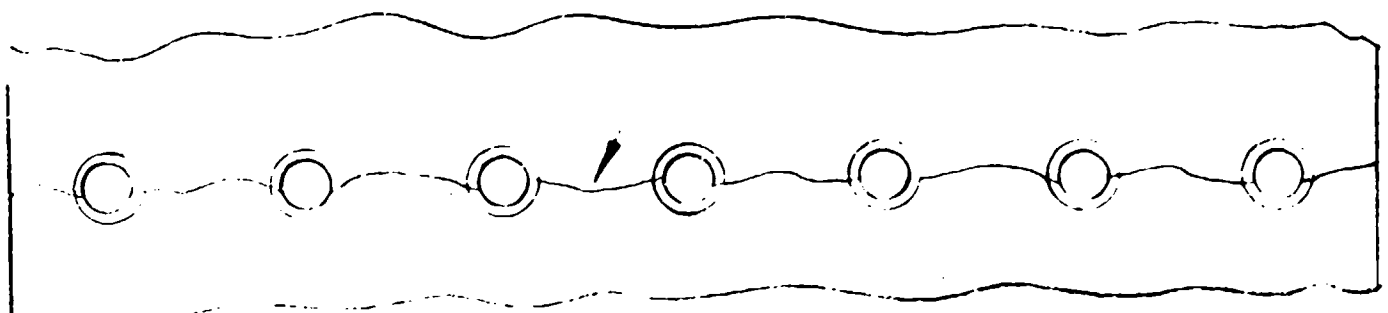


TABLE 6-15. CRACK MEASUREMENTS SPECIMEN LJ-25

SAMPLE NUMBER:	25	CYCLES TO FAILURE:	3,559
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	2.5
MAX LOAD (KIPS):	103.2	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 1 HZ	HOLE DIAMETER:	0.312

1. At 2,020 cycles the precrack broke through to the next rivet.
2. At 3,127 cycles the left side of the hole with the precrack broke through to the next rivet.
3. At 3,551 cycles the right side (precrack side) broke through to the second rivet.
4. At 3,559 cycles the specimen failed. This is 2.5% of life.
5. Failure load - 75.4 KIPS.



FAILURE SURFACE

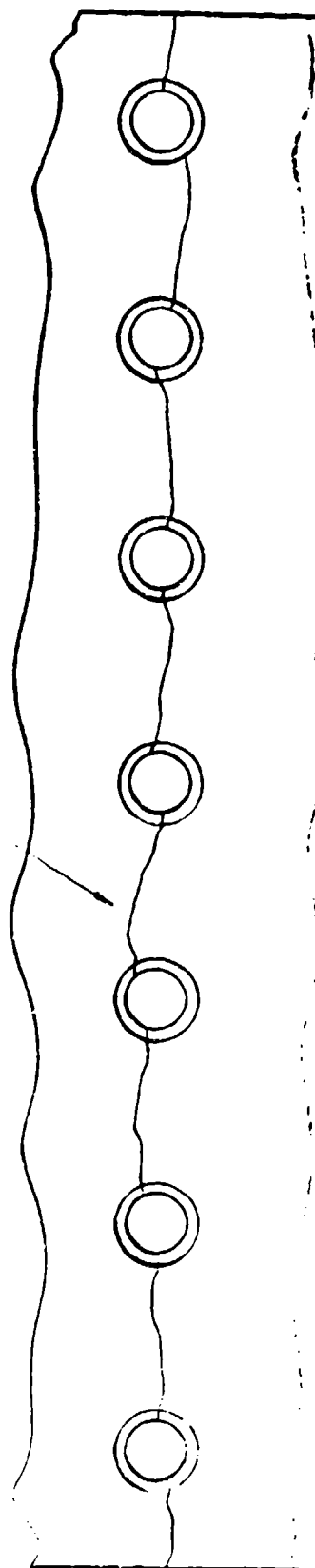


TABLE 6-16. CRACK MEASUREMENTS SPECIMEN LJ-26

SAMPLE NUMBER:	26	CYCLES TO FAILURE:	7,215
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	5.03
MAX LOAD (KIPS):	103.2	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMVS 1 Hz	HOLE DIAMETER:	0.312

1. At 5,608 cycles the precrack side of the flawed hole broke through to the next rivet.
2. At 7,215 cycles the specimen failed which was 5.03% of life.
3. Failure load - 80.0 KIPS.



FAILURE SURFACE

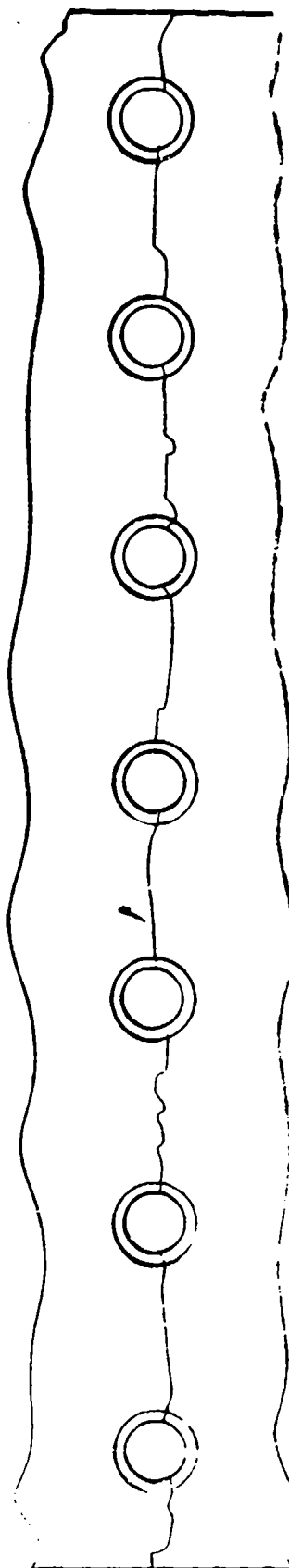


TABLE 6-17. CRACK MEASUREMENTS SPECIMEN LJ-27

SAMPLE NUMBER:	27	CYCLES TO FAILURE:	11,091
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	7.7
MAX LOAD (KIPS):	103.2	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 2 Hz	HOLE DIAMETER:	0.312

1. No crack growth data.
2. Failure at 11,091 cycles = 7.7% of life.
3. Failure Load - 92.3 KIPS.
4. Failed in main plate not cover plate. Rivet heads pulled through cover plate.



FAILURE SURFACE

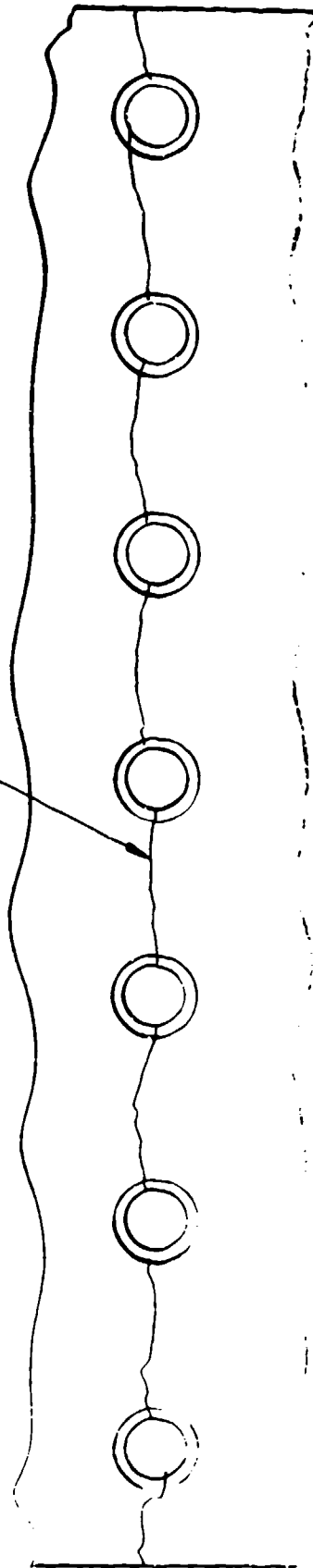


TABLE 6-18. CRACK MEASUREMENTS SPECIMEN LJ-28

SAMPLE NUMBER:	28	CYCLES TO FAILURE:	11,119
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	7.7
MAX LOAD (KIPS):	103.2	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 2 Hz	HOLE DIAMETER:	0.311

1. No crack growth data.
2. Failure at 11,119 cycles = 7.7% of life.
3. Failure load - 93.6 KIPS.



FAILURE SURFACE

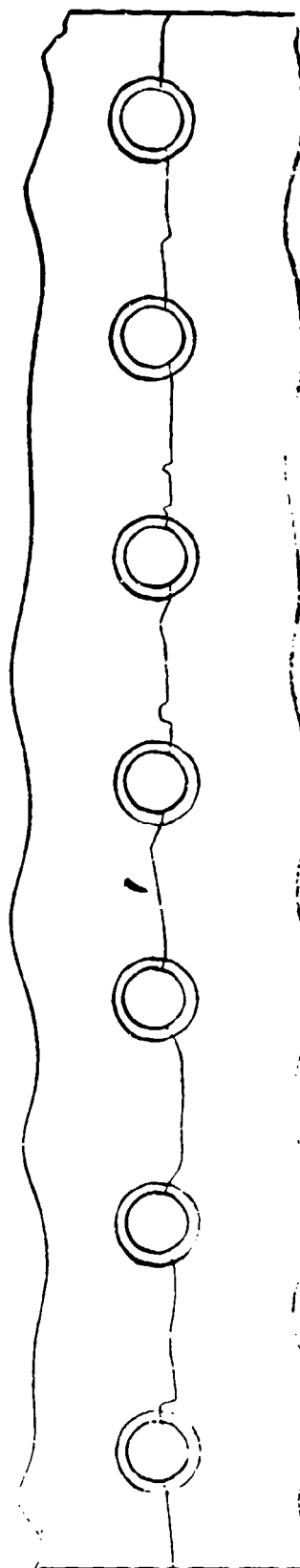
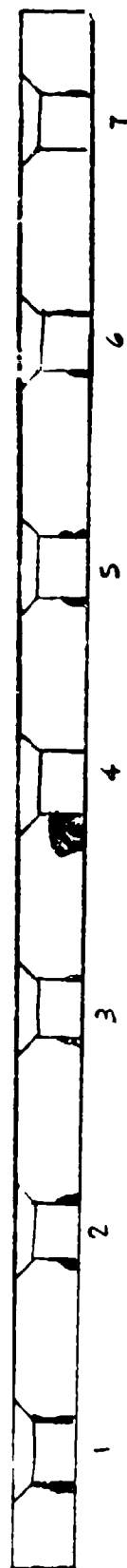


TABLE 6-19. CRACK MEASUREMENTS SPECIMEN LJ-29

SAMPLE NUMBER:	29	CYCLES TO FAILURE:	11,091
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	7.7
MAX LOAD (KIPS):	103.2	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 2 Hz	HOLE DIAMETER:	0.314

1. No crack growth data.
2. Failure at 11,091 cycles = 7.7% of life.
3. Failure load - 99.3 KIPS.



FAILURE SURFACE

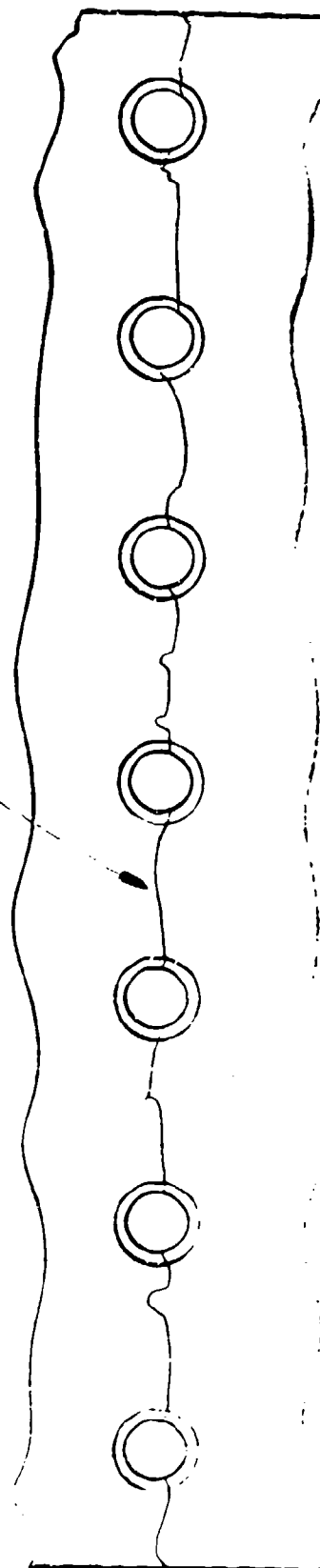
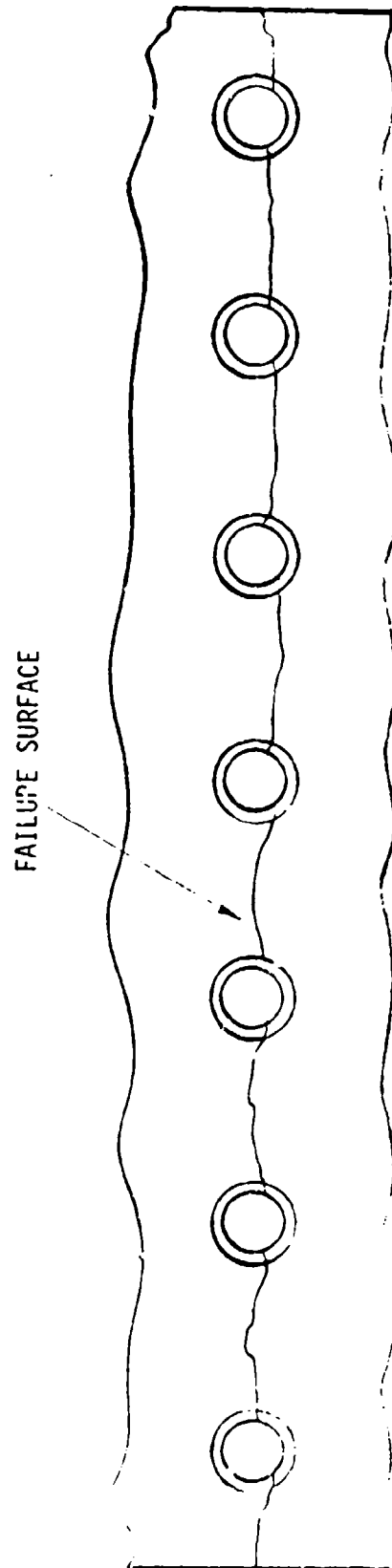


TABLE 6-20. CRACK MEASUREMENTS SPECIMEN LJ-30

SAMPLE NUMBER:	30	CYCLES TO FAILURE:	8,870
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	6.16
MAX LOAD (KIPS):	103.2	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 2 Hz	HOLE DIAMETER:	0.313

1. No crack growth data.
2. Failure at 8,870 cycles = 6.16% of life.
3. Failure Load - 91.5 KIPS.



7.0 DOUBLE-SHEAR LAP-JOINT TEST PROGRAM

The purpose of the double-shear lap-joint test program is similar to that of the single-shear lap-joint program, namely to assess the analytical methods in predicting crack growth of structural configuration often found in aircraft construction. The double-shear lap-joint provides redundancy in load path and eliminates some of the secondary effect due to changes in load path.

7.1 TEST SPECIMENS

A total of eighteen (18) double-shear lap-joint specimens were tested of 2024-T3 and 7075-T6 split skin spliced plates. The specimens configuration is shown in Figures 7-1 and 7-2. All specimens contained initial corner flaw of 0.050 inch located at the center fastener hole in the first row of fasteners through the skin making the splice plates more critical than the skin. The specimens were precracked prior to assembly. The initial flaw was introduced by means of saw-cut followed by constant amplitude fatigue loading not exceeding 40% of the yield stress. The loading was applied until a flaw of 0.050 in. was achieved.

The testing included three configurations;

- a. The base line was no interference fit fasteners, clamp-up or sealant at the faying surface.
- b. Specimens with clamp-up and interference fit hardware.
- c. Specimens with clamp-up, interference fit and sealant.

7.2 TEST DESCRIPTION

The double-shear lap-joint specimens were tested using a hydraulic, computer controlled MTS machine. Antibuckling plates were installed at both sides of the specimens to prevent lateral instability during compressive loading. The testing was performed in a Lab-Air environment at a frequency of 3 Hz. Figure 7-3 shows a specimen installed in the MTS machine. The precracking as well as the testing was performed at the University of Dayton Research Lab located in Dayton Ohio.

During the testing, measurements of crack growth were made using an optical method. A record of crack growth vs. number of cycles was recorded for each specimen, as well as the critical crack length measured at the fracture surface (Figures 7-15 through 7-33).

7.3 LOADING SPECTRA

The double-shear lap-joint specimens were subjected to three loading spectra;

- a. Constant amplitude loading spectrum,
- b. A-10A flight-by-flight loading spectrum,
- c. 'AMAVS' flight-by-flight loading spectrum.

The A-10A and the AMAVS loading spectra contained marker band cycles (Ref. Appendix A). Table 7-1 provides a description of the various specimens and loading configurations.

7.4 TEST RESULTS

The test results of eighteen (18) double-shear lap-joint specimens are summarized in Table 7-1, and shown for individual specimens in Figures 7-15 through 7-33. The scatter in the test data was within 30% except for specimen LJ-23, (interference fit, clamp-up and sealant) which had a scatter factor of 2.0. Specimens LJ-13 and LJ-14 (clearance fit, no clamp-up or sealant) and specimens LJ-17 and LJ-18 (interference fit, clamp-up and no sealant) were tested under constant amplitude loading at a maximum stress level of 13.1 Ksi and a minimum stress of 4.7 Ksi. Specimens LJ-13 and LJ-14 failed at 210,300 cycles and 217,800 cycles, respectively. However, specimens LJ-17 and LJ-18 did not fail at 2×10^6 cycles. Subsequently, a decision was made to increase the stress level of specimen LJ-21 (interference fit, clamp-up and sealant).

For specimens which were tested under randomized spectrum, the best results were obtained from those specimens with interference fit and clamp-up. The lives of those specimens were much higher (factor of 3-4) than the specimen without interference fit or clamp-up, and somehow higher than specimens containing sealant ($\sim$ 30% - 40%). It is concluded that the presence of sealant at the faying surface tends to reduce the fatigue life and is mainly due to

the additional stress concentration at the faying surface. It must be mentioned that the test gross stress level of 37.75 Ksi is much higher than the acceptable maximum spectrum loading for aluminum alloys. A more realistic stress level is on the order of 30.0 Ksi to 32.0 Ksi.

The majority of the specimens exhibited cracking at both splice plates. Although, the critical crack size was not the same, it was on the same order of magnitude.

In contrast to the single-shear lap-joint specimens, relatively few cracks were initiated at holes adjacent to the initial crack section. A strain survey was performed on specimens LJ-13 and LJ-31 (Figure 7-4 and Tables 7-2 and 7-3). As expected, the survey shows a decrease in load adjacent to the cracked section (Figure 7-5).

7.5 FRACTOGRAPHIC ANALYSIS

Three (3) specimens were selected for Fractographic Examination. They included specimen LJ-19 which was subjected to A-10A loading spectrum, LJ-21 subjected to constant amplitude spectrum and specimen LJ-33 subjected to AMAVS loading spectrum. Specimens LJ-10 and LJ-21 were examined under a low power microscope, while specimen LJ-33 was examined under a Scanning Electron Microscope (SEM).

Crack starter flaws can be seen in most fracture faces in the center hole except where compressive loads have caused local damage. In most of the specimens, additional independent cracks had initiated in other holes. The presence of multiple holes with multiple cracks makes uncertain the determination of a clearly defined $\bar{\sigma}_{cr}$ since the segments of the cross section will tend to fail independently and sometimes sequentially.

The results of the examinations are presented as diagrams of the physical cross section showing origin directions and the extent of crack growth. Selected comments are appended appropriate to each specimen and appropriate photos are also appended. Crack lengths as well as the beginnings of fast fracture, can be directly derived from the diagrams and photos of marker bands.

All diagrams are viewed with the joint nuts on the upper side. Growth in the plane strain (flat) mode, plane stress (slant) mode and rapid fracture are separated on the diagrams.

Specimen LJ-19 (interference fit and hardware clamp-up) failed at 171,714 cycles of spectrum loading, or approximately 21 passes. One visible marker band appeared on the bottom and top plates (nut is in the top). The critical crack length of the top plate was approximately 2.5 in., while the lower plate was 1.5 in. The same proportionality appeared in the marker band distance from the hole (Figure 7-6). Also, the top plate appears to have more crack initiation sites than the bottom one. This may be attributed to higher stress level on the top plate or early crack initiation and subsequent growth.

Specimen LJ-21 exhibited similar behavior to LJ-19. The critical crack on the top plate (nut side of hardware) was approximately 4.0 in. long, while the bottom plate was approximately 3.0 in. long (Figure 7-7).

Fractographic examination of specimen LJ-33 revealed clear marking of the marker band cycles as indicated in Figures 7-8 through 7-10. The marking may be used to construct a revised crack growth diagram which shows the rates of growth at each interval of the testing. Additional fractographic examination was performed at hole No. 4 (initial flaw site) using the Scanning Electron Microscope (SEM). Polaroid photos of magnifications 10x, 50x, 300x, and 1000x were taken (Figures 7-11 through 7-14). The 10x photo shows the shape of the crack at various stages of its growth and its associated marker band (Figure 7-10). A single pronounced overload cycle may be seen periodically. Since the specimen failed at 92.45% of expected life, the number of overload cycles applied will be $92.45/7.8 = 12$, which is the number of 'crack jumps' counted on the fracture surface (Figure 7-10). The 50x polaroid shows intermediate marking corresponding to marker band sequencing as well as periodic jump in crack length due to overload cycles (Figure 7-12). Further magnification of the cracking surface, 300x and 1000x (Figures 7-13 and 7-14), revealed additional information as to the mode of crack extension adjacent to the initial flaw location.

TABLE 7-1. DOUBLE-SHEAR LAP-JOINT SPECIMENS SUMMARY TABLE

MATERIAL	SPECIMEN ID	TEST CONDITION	TYPE OF LOADING	STRESS (Ksi)	(1)CYCLES TO FAILURE
2024-T3	LJ 13 LJ 14	Clearance fit, no clamp-up, no sealant	Constant amplitude	13.1 max. 4.7 min.	210,300 217,800
	LJ 17 LJ 18	Interference fit, clamp-up, no sealant	Constant amplitude	13.1 max. 4.7 min.	2.35x10 ⁶ (*)(+) 2.08x10 ⁶ (*)
	LJ 21	Interference fit, clamp-up sealant	Constant amplitude	17.0 max. 1.7 min.	129,300
	LJ 15 LJ 16	Clearance fit, no clamp-up, no sealant	A-10 spectrum	37.75 max.	42,008 36,362
	LJ 19 LJ 20	Interference fit, clamp-up no sealant	A-10 spectrum	37.75 max.	171,714 179,255
	LJ 22 LJ 23 LJ 24	Interference fit, clamp-up, sealant	A-10 spectrum	37.75 max.	62,240 172,005 86,871
	LJ 31 LJ 32	Clearance fit, no clamp-up, no sealant	AMAVS spectrum	37.75 max.	47,637 45,860
	LJ 33 LJ 34	Interference fit, clamp-up, no sealant	AMAVS spectrum	37.75 max.	135,597 162,237
7075-T6	LJ 35 LJ 36	Interference fit, clamp-up, sealant	AMAVS spectrum	37.75 max.	103,461 137,937

(*) Did not fail

(+) Specimen LJ-17 was retested at $\sigma_{\max} = 17.0$ Ksi,
 $\sigma_{\min} = 1.7$ Ksi, the test life is 349,500 cycles.

(1) life time of A-10 Spectrum = 185,400 cycles

(1) life time of AMAVS Spectrum = 143,900 cycles

TABLE 7-2A. STRAIN SURVEY DATA OF SPECIMEN NO. LJ-13

Gage No. Cycles	1	2	3	4	5	6	7	8	Crack Length (inch)	
									Front	Rear
0.0	0.966	0.992	1.002	0.796	0.781	1.118	1.156	0.993	0.050	0.050
130,300	0.974	0.991	1.006	0.836	0.787	1.103	1.000	0.997	0.171	0.343
160,600	0.976	0.994	1.003	0.806	0.801	1.060	0.788	0.997	0.203	0.514
169,800	0.983	1.000	1.001	0.781	0.815	1.006	0.587	1.001	0.237	0.631
										(0.236)
173,000	0.988	1.007	0.997	0.767	0.826	0.977	0.322	1.006	0.250	0.750
										(0.344)
178,300	0.991	1.009	0.996	0.735	0.832	0.952	0.321	1.008	0.353	0.750
										(0.344)
183,600	0.996	1.013	0.995	0.698	0.838	0.923	0.330	1.011	-	0.750
										(0.462)
187,500	1.006	1.023	0.991	0.669	0.850	0.885	0.355	1.017	0.394	0.750
										(0.586)
189,900	1.027	1.042	0.980	0.641	0.857	0.837	0.388	1.029	0.750	0.750
										(0.750)
192,200	1.033	1.047	0.977	0.614	0.863	0.811	0.405	1.033	0.750	0.750
										(1.559)

- Note:
1. The specimen is 2024-T3 double-shear lap-joint specimen without interference, clamp-up, or sealant.
 2. Strain survey was performed at 12.6 ksi.
 3. The figures in the table are normalized with respect to remote strain
 4. The figures within the parentheses are the crack lengths at the opposite side of the precracked hole.

TABLE 7-2B. STRAIN SURVEY DATA OF SPECIMEN NO. LJ-31

Gage No. Life	1	2	3	4	5	6	7	8	9	10	Crack Length (inch)	
											Front	Rear
0 ⁽¹⁾	-0.015	-0.012	-0.051	-0.023	-0.006	-0.014	-0.007	-0.035	-0.051	0.001	NA	NA
0 ⁽²⁾	0.932	0.961	0.904	0.667	0.623	1.117	1.160	0.938	-0.013	0.115	NA	NA
2%	0.937	0.961	0.918	0.722	0.680	1.134	1.146	0.946	-0.046	0.115	NA	NA
2% ⁽³⁾	-0.042	-0.058	0.005	0.037	0.003	0.001	0.005	0.015	-0.984	-0.010	NA	NA
2% ⁽⁴⁾	0.925	0.907	0.923	0.720	0.670	1.128	1.145	0.928	-0.047	0.112	NA	NA
4%	0.911	0.927	0.923	0.779	0.712	1.444	1.163	0.920	-0.074	0.129	NA	NA
8%	0.897	0.948	0.908	0.783	0.741	1.130	1.153	0.905	-0.152	0.118	NA	NA
12%	0.884	0.965	0.899	0.799	0.765	1.085	1.117	0.890	-0.244	0.139	NA	NA
16%	0.885	0.991	0.952	0.027	1.425	0.463	1.007	0.871	-0.349	-0.019	0.165	0.138

- Note:
1. Strain readings were taken at zero load
 2. Strain readings were taken at 29.26 ksi unless otherwise noted.
 3. An error in test fixture was corrected; strain readings were taken at zero load.
 4. Strain readings were taken at 29.26 ksi after the error in test fixture was corrected.
 5. The specimen is 7075-T651 double-shear lap-joint specimen without interference, clamp-up, or sealant.
 6. The figures in the table are normalized with respect to remote stress.

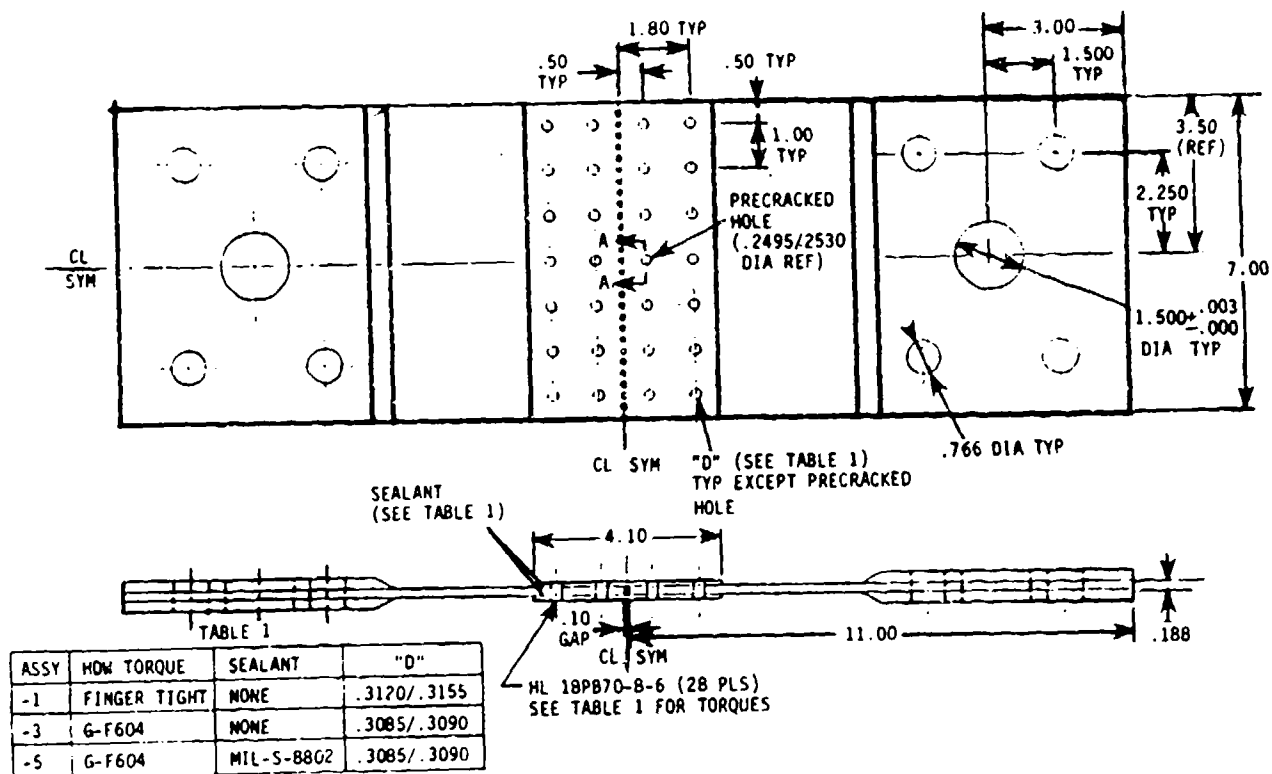


Figure 7-1. Double-Shear Lap-Joint Specimen Configuration (2024-T3XX)

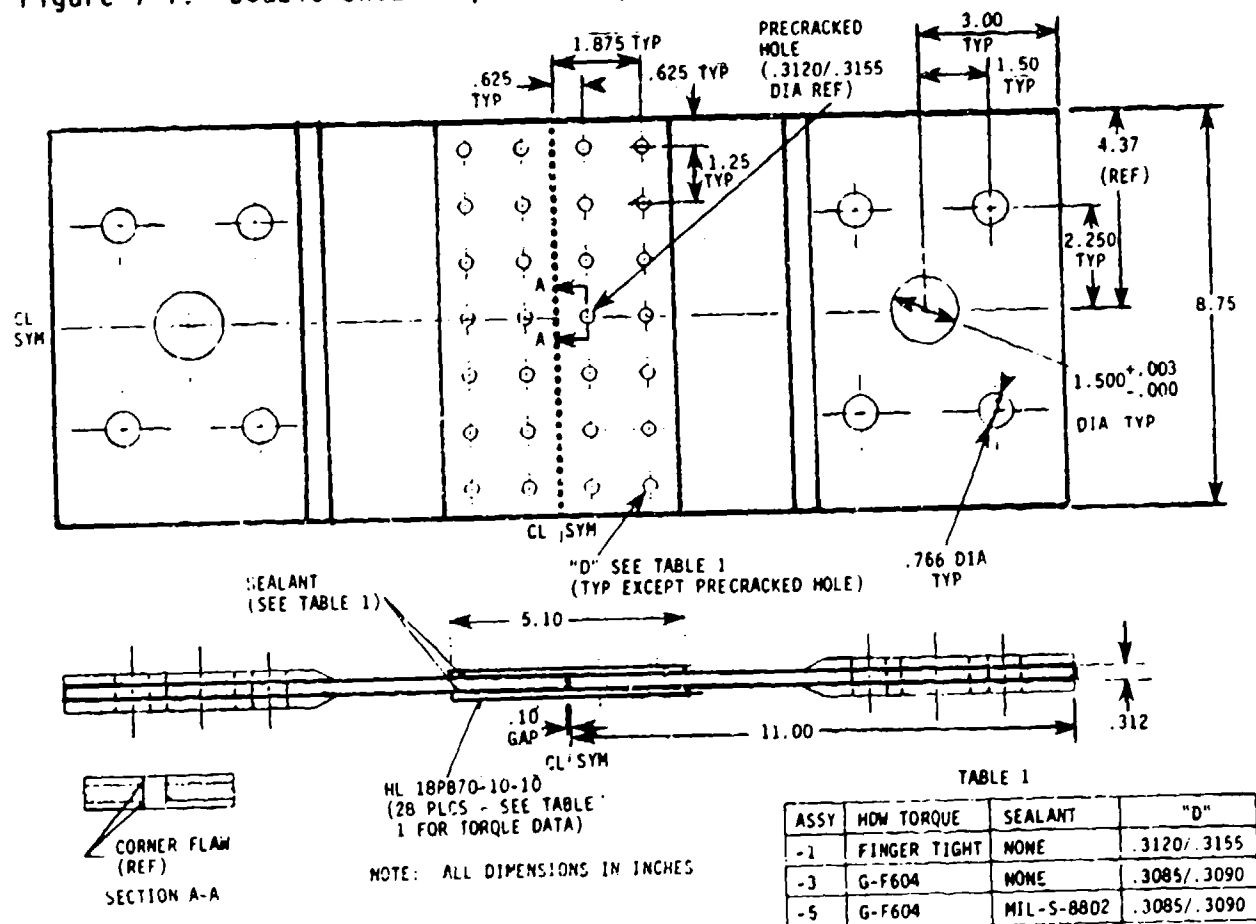


Figure 7-2. Double-Shear Lap-Joint Specimen Configuration (7075-T6XX)



Figure 7-3. Test Set-Up, Typical Double-Shear Lap-Joint Specimen

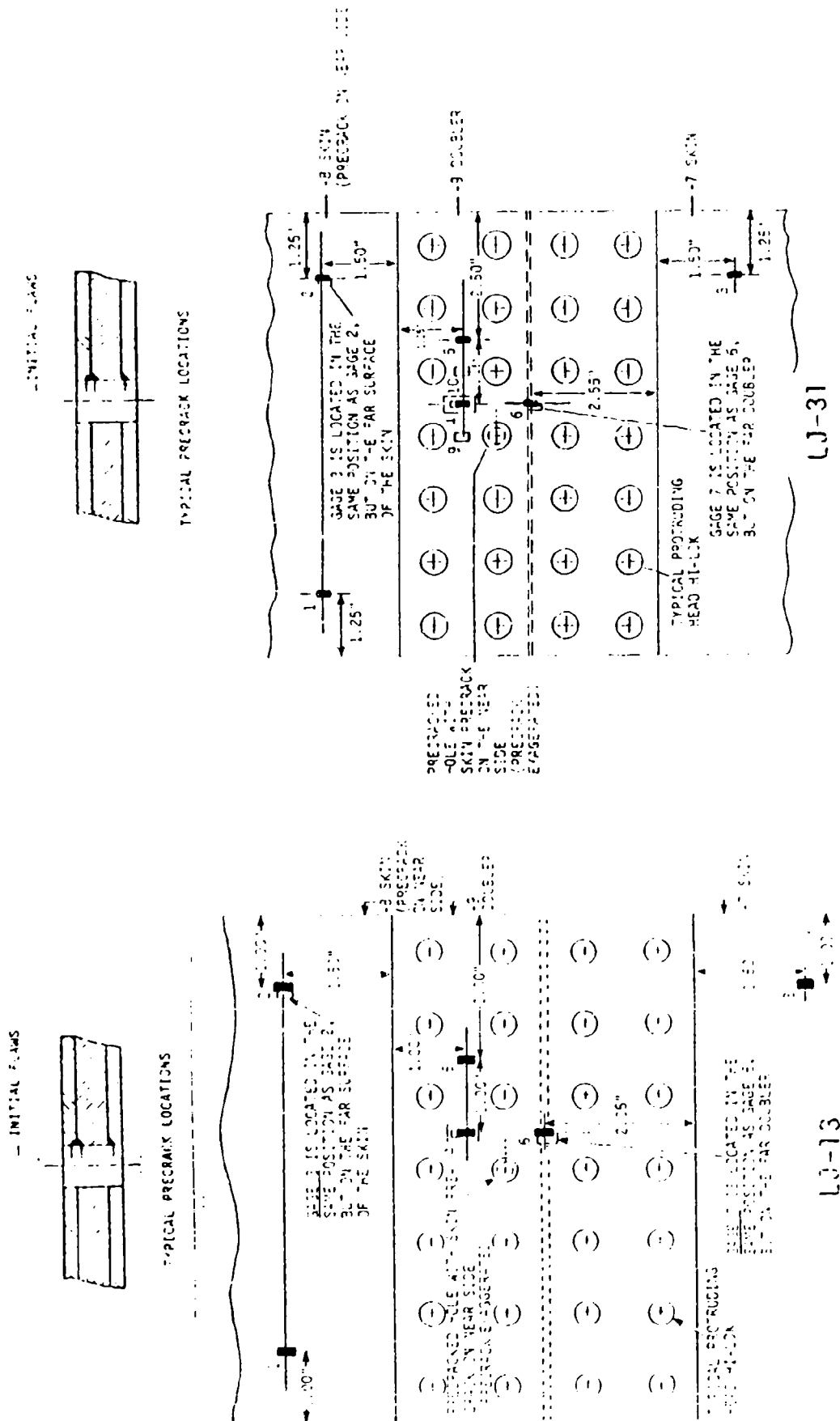


Figure 7-4. Strain Gage Locations Specimens LJ-13 and LJ-31

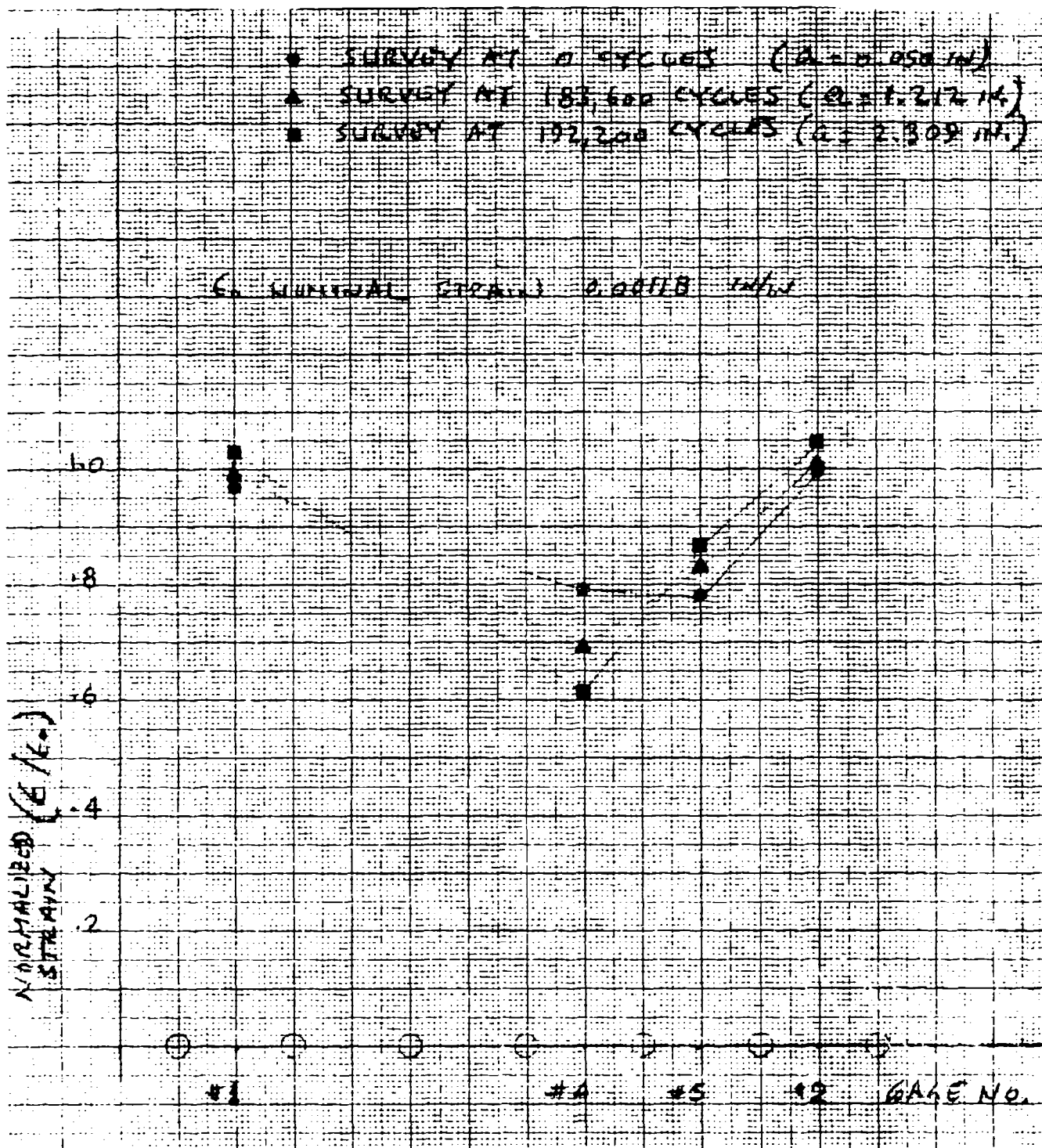
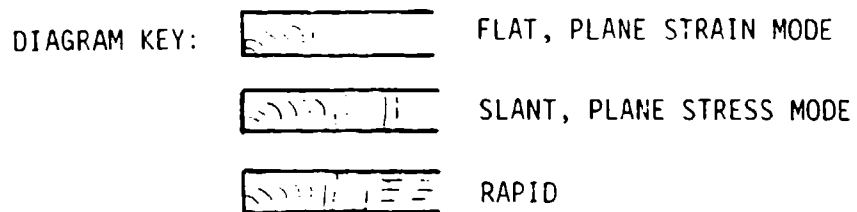


Figure 7-5. Strain Survey Double-Shear Lap-Joint Specimen LJ-13



NOTES: 1. 4 BAND-A-10 MARKERS SEEN AS INDICATED

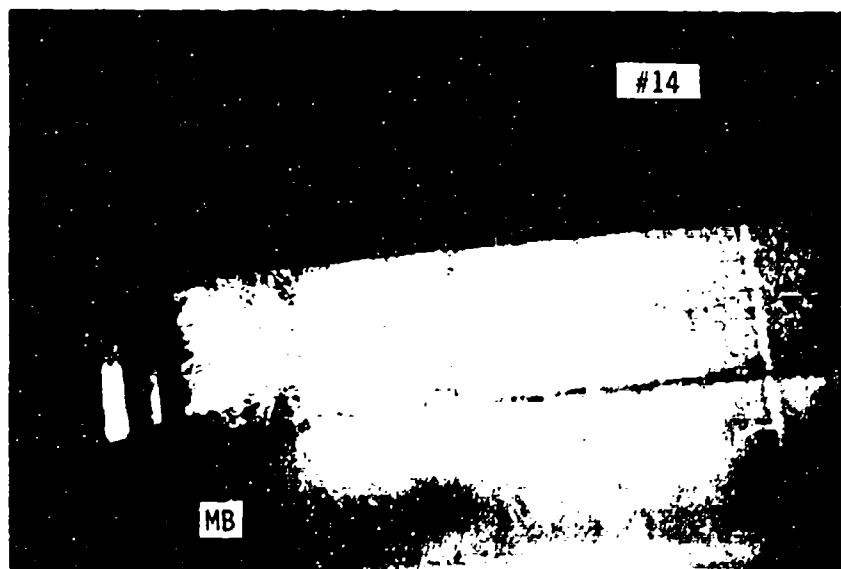
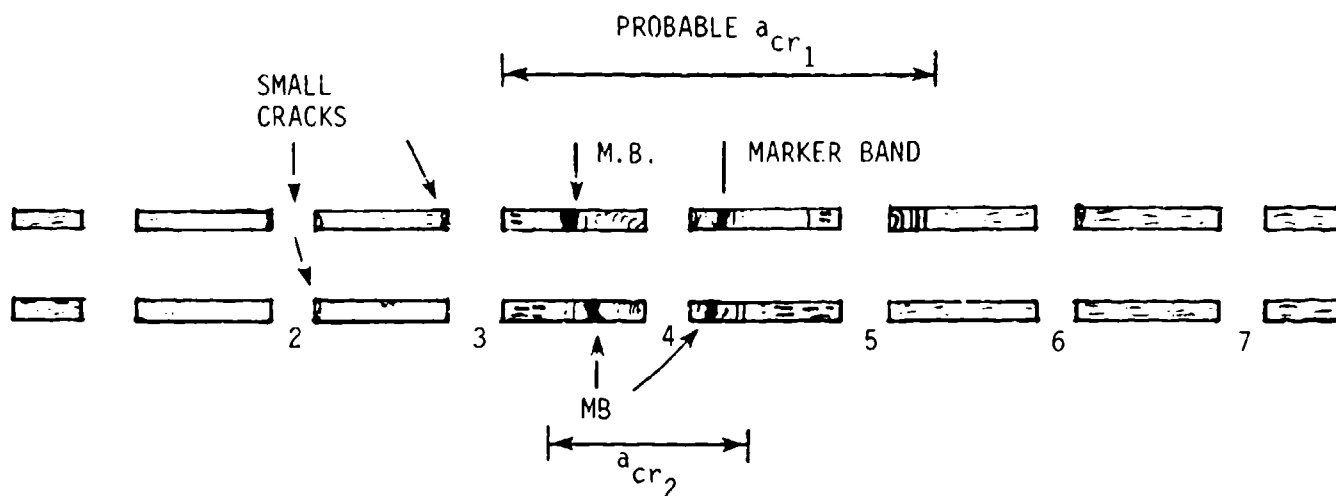
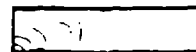


Figure 7-6. Fractographic Examination of Specimen LJ-19

DIAGRAM KEY:



FLAT, PLANE STRAIN MODE



SLANT, PLANE STRESS MODE



RAPID FRACTURE

NOTES: 1. NO UNUSUAL CONDITIONS

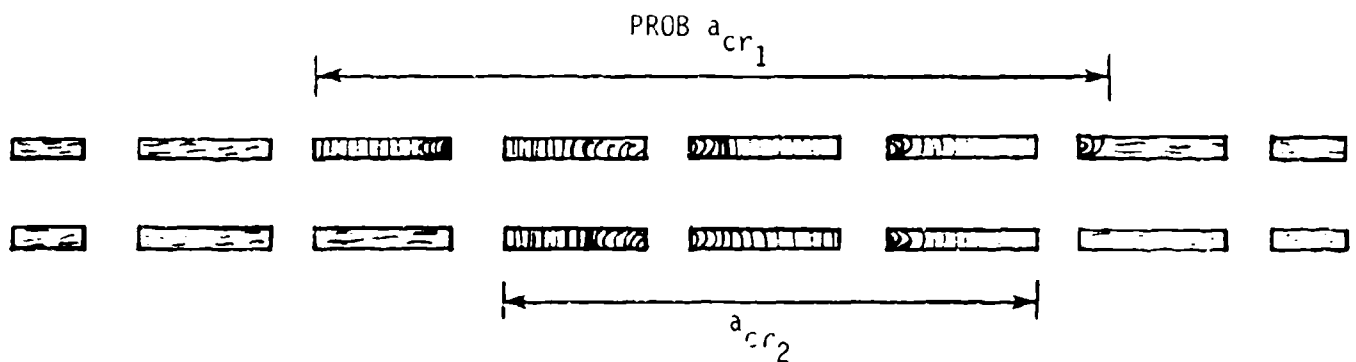


Figure 7-7. Fractographic Examination of Specimen LJ-21

NOTES: 7. REPEATED HIGH LOADS SAME AS MARKERS - SEE PHOTO

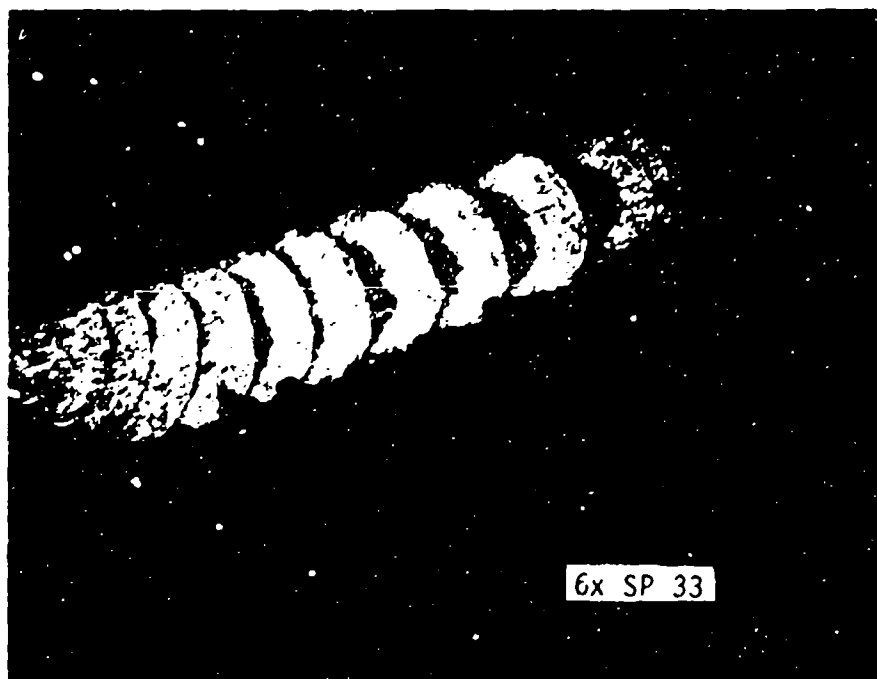
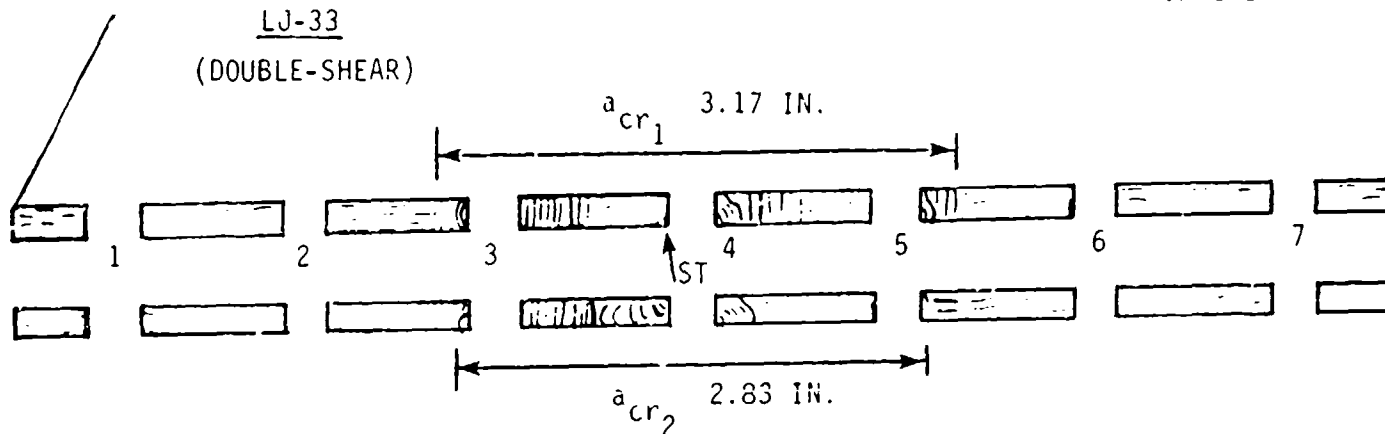
SPECIMEN

LJ-33

(DOUBLE-SHEAR)

REF. FIGURES

6-10 THROUGH 6-14



HOLE NO. 4

Figure 7-8. 6x Photo of Specimen LJ-33 Through Low-Power Microscope



Figure 7-9. 10x Photo of Specimen LJ-33 Through SEM

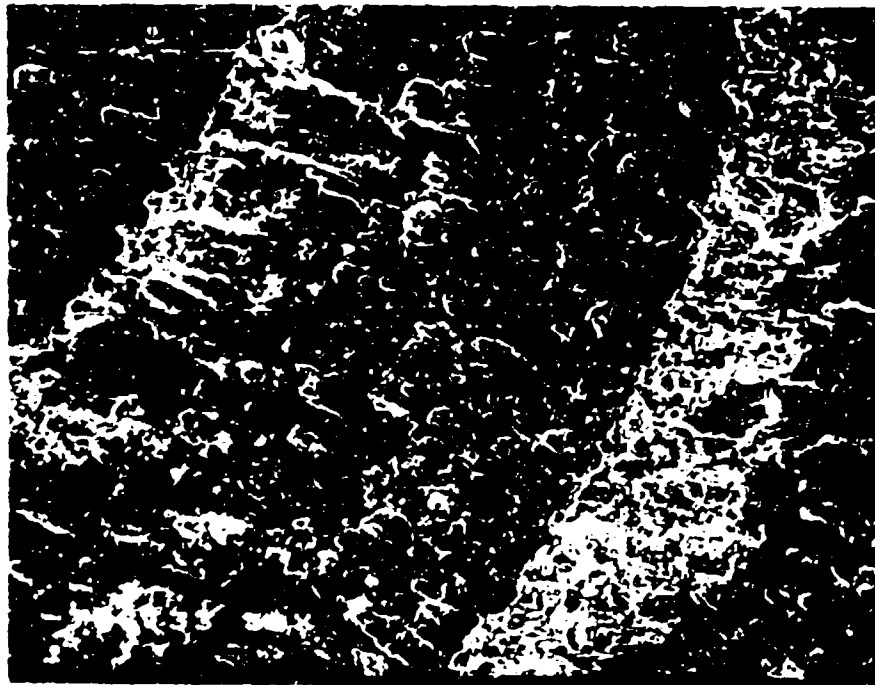


Figure 7-10. 50x Photo of Specimen LJ-33 Through SEM

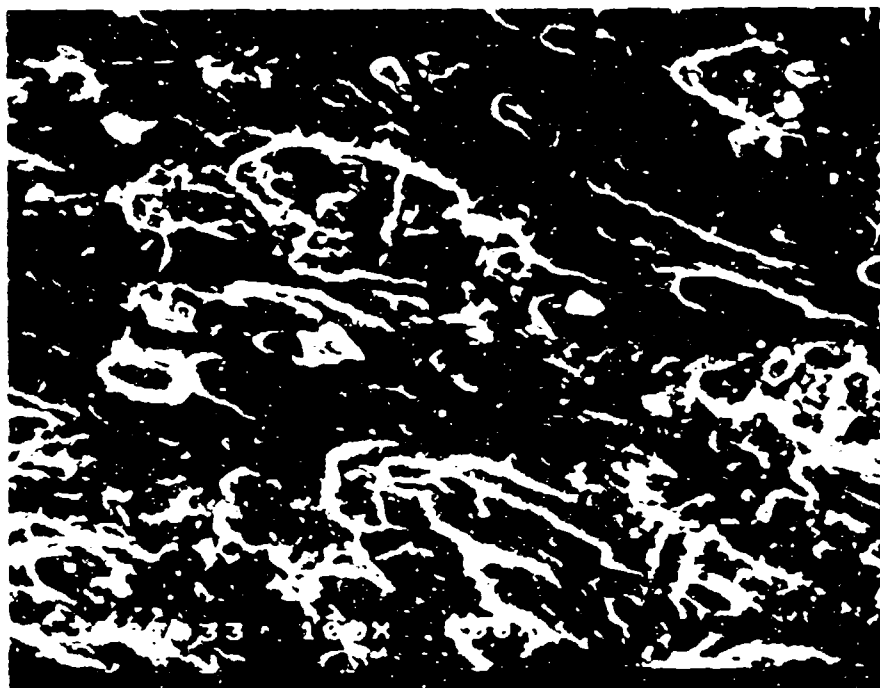


Figure 7-11. 300x Photo of Specimen LJ-33 Through SEM

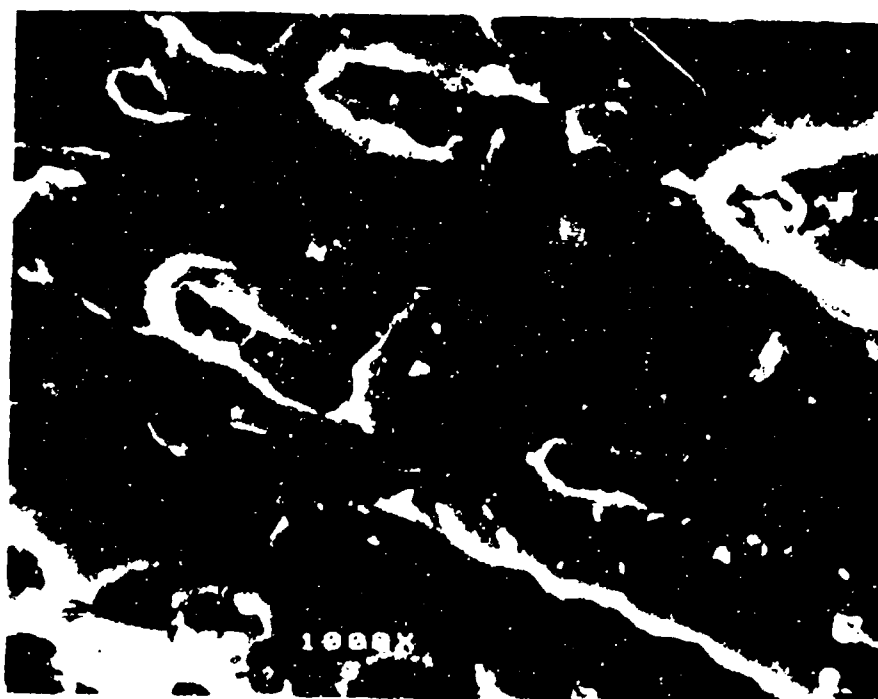


Figure 7-12. 1000x Photo of Specimen LJ-33 Through SEM

TABLE 7-3. CRACK MEASUREMENT OF SPECIMEN LJ-13

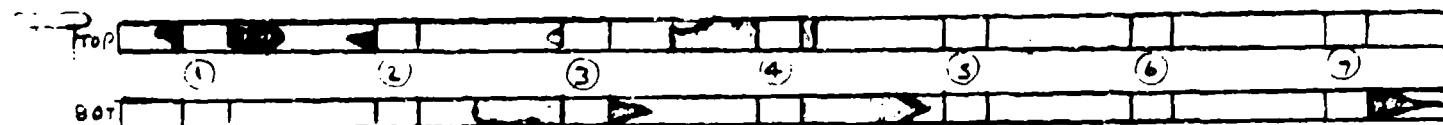
SAMPLE NUMBER:	13	CYCLES TO FAILURE:	210,300
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	16.581/5.922	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 7.5 Hz	HOLE DIAMETER:	0.250

CYCLES	DISTANCE FROM EDGE OF HOLE			
	FRONT		BACK	
	PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
0	0.000	0.000	0.000	0.000
75500	0.000	0.000	0.125	0.000
98000	0.000	0.000	0.222	0.000
106300	0.000	0.075	0.250	0.000
111900	0.000	0.112	?	0.000
130400	0.000	0.171	0.343	0.000
146000	0.000	0.176	0.434	0.000
160600	0.000	0.203	0.514	0.000
169800	0.000	0.237	0.631	0.236
173000	0.000	0.250	TNR	0.246
178300	0.000	0.353	Same	0.344
183600	0.000	?	Same	0.462
187500	0.000	0.394	Same	0.586
189900	0.000	TNR	Same	TNR#1
192200	0.000	Same	Same	1.559
197200	0.000	Same	1.056	TNR#2
210300	Failure		Failure	

* New crack at next rivet left side
Distance from edge of second rivet

189900	0.173
197200	0.214

TNR = Through Next Rivet



Fracture Surface Examination Specimen LJ-13

TABLE 7-4. CRACK MEASUREMENT OF SPECIMEN LJ-14

SAMPLE NUMBER:	14	CYCLES TO FAILURE:	217,800
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	16.581/5.922	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 7.5 Hz	HOLE DIAMETER:	FRONT 0.250 BACK 0.252

CYCLES	DISTANCE FROM EDGE OF HOLE			
	FRONT		BACK	
	PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
0	0.000	0.000	0.000	0.000
37200	0.000	0.000	0.097	0.000
39900	0.000	0.106	0.118	0.000
47900	0.000	0.135	0.137	0.000
58100	0.000	0.175	0.188	0.000
64400	0.000	0.187	0.211	0.000
84200	0.000	0.271	0.294	0.000
105700	0.000	0.367	0.405	0.000
120900	0.000	0.453	0.502	0.000
129100	0.000	0.515	0.580	0.000
133000	0.000	0.548	0.620	0.000
136300	0.000	0.574	0.658	0.000
138000	0.000	0.590	TNR	0.000
141600	0.000	0.630	Same	0.000
143800	0.000	0.674	Same	0.000
187000	0.000	TNR	Same	0.194
188200	0.000	Same	Same	0.227
189000	0.000	Same	1.141	0.242
190600	0.000	Same	1.181	0.275
192800	0.000	Same	1.218	0.318
194000	0.000	Same	1.256	0.347
195500	0.000	Same	1.297	0.384
196700	0.000	Same	1.322	0.416
198300	0.000	Same	1.364	0.467
199900	0.000	Same	1.428	0.523
201000	0.000	Same	1.471	0.575
202000	0.000	Same	1.497	0.680
202500	0.000	Same	1.592	TNR
203000	0.000	Same	TNR#2	Same
208300	0.000	Same	Same	1.178
208900	0.000	1.888	Same	1.243
209500	0.000	1.202	Same	1.298
210100	0.000	1.221	Same	1.351
210500	0.000	1.226	Same	1.404
211000	0.000	1.237	Same	1.472
211400	0.000	1.251	Same	1.551

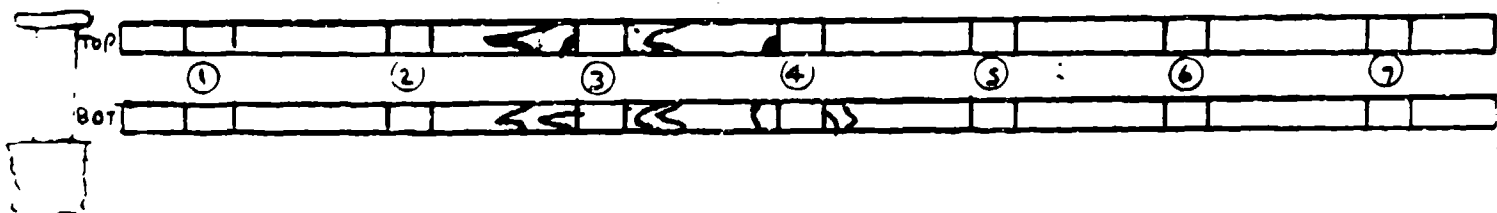
TNR - Through Next Rivet

TABLE 7-4. CRACK MEASUREMENT OF SPECIMEN LJ-14 (CONT.)

CYCLES	DISTANCE FROM EDGE OF HOLE			
	FRONT		BACK	
	PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
211600	0.000	1.255	Same	1.637
212000	0.000	0.000	Same	TRN#2
212500	0.000	1.288	2.229	Same
212900	0.000	1.305	2.314	Same
213300	0.000	1.316	2.453	Same
213600	0.000	1.332	2.605	Same
213700	0.000	0.000	TNR#3	Same
215300	0.000	1.425	Same	Same
215600	No crack	1.504	TPE	Same
216000	No crack	1.632	TPE	Same
216900	0.320	TRN#2	TPE	Same
217200	0.448	Same	TPE	2.333
217400	0.566	Same	TPE	TNR#
217800	Failure	Failure	Failure	Failure

TNR = Through Next Rivet

TPE = To Panel Edge

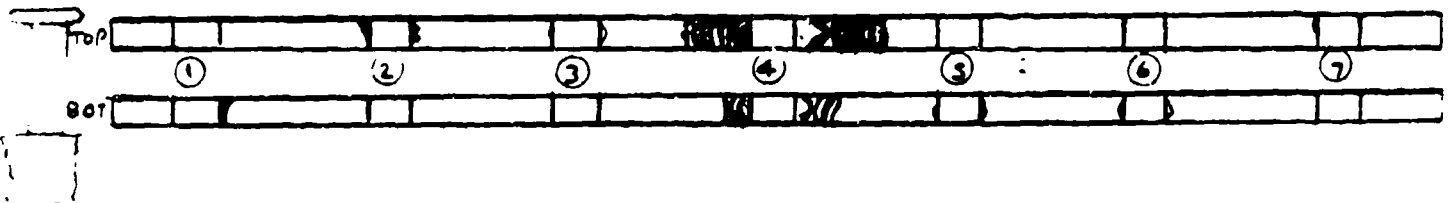


Fracture Surface Examination Specimen LJ-14

TABLE 7-5. CRACK MEASUREMENT OF SPECIMEN LJ-15

SAMPLE NUMBER:	15	CYCLES TO FAILURE:	42,008
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	21.35
MAX LOAD (KIPS):	49,700	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER: FRONT	0.254
		BACK	0.252

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE	
		FRONT PRE-CRACK HOLE <u>RIGHT</u>	BACK PRE-CRACK HOLE LEFT
0	0	0	0
1	4	0	0
2	8	.099	.002
3	12	.116	.125
4	16	.133	.159
5	20	.154	.235
	21.35	Failure	Failure



Fracture Surface Examination Specimen LJ-15

TABLE 7-6. CRACK MEASUREMENT OF SPECIMEN LJ-16

SAMPLE NUMBER:	16	CYCLES TO FAILURE:	36,362
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	18.0
MAX LOAD (KIPS):	49,700	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER:	0.254

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT	PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	4	0.000	0.007	0.087	0.000
2	8	0.000	0.114	0.118	0.000
2.45	9.8	0.000	0.130	0.132	0.000
3	12	0.000	0.146	0.153	0.069
4	16	0.000	0.191	0.222	0.097
4.4	17.6	0.081	0.279	0.42	0.309
4.59	18.36	0.196	0.425	TNR	TNR
4.63	18.52	Failure	Failure	Failure	Failure

TNR = Through Next Rivet



Fracture Surface Examination Specimen LJ-16

TABLE 7-7. CRACK MEASUREMENT OF SPECIMEN LJ-17

SAMPLE NUMBER:	17	CYCLES TO FAILURE:	2.35 x 10 ⁶
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	
MAX LOAD (KIPS):	16.5/5.9	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 7.5 Hz	HOLE DIAMETER: FRONT	0.251
		BACK	0.252

TNR = Through Next Rivet

CYCLES	DISTANCE FROM EDGE OF HOLE			
	FRONT		BACK	
	PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
2024100	0.000	0.000	0.111	0.000
38700	0.000	0.000	0.210	0.000
48100	0.000	0.000	0.310	0.000
52700	0.000	0.095	0.363	0.000
60200	0.000	0.105	0.459	0.000
71700	0.000	0.231	0.668	0.000
2082800	0.000	0.341	TNR	0.000
2092400	0.000	0.459	Same	0.000
2100000	0.000	0.554	Same	0.000
2105600	0.000	0.653	Same	0.000
2121500	0.000	TNR	Same	0.000
2129900	0.000	Same	Same	0.260
133200	0.000	Same	Same	0.350
137500	0.000	Same	Same	0.490
139700	0.000	Same	Same	0.621
144300	0.133	Same	Same	TNR
2147500	0.216	Same	Same	Same
2151100	0.318	Same	Same	Same
2155400	0.438	Same	Same	Same
2158200	0.562	Same	Same	Same
2159900	TNR	Same	Same	Same
2314600	Same	1.173	Same	Same
2318300	Same	1.279	Same	Same
2322600	Same	1.373	Same	Same
2326400	Same	1.485	Same	Same
328800	Same	1.592	Same	Same
329700	Same	1.672	Same	Same
330200	Same	TNR#2	Same	Same
335000	Same	Same	Same	1.121
340800	Same	Same	Same	1.320
343400	Same	Same	Same	1.629
346100	Same	Same	Same	1.820
347700	Same	Same	Same	1.996
348600	Same	Same	Same	2.269
349000	Same	Same	Same	2.517
349400	Same	Same	Same	3.116
2351600	Failure		Failure	



Fracture Surface Examination Specimen LJ-17

TABLE 7-8. CRACK MEASUREMENT OF SPECIMEN LJ-18

SAMPLE NUMBER:	18	CYCLES TO FAILURE:	See Note 2
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE	NA
MAX LOAD (KIPS):	16.581/5.922	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 7.5 Hz	HOLE DIAMETER:	FRONT 0.248 BACK 0.251

CYCLES	DISTANCE FROM EDGE OF HOLE			
	FRONT		BACK	
	PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
145700	0.000	0.000	0.124	0.000
170800	0.000	0.000	0.174	0.000
208000	0.000	0.000	0.238	0.000
220400	0.000	0.000	0.274	0.000
241000	0.000	0.000	0.324	0.000
261900	0.000	0.000	0.382	0.000
277800	0.000	0.000	0.431	0.000
289800	0.000	0.000	0.481	0.000
334600	0.000	0.000	0.677	0.000

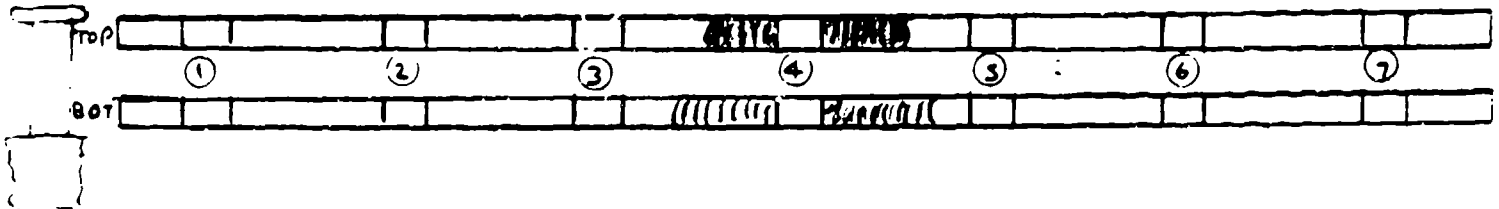
1. Crack broke to next rivet and arrested.
2. Test was terminated after 2.08×10^6 cycles.
3. Crack on front did not grow. Crack on back did not grow past the next rivet.

TABLE 7-9. CRACK MEASUREMENT OF SPECIMEN LJ-19

SAMPLE NUMBER:	19	CYCLES TO FAILURE:	171,714
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	84.0
MAX LOAD (KIPS):	49,700	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER:	FRONT 0.252 BACK 0.250

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
0	4	0.000	0.000	0.000	0.000
2	8	0.000	0.000	0.000	0.000
3	12	0.000	0.000	0.000	0.000
4	16	0.000	0.000	0.000	0.000
5	20	0.000	0.000	0.000	0.000
6	24	0.000	0.105	0.092	0.000
7	28	0.000	0.110	0.090	0.000
8	32	0.000	0.124	0.103	0.000
9	36	0.000	0.139	0.109	0.000
10	44	0.000	0.158	0.127	0.000
11	48	0.000	0.159	0.133	0.000
12	52	0.000	0.175	0.144	0.000
13	56	0.000	0.184	0.145	0.000
14	60	0.000	0.201	0.158	0.000
15	64	0.000	0.215	0.1711	0.000
16	68	0.000	0.236	0.182	0.000
17	72	0.000	0.270	0.192	0.000
17.40	73.6	0.000	0.289	0.207	0.000
18	76	0.130	0.313	0.218	0.000
19	80	0.169	0.354	0.239	0.000
20	84	0.242	0.432	0.274	0.102
21	88	TNR	TNR	0.435	0.270
21.02	88.08	Failure	Failure	Failure	Failure

TNR = Through Next Rivet



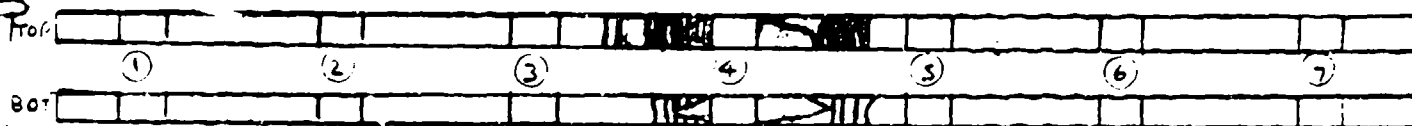
Fracture Surface Examination Specimen LJ-19

TABLE 7-10. CRACK MEASUREMENT OF SPECIMEN LJ-20

SAMPLE NUMBER:	20	CYCLES TO FAILURE:	179,255
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	95.6
MAX LOAD (KIPS):	49,700	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER: FRONT	0.252
		BACK	0.251

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT	PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	4	0.000	0.000	0.000	0.000
3	8	0.000	0.000	0.000	0.000
4	12	0.000	0.000	0.000	0.000
5	20	0.000	0.092	0.080	0.000
6	24	0.000	0.101	0.086	0.000
7	28	0.000	0.109	0.100	0.000
8	32	0.000	0.119	0.105	0.000
9	36	0.000	0.131	0.128	0.000
10	40	0.000	0.151	0.141	0.000
11	44	0.000	0.158	0.152	0.000
12	48	0.000	0.165	0.159	0.000
13	52	0.000	0.174	0.160	0.000
14	56	0.000	0.180	0.176	0.000
15	60	0.000	0.189	0.192	0.000
16	64	0.000	0.200	0.204	0.000
17	68	0.000	0.215	0.222	0.000
18	72	0.000	0.228	0.232	0.000
18.87	75.48	0.000	0.241	0.262	0.092
20	80	0.000	0.251	0.292	0.122
21	84	0.085	0.287	0.327	0.152
22	88	0.146	0.326	0.385	0.206
23	92	0.231	0.436	0.530	0.347
23.21	92.84	Failure	Failure	Failure	Failure

TNR = Through Next Rivet

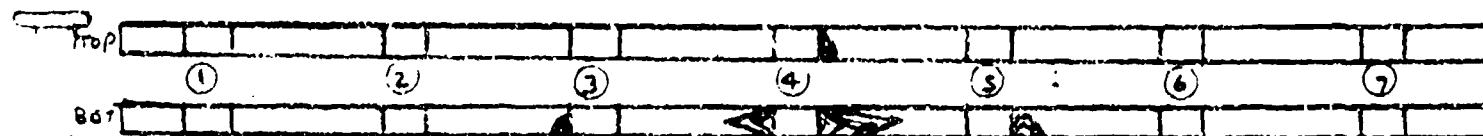


Fracture Surface Examination Specimen LJ-20

TABLE 7-11. CRACK MEASUREMENT OF SPECIMEN LJ-21

SAMPLE NUMBER:	21	CYCLES TO FAILURE:	129300
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	NA
MAX LOAD (KIPS):	22.4/2.2	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	CA 5 Hz	HOLE DIAMETER:	FRONT 0.251 BACK 0.251

CYCLES	DISTANCE FROM EDGE OF HOLE			
	FRONT		BACK	
	PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT	PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT
0	0.000	0.000	0.000	0.000
16400	0.000	0.102	0.000	0.000
20800	0.000	0.141	0.000	0.000
26500	0.000	0.197	0.000	0.000
31600	0.000	0.239	0.129	0.000
37700	0.000	0.317	0.166	0.000
45600	0.000	0.418	0.257	0.000
52500	0.094	0.534	0.332	0.000
57100	0.184	0.653	0.375	0.000
60900	0.309	TNR	0.445	0.000
64400	0.441	Same	0.499	0.000
67200	0.578	Same	0.562	0.000
69800	TNR	Same	0.677	0.000
74500	Same	Same	TNR	0.000
93900	Same	Same	Same	0.098
96000	Same	Same	Same	0.196
98200	Same	Same	Same	0.296
100100	Same	Same	Same	0.390
102500	Same	Same	Same	0.559
103200	Same	Same	Same	0.668
103500	Same	Same	Same	TNR
115300	Same	Same	Same	1.275
116600	Same	Same	Same	1.374
117600	Same	Same	Same	1.477
118300	Same	Same	Same	1.576
118600	Same	Same	Same	Same
119000	Same	Same	1.173	Same
120300	Same	Same	1.271	Same
121500	Same	Same	1.372	Same
122400	Same	Same	1.472	Same
123100	Same	Same	1.581	Same
123500	Same	Same	TNR#2	Same
125700	Same	1.181	Same	Same
126600	Same	1.310	Same	Same
127200	Same	1.410	Same	Same
127600	Same	1.508	Same	Same
127900	Same	1.622	Same	Same
128000	Same	TNR#2	Same	Same
128800	Same	Same	2.226	Same
129200	Same	Same	2.489	Same
129300	Failure		Failure	

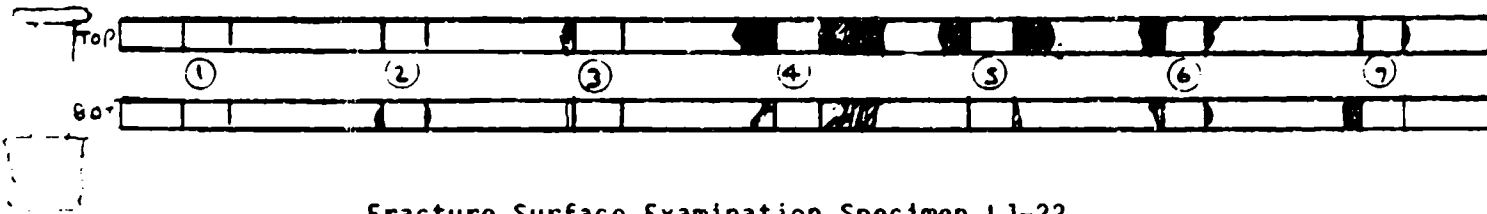


Fracture Surface Examination Specimen LJ-21

TABLE 7-12. CRACK MEASUREMENT OF SPECIMEN LJ-22

SAMPLE NUMBER:	22	CYCLES TO FAILURE:	62,240
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	31.92
MAX LOAD (KIPS):	49,700	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 3 Hz	HOLE DIAMETER:	FRONT 0.251 BACK 0.253

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK HOLE LEFT	RIGHT	PRE-CRACK HOLE LEFT	RIGHT
0	0	0.000	0.000	0.000	0.000
1	4	0.000	0.000	0.000	0.000
2	8	0.000	0.000	0.000	0.000
3	12	0.000	0.000	0.073	0.000
4	16	0.000	0.102	0.114	0.000
5	20	0.000	0.106	0.130	0.000
6	24	0.000	0.133	0.152	0.000
7	28	0.000	0.152	0.190	0.000
7.98	31.92	Failure	Failure	Failure	Failure



Fracture Surface Examination Specimen LJ-22

TABLE 7-13. CRACK MEASUREMENT OF SPECIMEN LJ-23

SAMPLE NUMBER:	23	CYCLES TO FAILURE:	172,005
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	89.08
MAX LOAD (KIPS):	49,700	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 4 Hz	HOLE DIAMETER:	FRONT 0.251 BACK 0.252

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	4	0.000	0.000	0.000	0.000
2	8	0.000	0.000	0.000	0.000
3	12	0.000	0.000	0.000	0.000
4	16	0.000	0.000	0.000	0.000
5	20	0.000	0.096	0.000	0.000
6	24	0.000	0.110	0.000	0.000
7	28	0.000	0.111	0.000	0.000
8	32	0.000	0.122	0.000	0.000
9	36	0.000	0.134	0.000	0.000
10	40	0.000	0.143	0.000	0.000
11	44	0.000	0.149	0.081	0.000
12	48	0.000	0.161	0.094	0.000
13	52	0.000	0.168	0.108	0.000
14	56	0.000	0.177	0.116	0.000
15	60	0.000	0.189	0.136	0.000
16	64	0.000	0.200	0.149	0.000
17	68	0.000	0.205	0.169	0.090
18	72	0.000	0.222	0.190	0.120
19	76	0.000	0.237	0.209	0.134
20	80	0.000	0.262	0.244	0.163
21	84	0.103	0.301	0.296	0.215
22	88	0.202	0.380	0.417	0.347
22.29	89.16	Failure	Failure	Failure	Failure

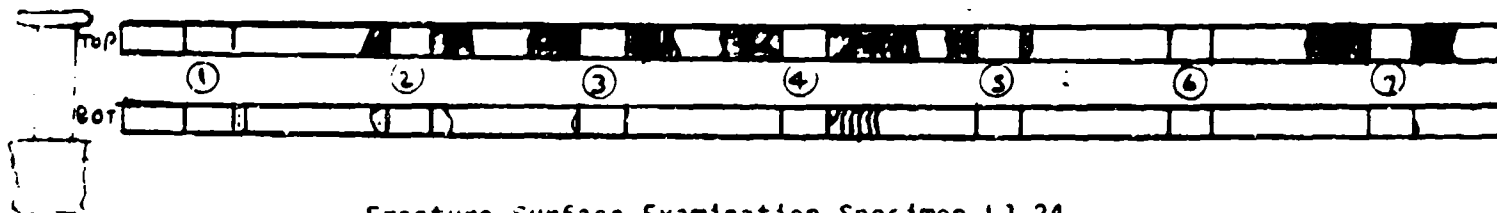


Fracture Surface Examination Specimen LJ-23

TABLE 7-14. CRACK MEASUREMENT OF SPECIMEN LJ-24

SAMPLE NUMBER:	24	CYCLES TO FAILURE:	86,871
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	44.72
MAX LOAD (KIPS):	49,700	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	A-10 4 Hz	HOLE DIAMETER:	FRONT 0.251 BACK 0.251

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	4	0.000	0.000	0.000	0.000
2	8	0.000	0.000	0.000	0.000
3	12	0.000	0.097	0.000	0.000
4	16	0.000	?	0.000	0.000
5	20	0.000	0.103	0.118	0.000
6	24	0.000	0.105	0.131	0.000
7	28	0.000	0.126	0.140	0.000
8	32	0.000	0.142	0.155	0.000
9	36	0.000	0.149	0.173	0.000
10	40	0.000	0.166	0.210	0.000
11	44	0.000	0.180	0.272	0.137
11.19	44.72	Failure	Failure	Failure	Failure



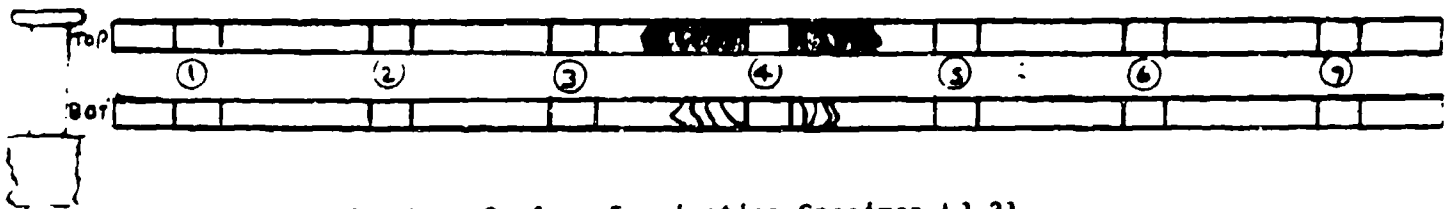
Fracture Surface Examination Specimen LJ-24

TABLE 7-15. CRACK MEASUREMENT OF SPECIMEN LJ-31

SAMPLE NUMBER:	31	CYCLES TO FAILURE:	47,637
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	32.47
MAX LOAD (KIPS):	103,200	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 3 Hz	HOLE DIAMETER:	FRONT 0.314 BACK 0.312

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT	PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	7.84	0.000	0.000	0.000	0.000
2	15.68	0.165	0.000	0.000	0.138
3	23.52	0.298	0.000	0.000	0.226
4	31.37	TNR	TNR	0.113	0.348
4.14	32.47	Failure	Failure	Failure	Failure

TNR = Through Next Rivet

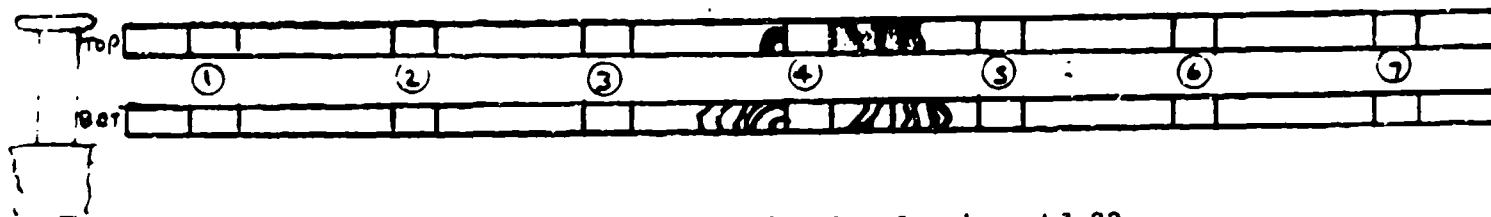


Fracture Surface Examination Specimen LJ-31

TABLE 7-16. CRACK MEASUREMENT OF SPECIMEN LJ-32

SAMPLE NUMBER:	32	CYCLES TO FAILURE:	45,860
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	31.25
MAX LOAD (KIPS):	103,200	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 4 Hz	HOLE DIAMETER: FRONT	0.312
		BACK	0.313

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK	HOLE	PRE-CRACK	HOLE
		LEFT	RIGHT	LEFT	RIGHT
0	0	0.000	0.000	0.000	0.000
1	7.84	0.000	0.000	0.000	0.000
2	15.68	0.184	0.000	0.000	0.000
3	23.52	0.335	0.160	0.0000	0.000
3.986	31.25	Failure	Failure	Failure	Failure



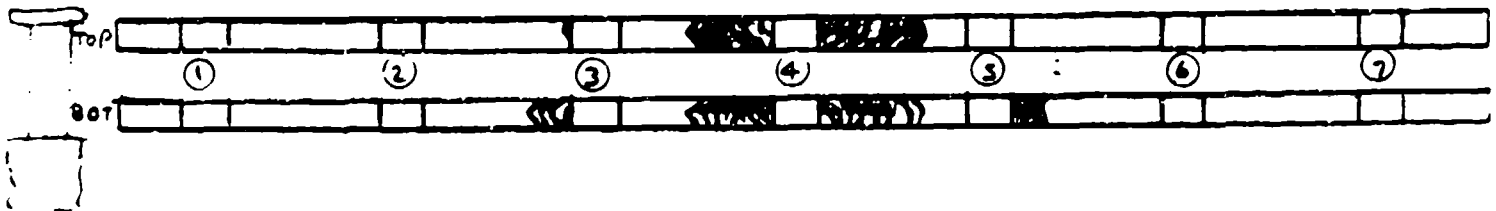
Fracture Surface Examination Specimen LJ-32

TABLE 7-17. CRACK MEASUREMENT OF SPECIMEN LJ-33

SAMPLE NUMBER:	33	CYCLES TO FAILURE:	135,597
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	92.45
MAX LOAD (KIPS):	103,200	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 4 Hz	HOLE DIAMETER: FRONT	0.311
		BACK	0.313

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	7.84	0.000	0.000	0.000	0.000
2	15.68	0.000	0.000	0.000	0.000
3	23.52	0.000	0.000	0.000	0.000
4	31.37	0.000	0.156	0.102	0.000
5	39.21	0.000	0.198	0.159	0.000
6	47.05	0.000	0.261	0.206	0.000
7	54.89	0.000	0.321	0.262	0.000
8	62.73	0.000	0.388	0.331	0.000
9	70.58	0.000	0.466	0.406	0.000
10	78.42	0.000	0.613	0.520	0.200
10.85	85.08	TNR	TNR	TNR	TNR
11	86.26	Same	Same	Same	Same
11.79	92.45	Failure	Failure	Failure	Failure

TNR = Through Next Rivet



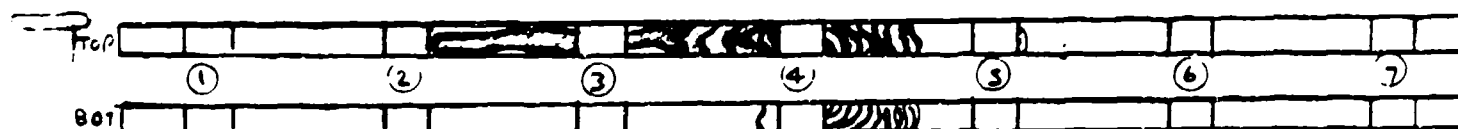
Fracture Surface Examination Specimen LJ-33

TABLE 7-18. CRACK MEASUREMENT OF SPECIMEN LJ-34

SAMPLE NUMBER:	34	CYCLES TO FAILURE:	162,237
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	110.49
MAX LOAD (KIPS):	103,200	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 7 Hz	HOLE DIAMETER:	FRONT 0.313 BACK 0.315

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT	PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	7.84	0.000	0.000	0.000	0.000
2	15.68	0.000	0.000	0.000	0.000
3	23.52	0.000	0.000	0.000	0.000
4	31.37	0.000	0.000	0.156	0.000
5	39.21	0.000	0.0000	0.195	0.000
6	47.05	0.000	0.146	0.238	0.000
7	54.89	0.000	0.185	0.300	0.000
8	62.73	0.000	0.224	0.350	0.000
9	70.58	0.000	0.261	0.433	0.000
10	78.42	0.000	0.304	0.497	0.000
11	86.26	0.000	0.344	TNR	0.333
12	94.10	0.000	0.418	Same	TNR
13	101.94	0.000	0.512	Same	Same
14	109.79	TNR	TNR	TNR#2	Same
14.03	110.00	Same	Same	Same	TNR#2
14.09	110.49	Failure	Failure	Failure	Failure

TNR = Through Next Rivet



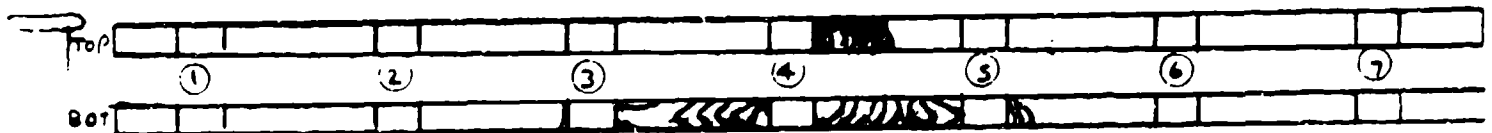
Fracture Surface Examination Specimen LJ-34

TABLE 7-19. CRACK MEASUREMENT OF SPECIMEN LJ-35

SAMPLE NUMBER:	35	CYCLES TO FAILURE:	103,461
SPECIMEN TYPE:	DOUBLE LAP JOINT	% OF LIFE AT FAILURE:	70.50
MAX LOAD (KIPS):	103,200	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 7 Hz	HOLE DIAMETER:	FRONT 0.313 BACK 0.315

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK LEFT	HOLE RIGHT	PRE-CRACK LEFT	HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	7.84	0.000	0.000	0.000	0.000
2	15.68	0.000	0.000	0.000	0.000
3	23.52	0.000	0.000	0.000	0.000
4	31.37	0.143	0.000	0.000	0.207
5	39.21	0.191	0.000	0.000	0.281
6	47.05	0.238	0.000	0.000	0.374
7	54.89	0.286	0.000	0.000	0.508
8	62.74	0.364	0.000	TNR	TNR
8.99	70.50	Failure	Failure	Failure	Failure

TNR = Through Next Rivet



Fracture Surface Examination Specimen LJ-35

TABLE 7-20. CRACK MEASUREMENT OF SPECIMEN LJ-36

SAMPLE NUMBER:	36	CYCLES TO FAILURE:	137,937
SPECIMEN TYPE:	SINGLE LAP JOINT	% OF LIFE AT FAILURE:	94.02
MAX LOAD (KIPS):	103,200	FINAL CRACK LENGTH:	
SPECTRUM TYPE:	AMAVS 5 Hz	HOLE DIAMETER:	FRONT 0.314 BACK 0.311

PASS	% OF LIFE	DISTANCE FROM EDGE OF HOLE			
		FRONT		BACK	
		PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT	PRE-CRACK HOLE LEFT	PRE-CRACK HOLE RIGHT
0	0	0.000	0.000	0.000	0.000
1	7.84	0.000	0.000	0.000	0.000
2	15.68	0.000	0.000	0.000	0.000
3	23.52	0.108	0.000	0.000	0.000
4	31.37	0.163	0.000	0.000	0.127
5	39.21	0.221	0.000	0.000	0.185
6	47.05	0.267	0.000	0.000	0.216
7	54.89	0.332	0.000	0.000	0.273
8	62.73	0.406	0.000	0.000	0.348
9	70.58	0.542	0.000	0.000	0.433
10	78.42	TNR	0.000	0.000	0.590
11	86.26	Same	0.230	0.088	TNR
11.99	94.02	Failure	Failure	Failure	Failure

TNR = Through Next Rivet



Fracture Surface Examination Specimen LJ-36

8.0 STRINGER REINFORCED SPECIMENS TEST PROGRAM

The purpose of the stringer reinforced test program was to access the state-of-the-art analytical capabilities in predicting crack growth life of specimen configurations typical to that which exist in aircraft.

8.1 TEST SPECIMENS

A total of thirty-six (36) stringer-reinforced specimens were tested. The specimens were made of 2024-T3XX and 7075-T6XX aluminum alloy representative of materials used in the lower wing cover of fighter/trainer and bomber/cargo type aircrafts, respectively. Four (4) specimen configurations were tested, including (Ref. Table 8-1):

- a. Continuous skin, center 'TEE' stringer.
- b. Split skin, center 'TEE' stringer.
- c. Continuous skin, center 'L' stringer.
- d. Continuous skin, edge 'L' stringer.

A photo of specimens No. GT221K0011-7A and -5B are shown in Figure 8-1. Cross section illustration of each of the specimens is shown in Figure 8-2 through 8-7. All specimens contained an initial flaw ($a = 0.050$ in.) located at the edge of an attachment hole. The specimens were precracked prior to assembly. The initial flaw was introduced by means of a saw-cut, followed by the application of a constant amplitude load spectrum. The magnitude of the load did not exceed 40% of the yield stress of the material. The specimens were then assembled. The precracked holes had always clearance fit hardware with no clamp-up. The adjacent holes had interference fit hardware and the appropriate clamp-up.

8.2 TEST DESCRIPTION

The stringer reinforced specimens were tested using a MTS, hydraulic computer controlled testing machine. Anti-buckling plates were installed on both sides of the specimens to prevent lateral instability during compressive loading. The testing was performed at the University of Dayton Research Center in a Lab-Air environment and a loading frequency of 3 Hz. Measurements of crack length vs. number of cycles were recorded. Using optical means (Table 8-3 through 8-44), a strain survey were taken before and during the tests (Ref. Tables 8-6, 8-17, 8-25, 8-31, 8-36 and 8-41).

8.3 LOADING SPECTRA

The stringer reinforced specimens were subjected to either a constant amplitude loading or a flight-by-flight loading. The flight-by-flight loading included the A-10A and the AMAVS randomized loading spectra. The maximum and the minimum stress levels are given in Table 8-2. Marker band cycles were included in the A-10A and the AMAVS loading spectra (Ref. Volume III).

8.4 TEST RESULTS

The test results obtained from thirty-six (36) stringer reinforced specimens are presented in Table 8-2. In general, the test results show wider scatter in number of cycles to failure than those obtained from the lap-joint specimens. This may be attributed to the geometrical complexity of the stringer-reinforced specimens. Table 8-2 contains critical crack length measurements taken during the test as well as the crack length measured after specimen failure. In some instances there is a wide variation between the two sets of measurements. The individual crack length data and strain survey of specimens No. 40, 50 and 56 are presented in Tables 8-3 through 8-44.

8.4.1 Test Results of Specimens Subjected to A-10A Loading Spectrum

The test results obtained from twelve (12) stringer-reinforced specimens subjected to an A-10A loading spectrum, indicate a substantially higher life for L-center stringer specimen than the T-center or the L-edge specimens. This may be attributed to the relative cross sectional area of the stringer section to the specimen section. The above ratio for the T-center and the L-edge specimens are approximately 20%, while the L-center is 10%. Therefore, the failure of the stringer in the case of the L-center contributed less in stress rise than the other two cases. The lowest life was obtained from the L-edge specimen. This may be attributed to the eccentricity of the load distribution that causes uneven load distribution along the specimen cross section. The scatter in the total life for the L-edge type specimen was the worst of the three. Specimen No. 55 failed at 100,823 cycles vs. 160,900 cycles for specimen 56. The reason of the relatively large deviation in crack growth life between specimen No. 55 and specimen No. 56 was attributed to unintentionally extra drilled 0.125 in. diameter hole located at the fracture surface (Figure 8-10). A clear marking of crack initiation may be seen at the drilled hole.

The critical crack length exhibited a similar trend. For the L-center specimens (average of 4 specimens) the critical crack length was 8.4 in., compared with 4.6 in. and 3.67 in. for the T-center and L-edge specimens, respectively.

A strain survey of specimens 40, 50 and 56, indicate fairly uniform stress distribution until stringer failure. The strain surveys are presented in Tables 8-6, 8-17 and 8-24, respectively.

8.4.2 Test Results of Specimens Subjected to AMAVS Loading Spectrum

The test results of the stringer reinforced specimens subjected to the AMAVS loading spectrum are presented in Table 8-2. Specimens No. 61 through 68 were loaded at a maximum stress level of 30.5 Ksi, while specimens No. 69 through 72 were loaded at a maximum stress of 21.5 Ksi. The largest scatter in life occurred in the T-center split skin specimens. Specimen No. 65 failed at 259,515 cycles, while specimen No. 66 failed at 101,023 cycles. Among the T-center specimens, the continuous skin specimens had higher life to failure. Although none of the split skin specimens showed any indication of crack initiation at the adjacent plate, their corresponding life was shorter. Also, the critical crack length for the split skin specimens was smaller than the continuous skin specimens. The average crack lengths to failure were 5.275 in., 3.275 in. and 4.975 in. for T-center continuous skin, T-center split skin and L-edge, respectively. The average fracture toughness of the specimen was approximately 100 Ksi in. A strain survey of specimens No. 62, 66 and 70 are shown in Tables 8-31, 8-36 and 8-41, respectively.

8.4.3 Test Results of Specimens Subjected to Constant Amplitude Loading Spectrum

The specimens which were subjected to a constant amplitude loading spectrum exhibited the best results with respect to scatter. Among similar specimens, the highest amount of scatter was observed for the TEE-center specimens. The failure occurred at 55,960 cycles and 74,330 cycles for specimens No. 41 and 42, respectively. The highest variation in the number of cycles to failure

was found in the L-edge specimens. The failure occurred at 67,136 cycles and 87,647 cycles for Type A and Type B respectively.

The highest average number of cycles to failure was obtained from the L-edge specimens. The failure occurred at 77,400 cycles vs. 74,500 and 65,450 cycles for L-center and TEE-center specimens respectively.

The critical crack length at failure was fairly uniform. The average crack length of twelve (12) specimens was 11.0 inches. The corresponding fracture toughness was $K_{IC} = 120 \text{ Ksi } \sqrt{\text{in.}}$.

8.5 FRACTOGRAPHIC ANALYSIS

Four (4) stringer reinforced specimens were selected for fractographic examination. The purpose of the examination was to determine the fracture surface characteristics for the initiation and growth of the cracks. The examinations were performed under a low-power microscope. The specimens examined included No.'s 57, 60, 63 and 67. Figures 8-9 through 8-16 show the fracture surfaces of some of the specimens subsequent to failure.

8.5.1 Specimen No. 57 Fractographic Analysis

Specimen No. 57 consisted of an edge-stringer reinforced skin. It was made of 2024-T3 sheet and 2024-T3511 extruded angles. The specimen was subjected to a constant amplitude load spectrum with a maximum stress level of 17.0 Ksi and stress ratio of $R = 0.10$. The specimen failed at 92,784 cycles.

The fractographic examination revealed slow crack growth at the extruded angle, with some initiation at the adjacent hole. The vertical member of the angle contained very little evidence of crack initiation. The stringer failed with relatively small cracks present, being on the order of 0.25 inch on each side of the hole. However, the skin contained much more crack growth, starting with plane strain growth and followed by plane stress up to final failure. The critical crack length at failure was determined to be $a_{cr} = 11.75$ inches. The initial flaw was visible at the hole close to the stringer's up-standing leg. The fracture toughness was determined to be in the order of $100\text{--}120 \text{ ksi } \sqrt{\text{in.}}$. Figures 8-11A and 8-11B show the fracture surfaces subsequent to failure.

8.5.2 Specimen No. 60 Fractographic Analysis

Specimen No. 60 consisted of an edge-stringer reinforced skin. It was made of 2024-T3 sheet reinforced by two edge members made of 2024-T3511 extruded angle. The specimen was subjected to the A-10A loading spectrum and contained marker band cycles. The maximum and minimum stress levels were 37.5 Ksi and -8.34 Ksi, respectively. The specimen failed at 130,030 cycles (≈ 17 passes). The fractographic analysis did not reveal any significant amount of crack initiation at the adjacent hole. The total length of the stringer crack was on the order of 1.4 inches, while the skin contained 3.0 inches of stable cracking. Clear marker band serrations were visible at the skin and stringer fracture surface. As expected, the crack growth rate in the stringer flange slowed substantially upon approaching the upstanding leg, while growth in the skin accelerated. Figures 8-12A and 8-12B show the fracture surface subsequent to failure.

8.5.3 Specimen No. 63 Fractographic Analysis

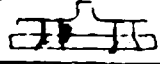
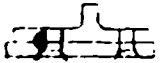
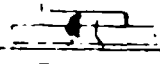
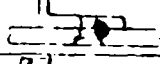
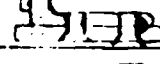
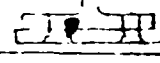
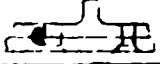
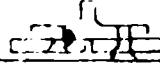
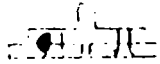
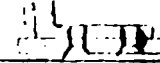
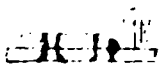
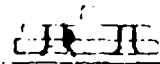
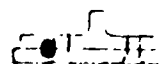
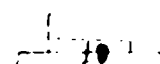
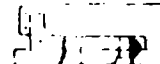
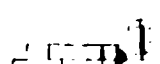
Specimen No. 63 consisted of tee-stringer reinforced continuous skin. The specimen was made of 7075-T6 sheet attached to 7075-T651 extruded angle. The specimen was subjected to the 'AMAVS' loading spectrum containing marker band cycles. The maximum and minimum stress levels were 30.5 Ksi and -6.64 Ksi, respectively. The specimen failed at 156,117 cycles (≈ 13 passes). The fractographic examination revealed clear markings corresponding to high load cycles. The crack growth rates slowed down substantially when the crack approached the upstanding leg of the stringer. The crack had plane strain characteristics up to a length of 0.9 inch in the stringer and 1.65 inches in the skin, subsequently, the mode of propagation changed to plane stress until final failure. The critical crack length in the stringer was 2.2 inches in the flange section and 0.60 inch in the upstanding leg section. The critical length in the skin was 4.60 inches. Contrary to expectation, there was no crack initiation at the adjacent hole. Figures 8-13A through 8-13C show the fracture surface subsequent to failure.

8.5.4 Specimen No. 67 Fractographic Analysis

Specimen No. 67 consisted of tee-stringer reinforced split skin. The specimen was made of 7075-T6 skin attached to 7075-T651 extruded angle. It was subjected to the 'AMAVS' load spectrum, including marker band cycles. The

maximum and minimum stress levels were 30.5 Ksi and -6.64 Ksi, respectively. The specimen failed at 152,511 cycles ($\approx$ 13 passes). The fractographic examination revealed slow crack growth on one side of the specimen with very little initiation on the opposite side of the hole. The critical crack length was 0.50 inch and 2.3 inches in the stringer and skin, respectively. The adjacent skin did not contain any cracking, but failed statically. Figures 8-15 and 8-15B show the fracture surface subsequent to failure.

TABLE 8-1. STRINGER-REINFORCED SPECIMEN GEOMETRIES

SPECIMEN TYPE	FLAW CONFIGURATION	DASH NO.	TEST ID	SKIN		STRINGER			GROSS AREA (IN ²)
				W (IN)	t (IN)	A (IN ²)	I _{xx4} (IN ⁴)	C.G. (IN)	
Center T-Stringer Continuous Skin		-1A	39,40	18.0	.188	0.899	.4161	.5813	4.283
		-1B	43,44						
Center L-Stringer Continuous		-3A	47,48	18.0	.188	.3383	.1365	.6227	3.722
		-3B	50,52						
Edge L-Stringer Continuous Skin		-5A	55,56	18.0	.188	1.382	1.2222	0.917	6.148
		-5B	59,60						
Center T-Stringer Continuous Skin		-7A	61,62	18.0	0.312	1.5966	0.9719	0.7125	7.212
		-7B	63,64						
Center T-Stringer Split Skin		-9A	65,66	18.0	0.312	1.5966	.9719	.7125	7.182
		-9B	67,68						
Edge L-Stringer Continuous Skin		-11A	69,70	18.0	0.312	2.311	2.2168	1.12	10.240
		-11B	71,72						
Center T-Stringer Continuous Skin		-1A	37,38	18.0	.188	.899	.4161	.5813	4.283
		-1B	41,42						
Center L-Stringer Continuous Skin		-3A	45,46	18.0	.188	.3383	.1365	.6227	3.722
		-3B	49,51						
Edge L-Stringer Continuous Skin		-5A	53,54	18.0	.188	1.382	1.2222	.917	6.148
		-5B	57,58						

*REF DWG GT221K0011

TABLE 8-2. STRINGER-REINFORCED SPECIMENS; SUMMARY OF TEST RESULTS

SPEC. ID	DASH NO.	SPEC. LOADING	MAX. STRESS (KSI)	MIN. STRESS (KSI)	LAST a_{cr} (IN)	MEASURE FAILURE a_{cr} (IN)	CYCLES TO FAILURE
37	-1A	C.A.	17.0	1.70	8.54	11.50	65,560
38	-1A	C.A.	17.0	1.70	9.85	11.00	66,080
39	-1A	A-10A	35.75	-8.34	1.93	4.30	208,093
40	-1A	A-10A	35.75	-8.34	3.58	3.70	174,486
41	-1B	C.A.	17.0	1.70	6.00	11.10	55,960
42	-1C	C.A.	17.0	1.70	7.50	10.55	74,330
43	-1B	A-10A	35.75	-8.34	4.10	5.20	201,407
44	-1B	A-10A	35.75	-8.34	4.10	5.20	202,880
45	-3A	C.A.	17.0	1.70	8.03	11.20	79,950
46	-3A	C.A.	17.0	1.70	9.34	12.25	72,100
47	-3A	A-10A	35.75	-8.25	2.65	5.40	255,661
48	-3A	A-10A	35.75	-8.25	1.65	9.50	224,761
49	-3B	C.A.	17.00	*	8.96	11.30	66,100
50	-3B	A-10A	28.0	-6.73	8.53	9.00	461,585
51	-3B	C.A.	17.00	1.70	8.05	11.80	79,700
52	-3B	A-10A	28.0	-6.73	5.00	9.70	688,165
53	-5A	C.A.	17.0	1.70	6.44	7.50	64,725
54	-5A	C.A.	17.0	1.70	8.95	12.90	69,547
55	-5A	A-10A	35.75	-8.34	0.729	3.10	100,823
56	-5A	A-10A	35.75	-8.34	2.070	5.00	160,900
57	-5B	C.A.	17.0	1.70	11.72	11.70	92,784
58	-5B	C.A.	17.0	1.70	12.89	13.50	82,509
59	-5B	A-10A	35.75	-8.34	0.77	3.50	173,913
60	-5B	A-10A	35.75	-8.34	3.06	3.10	130,030
61	-7A	AMAVS	30.5	-6.64	0.99	4.60	146,742
62	-7A	AMAVS	30.5	-6.64	0.553	2.80	544,007
63	-7B	AMAVS	30.5	-6.64	4.756	7.20	156,117
64	-7B	AMAVS	30.5	-6.64	5.204	6.50	204,191
65	-9A	AMAVS	30.35	-6.60	2.160	2.30	259,515
66	-9A	AMAVS	30.35	-6.60	5.499	6.50	101,023
67	-9B	AMAVS	30.35	-6.60	1.777	2.50	152,511
68	-9B	AMAVS	30.35	-6.60	1.099	1.80	176,213
69	-11B	AMAVS	21.48	-4.67	7.448	8.00	285,354
70	-11B	AMAVS	21.48	-4.67	1.719	5.80	234,218
71	-11A	AMAVS	21.48	-4.67	2.545	3.70	629,051
72	-11A	AMAVS	21.48	-4.67	2.690	2.40	441,256

*First 47,700 cycles $\sigma_{min} = 4.54$ KSI, subsequently $\sigma_{min} = 1.7$ KSI

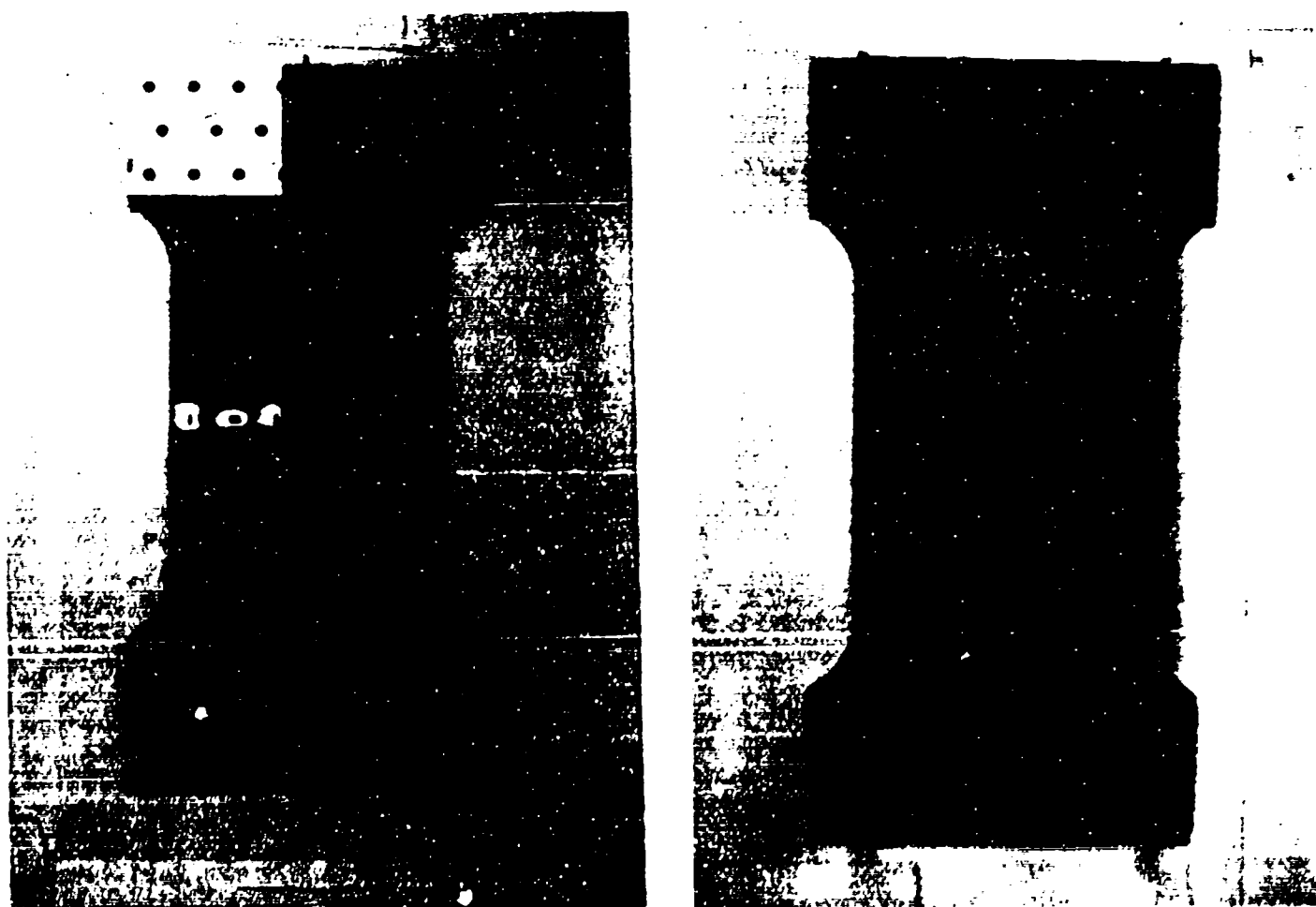
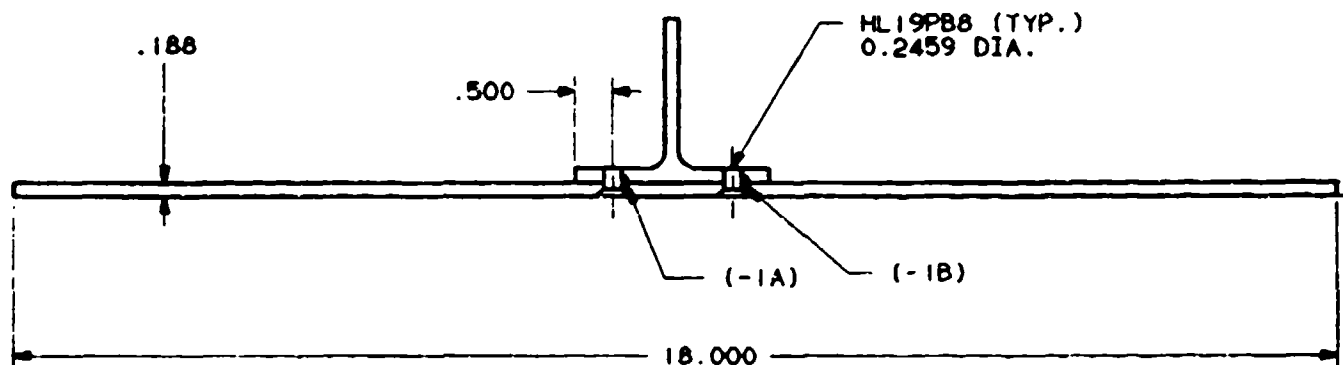


Figure 8-1. Photos of Stringer Reinforced Specimens

STRINGER

$$\bar{x} = 0.0$$

$$\bar{y} = 0.5813 \text{ in.}$$

$$I_{xx} = 0.4161 \text{ in.}^4$$

$$I_{yy} = 0.2890 \text{ in.}^4$$

$$A = 0.8990 \text{ in.}^2$$

SKIN + STRINGER

$$A = 4.28281 \text{ in.}^2$$

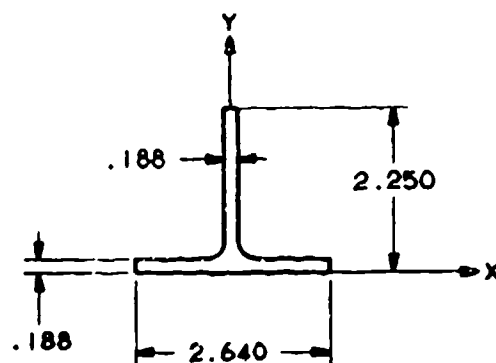
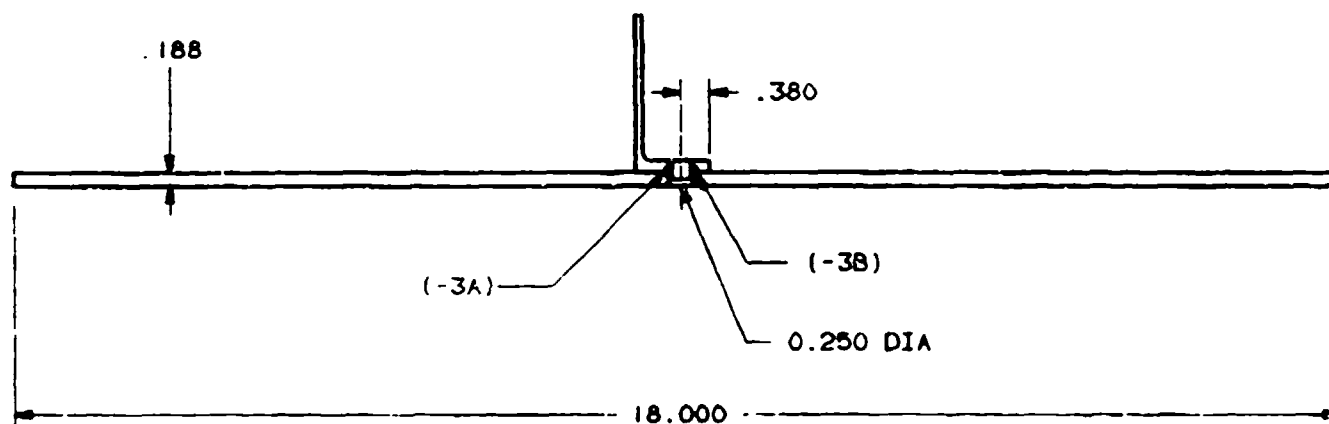


Figure 8-2. Specimen GT221K0011-1 Configuration

STRINGER

$$\bar{X} = 0.251 \text{ in.}$$

$$\bar{y} = 0.6227 \text{ in.}$$

$$I_{XX} = 0.1365 \text{ in.}^4$$

$$I_{YY} = 0.0292 \text{ in.}^4$$

$$A = 0.3383 \text{ in.}^2$$

SKIN + STRINGER

$$A = 3.7222 \text{ in.}^2$$

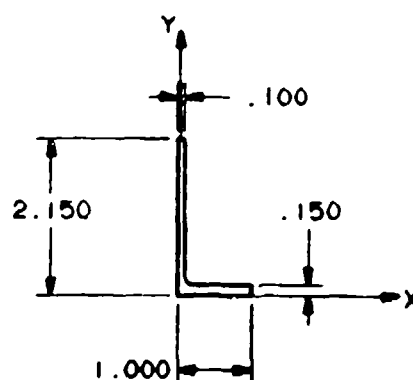
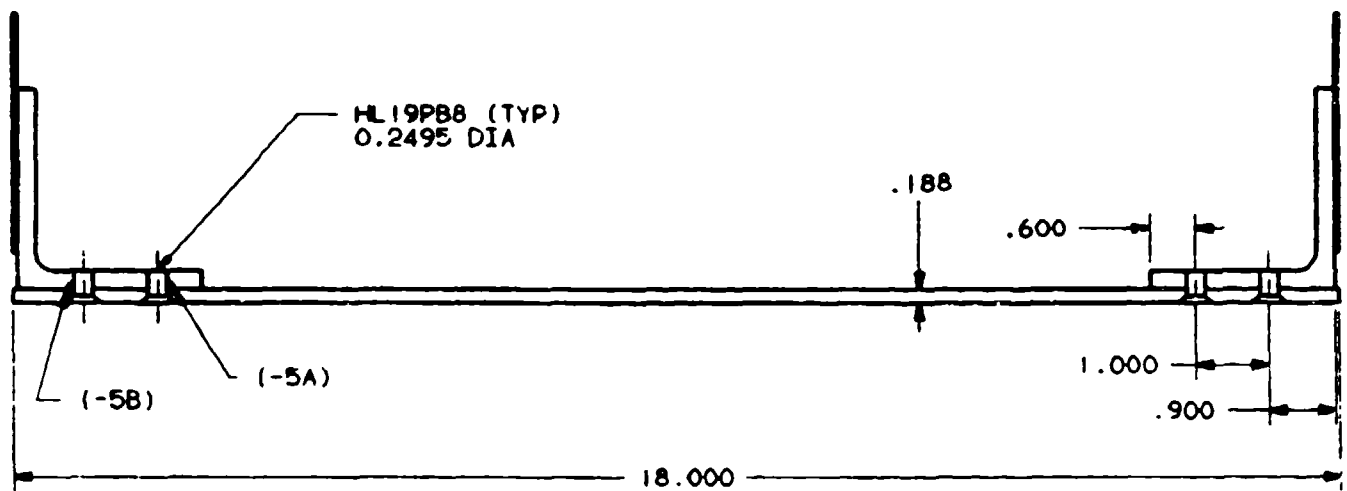


Figure 8-3. Specimen GT221K0011-3 Configuration

STRINGER

$$\bar{X} = 1.382 \text{ in.}^2$$

$$\bar{Y} = 1.852 \text{ in.}$$

$$I_{XX} = 0.593 \text{ in.}^4$$

$$I_{YY} = 0.868 \text{ in.}^4$$

$$A = 0.747 \text{ in.}^2$$

SKIN + STRINGER

$$A = 6.148 \text{ in.}^2$$

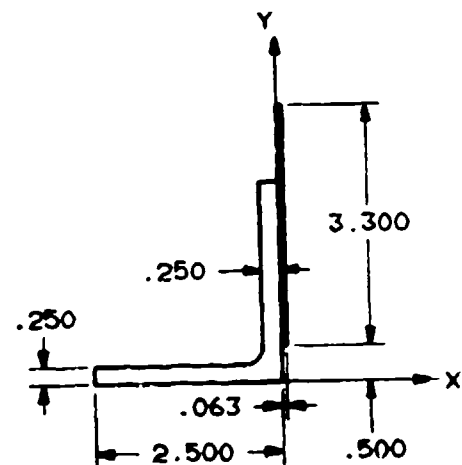
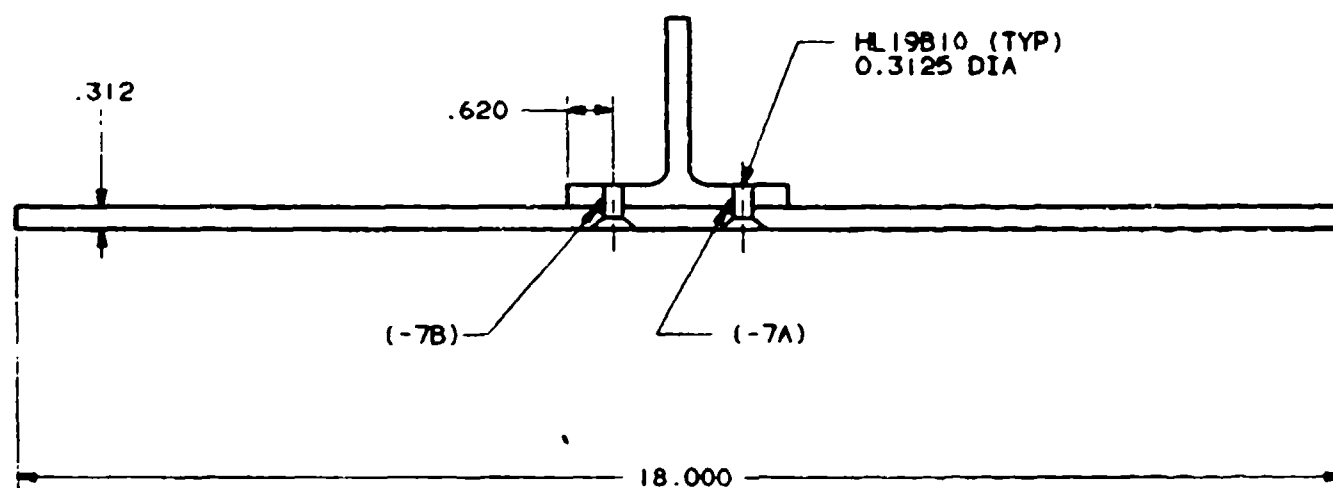


Figure 8-4. Specimen GT221K0011-5 Configuration

SPECIMEN NO. GT221K0011-7

MAT'L — 7075-T736/7075-T6



STRINGER

$$\bar{X} = 0.0$$

$$\bar{Y} = 0.7125 \text{ in.}$$

$$I_{XX} = 0.9719 \text{ in.}^4$$

$$I_{YY} = 0.6808 \text{ in.}^4$$

$$A = 1.5966 \text{ in.}^2$$

SKIN + STRINGER

$$A = 7.2124 \text{ in.}^2$$

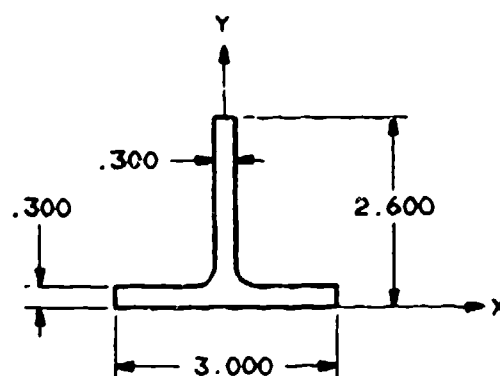
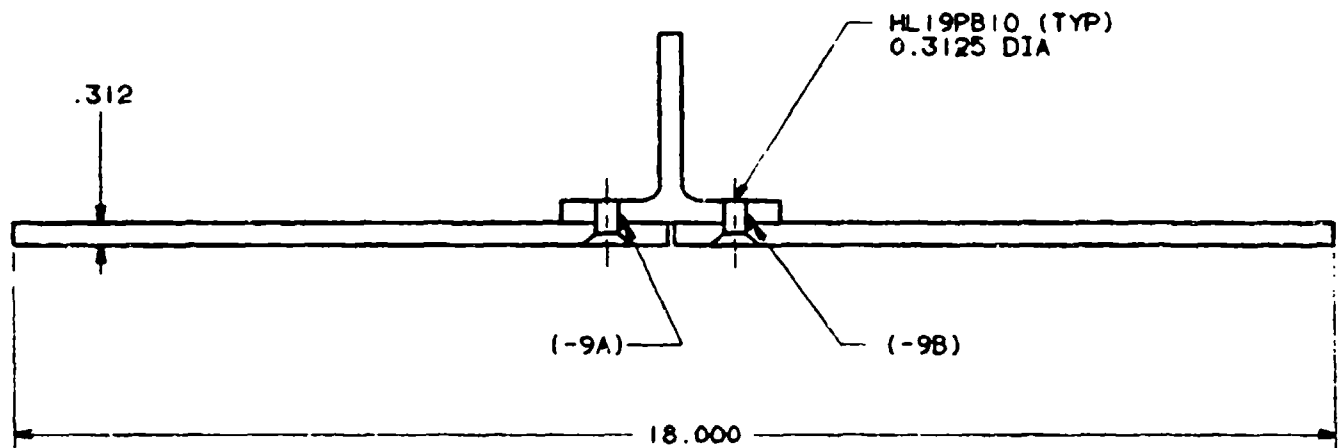


Figure 8-5. Specimen GT221K0011-7 Configuration

SPECIMEN NO. GT221K0011-9

MAT'L — 7075-T736/7075-T6



STRINGER

$$\bar{X} = 0.0$$

$$\bar{y} = 0.7125 \text{ in.}$$

$$I_{XX} = 0.9719 \text{ in.}^4$$

$$I_{YY} = 0.6808 \text{ in.}^4$$

$$A = 1.5966 \text{ in.}^2$$

SKIN + STRINGER

$$A = 7.18105 \text{ in.}^2$$

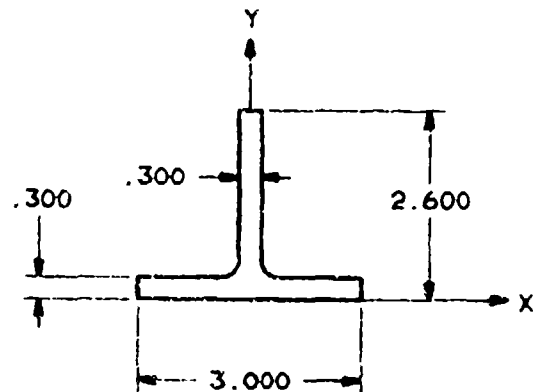
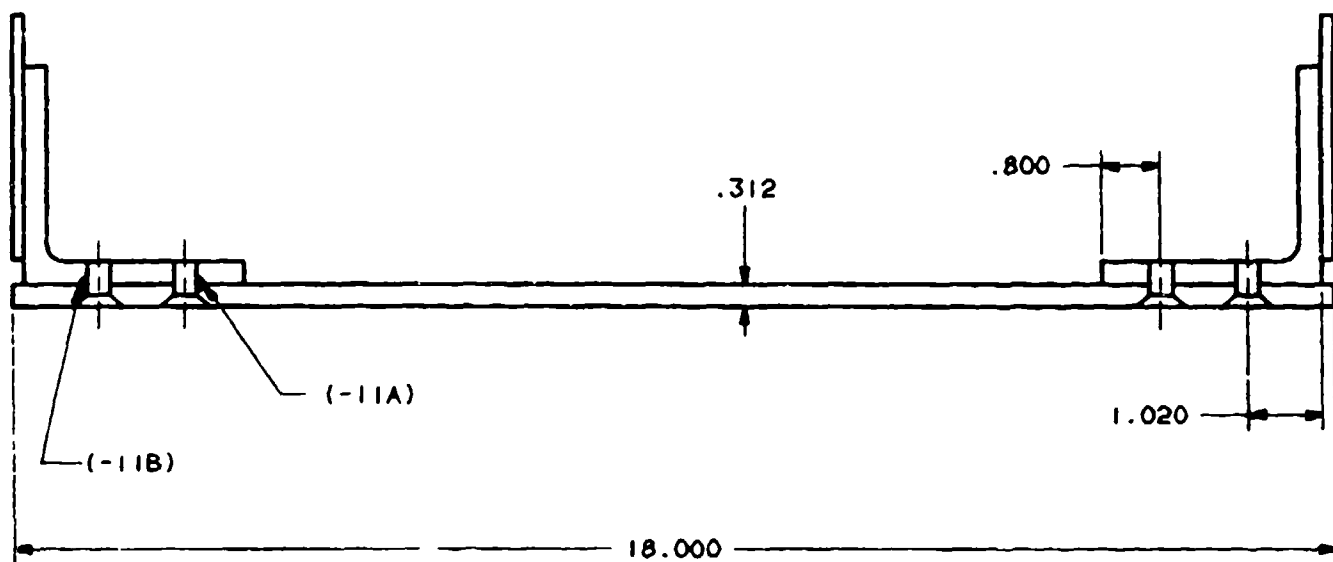


Figure 8-6. Specimen GT221K0011-9 Configuration

STRINGER

$$\bar{X} = 1.136 \text{ in.}$$

$$\bar{Y} = -0.643 \text{ in.}$$

$$I_{XX} = 1.8216 \text{ in.}^4$$

$$I_{YY} = 1.5693 \text{ in.}^4$$

$$A = 2.289 \text{ in.}^2$$

SKIN + STRINGER

$$A = 10.238 \text{ in.}^2$$

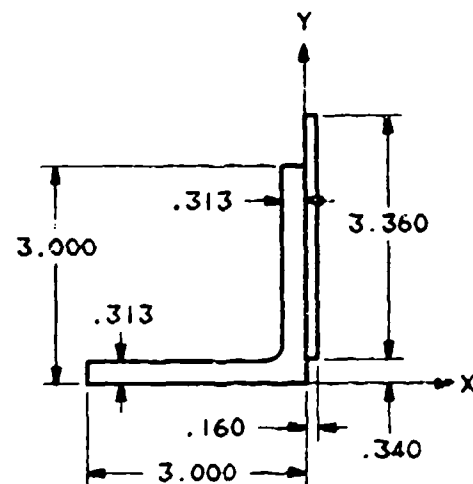


Figure 8-7. Specimen GT221K0011-11 Configuration



Figure 8-8. Specimen GT221K0011-1A Installed on MTS Testing Machine

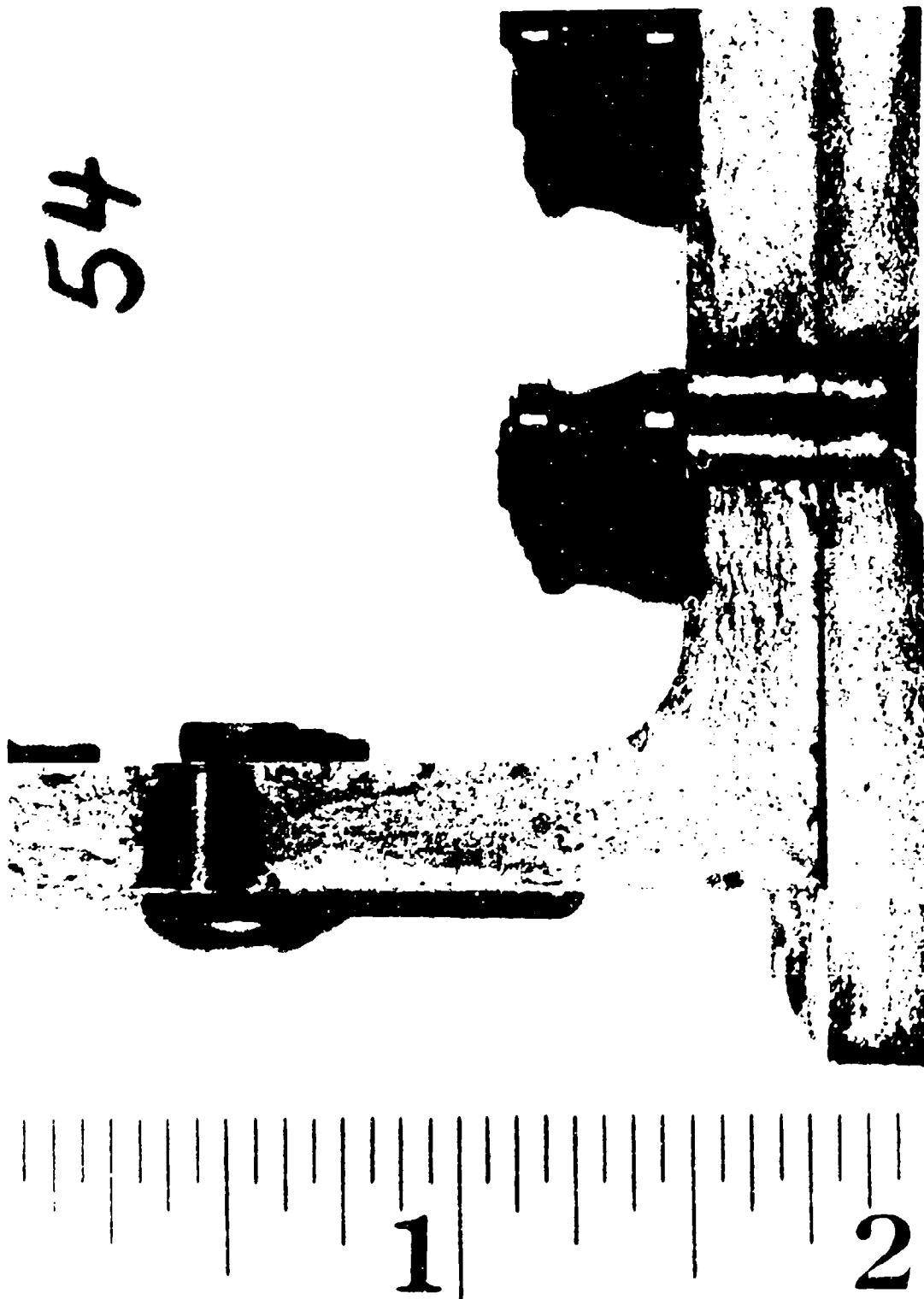


Figure 8-9. Specimen No. 54 Fracture Surface (Subjected to Constant Amplitude Loading)

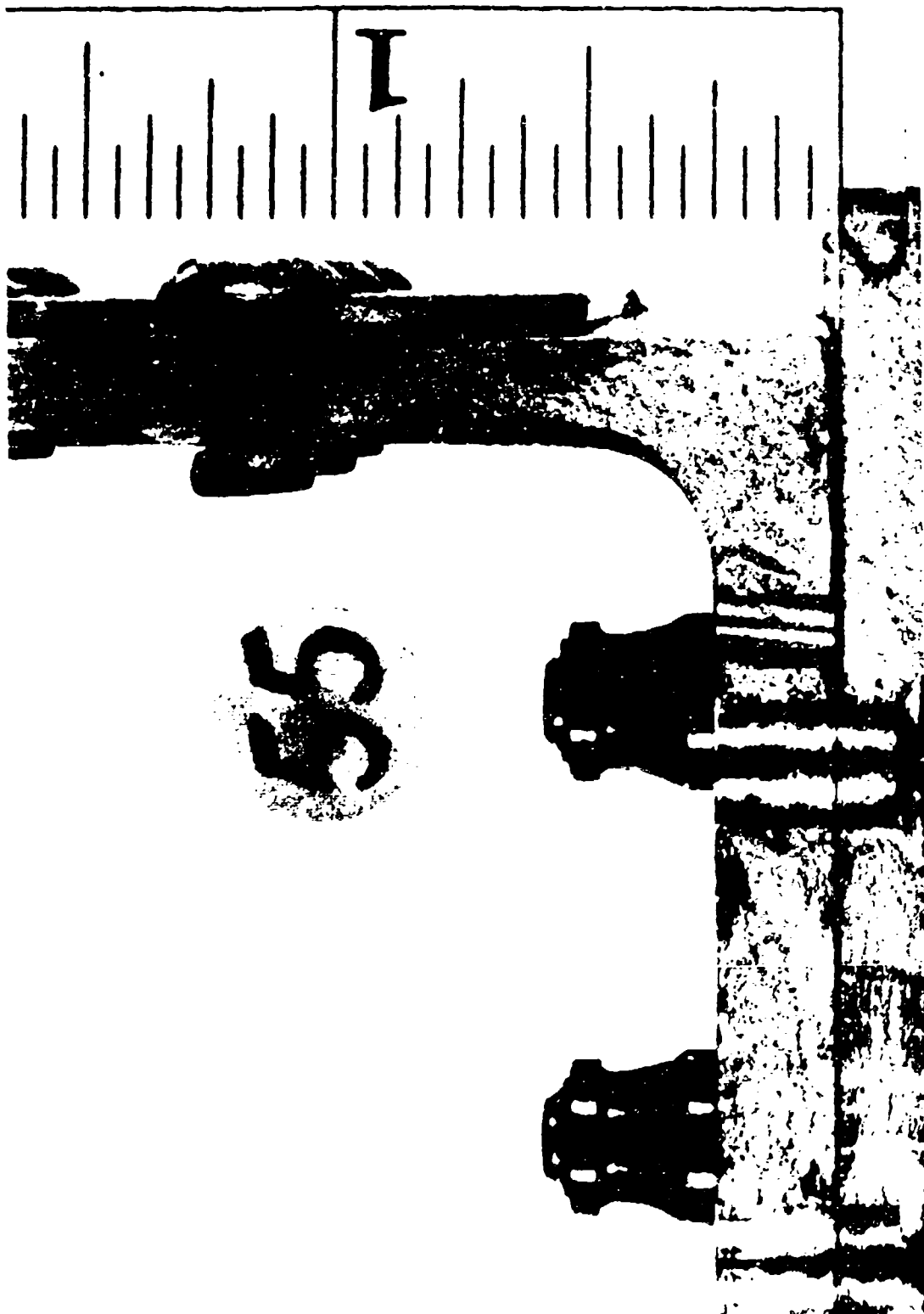


Figure 8-10. Specimen No. 55 Fracture Surface (Subjected to A-10A Loading Spectrum)

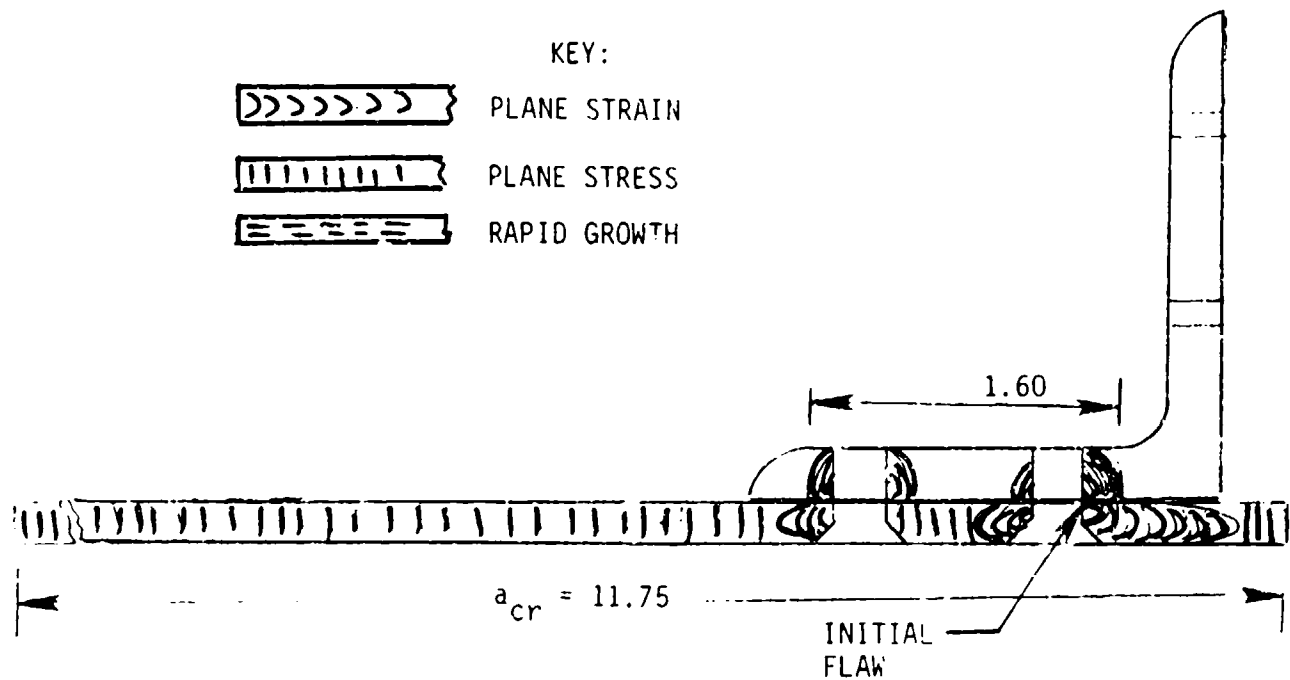


Figure 8-11A. Fractographic Examination of Specimen No. 57
(Subjected to C.A. Loading)

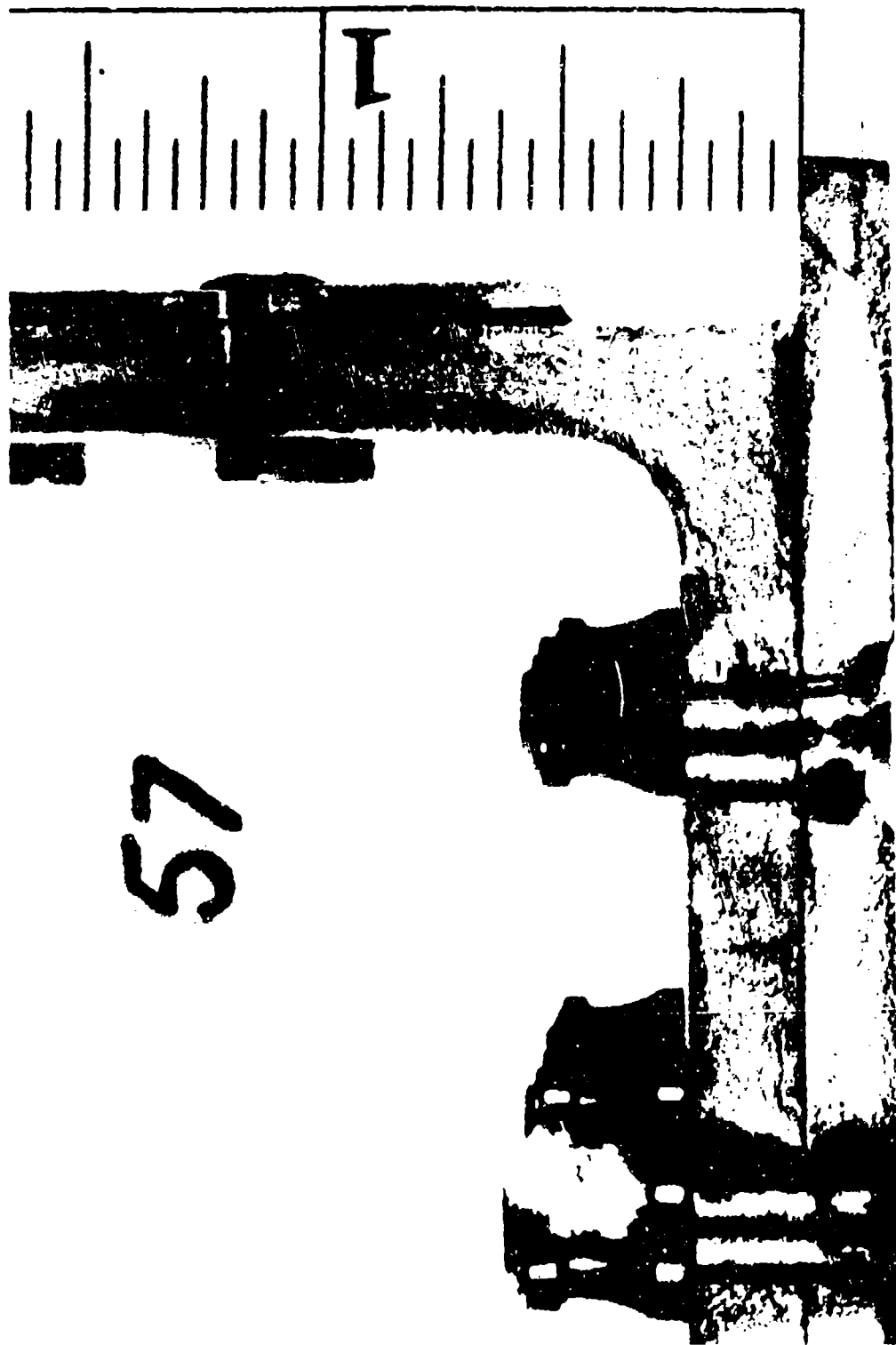


Figure 8-118. Specimen No. 57 Subsequent to Failure

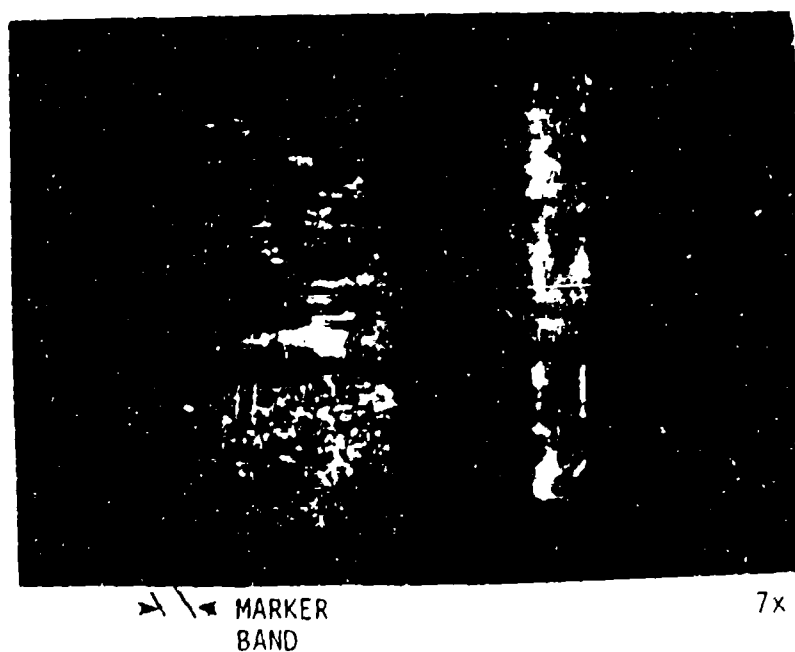
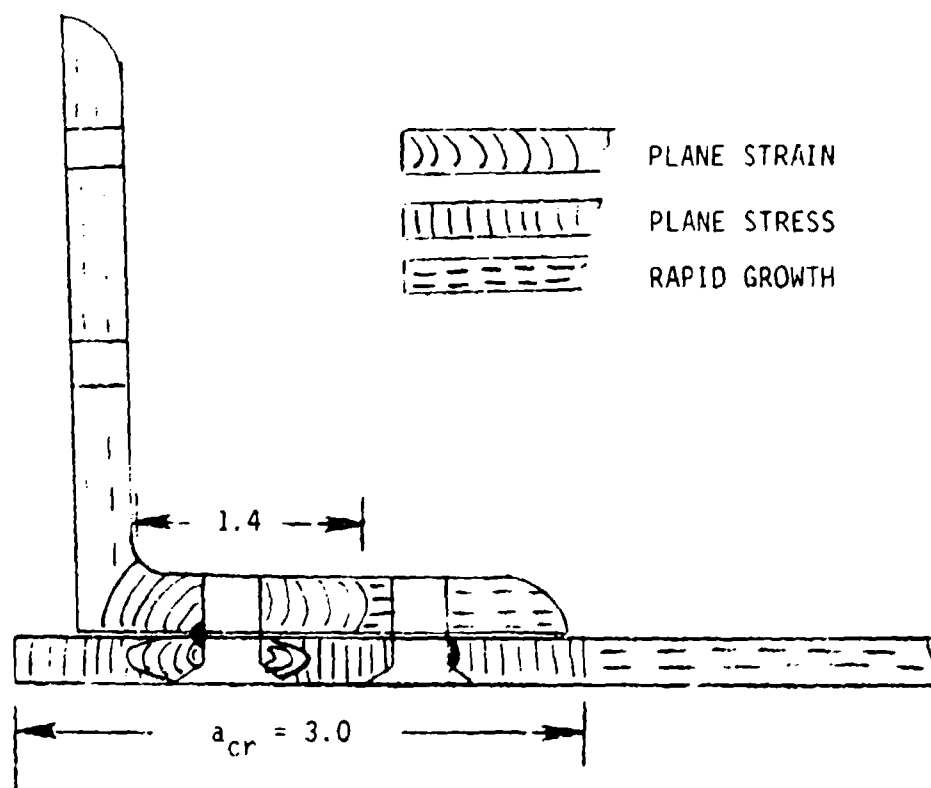


Figure 8-12A. Specimen No. 60 Fractographic Examination
(Subjected to A-10A Loading Spectrum)

60

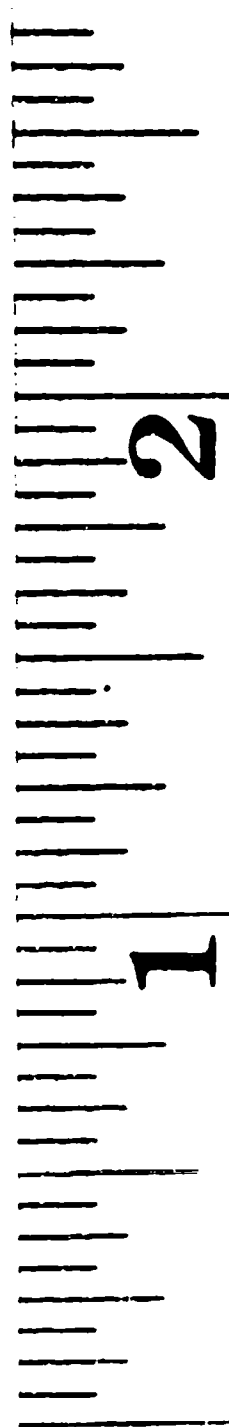
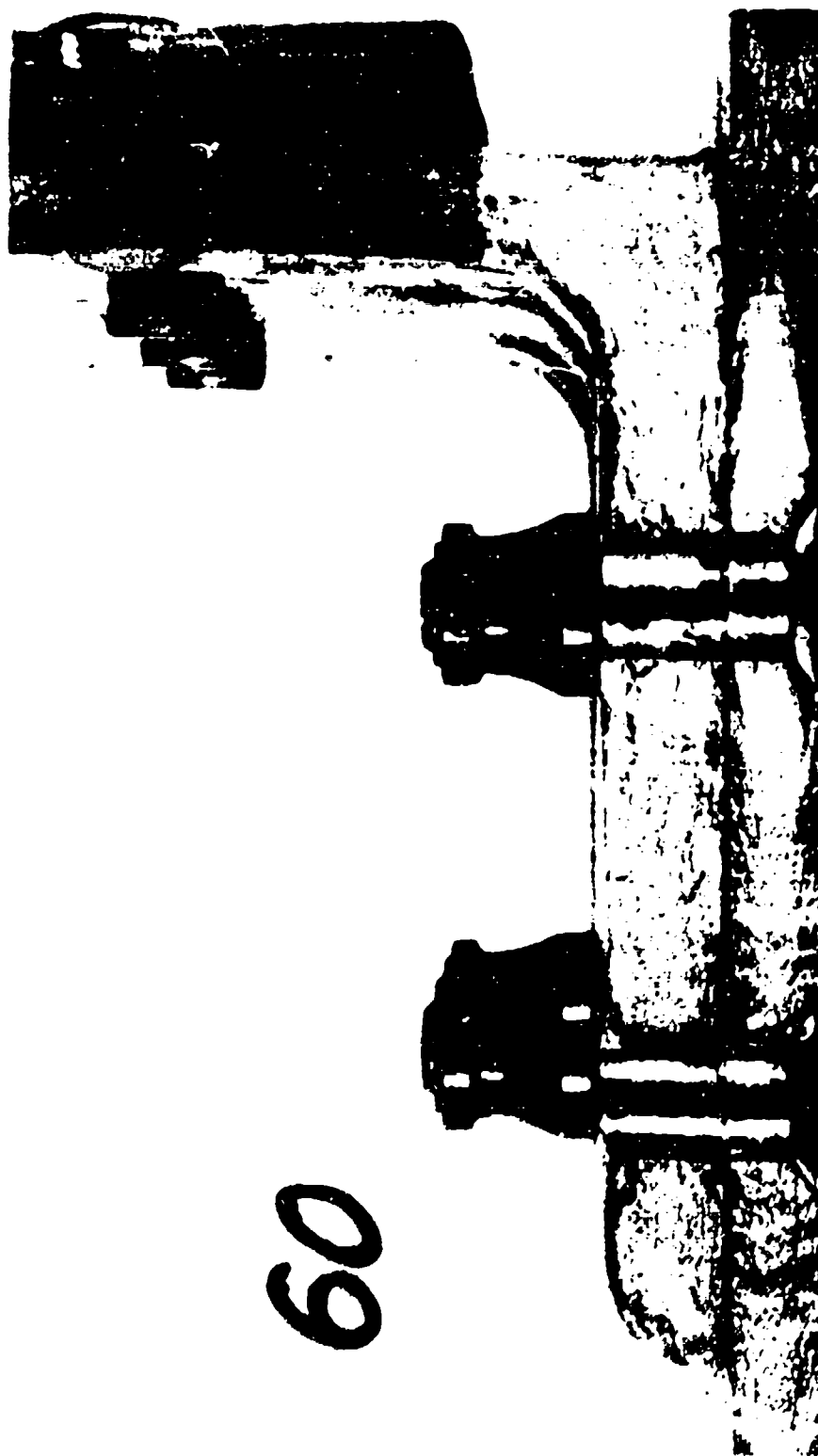


Figure 8-128. Specimen No. 60 Fracture Surface Subsequent to Failure

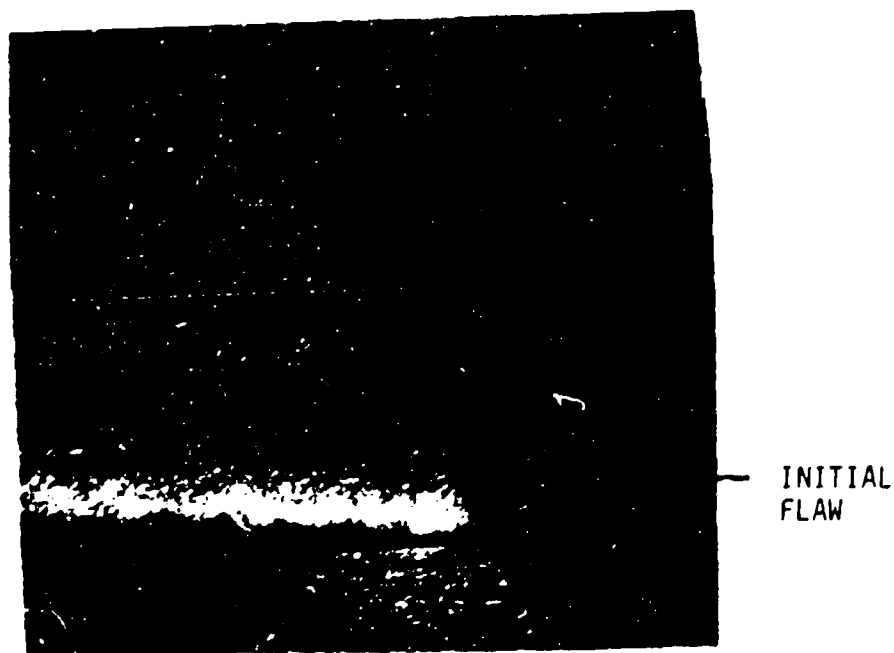
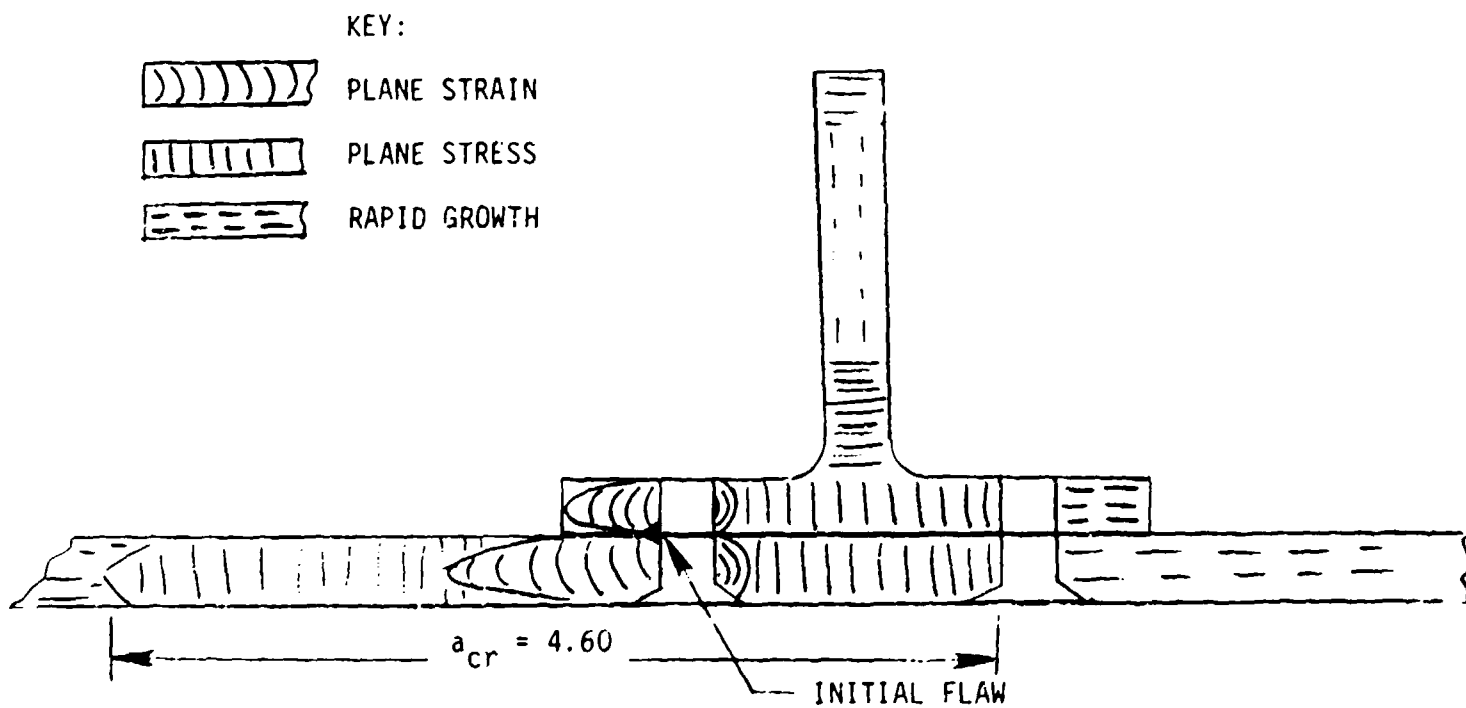


Figure 8-13A. Fractographic Examination of Specimen No. 63
(Subjected to AMAVS Loading Spectrum)

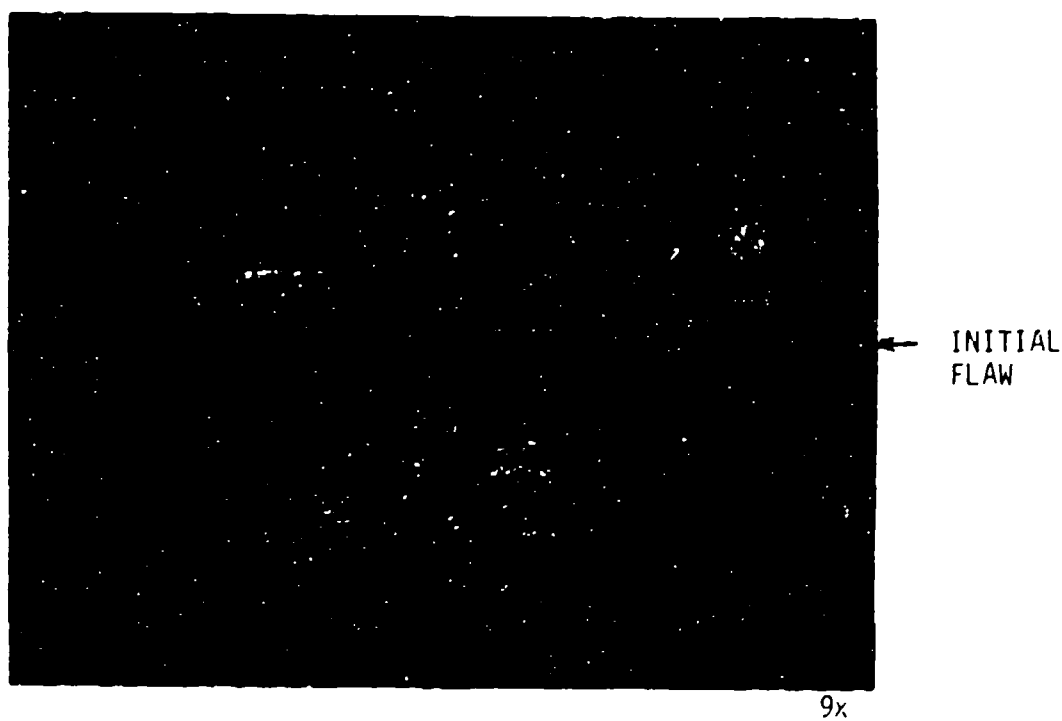
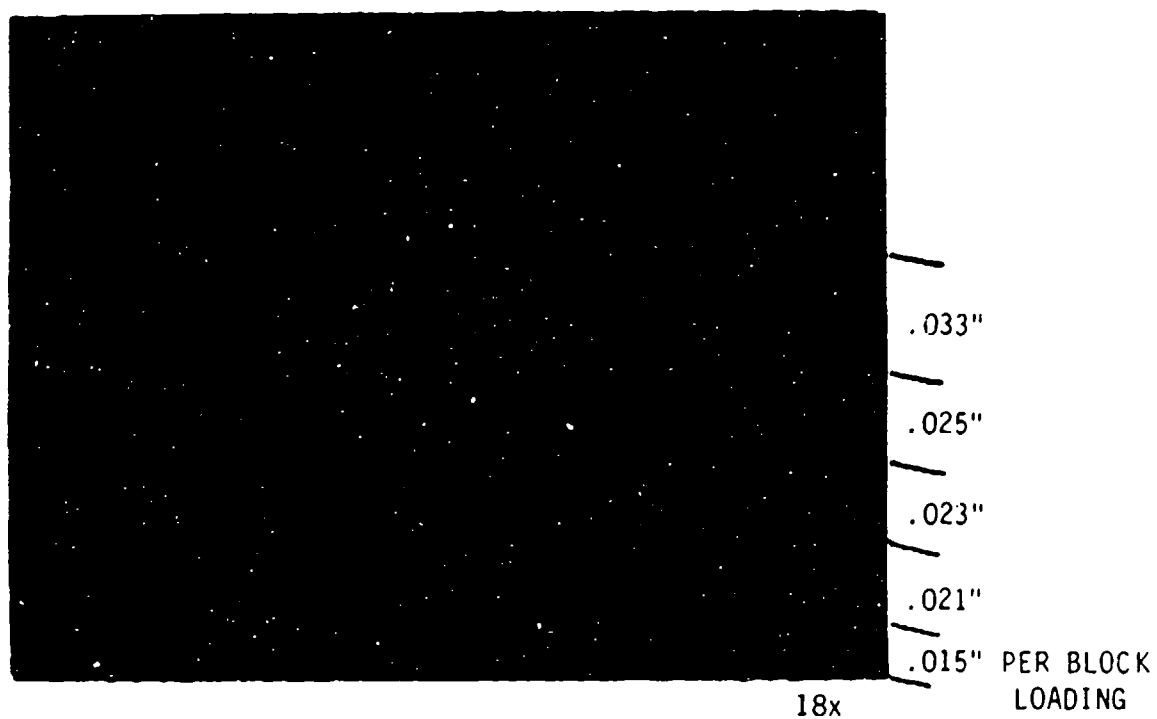


Figure 8-13B. Fractographic Examination of Specimen No. 63
(Subjected to AMAVS Loading Spectrum)

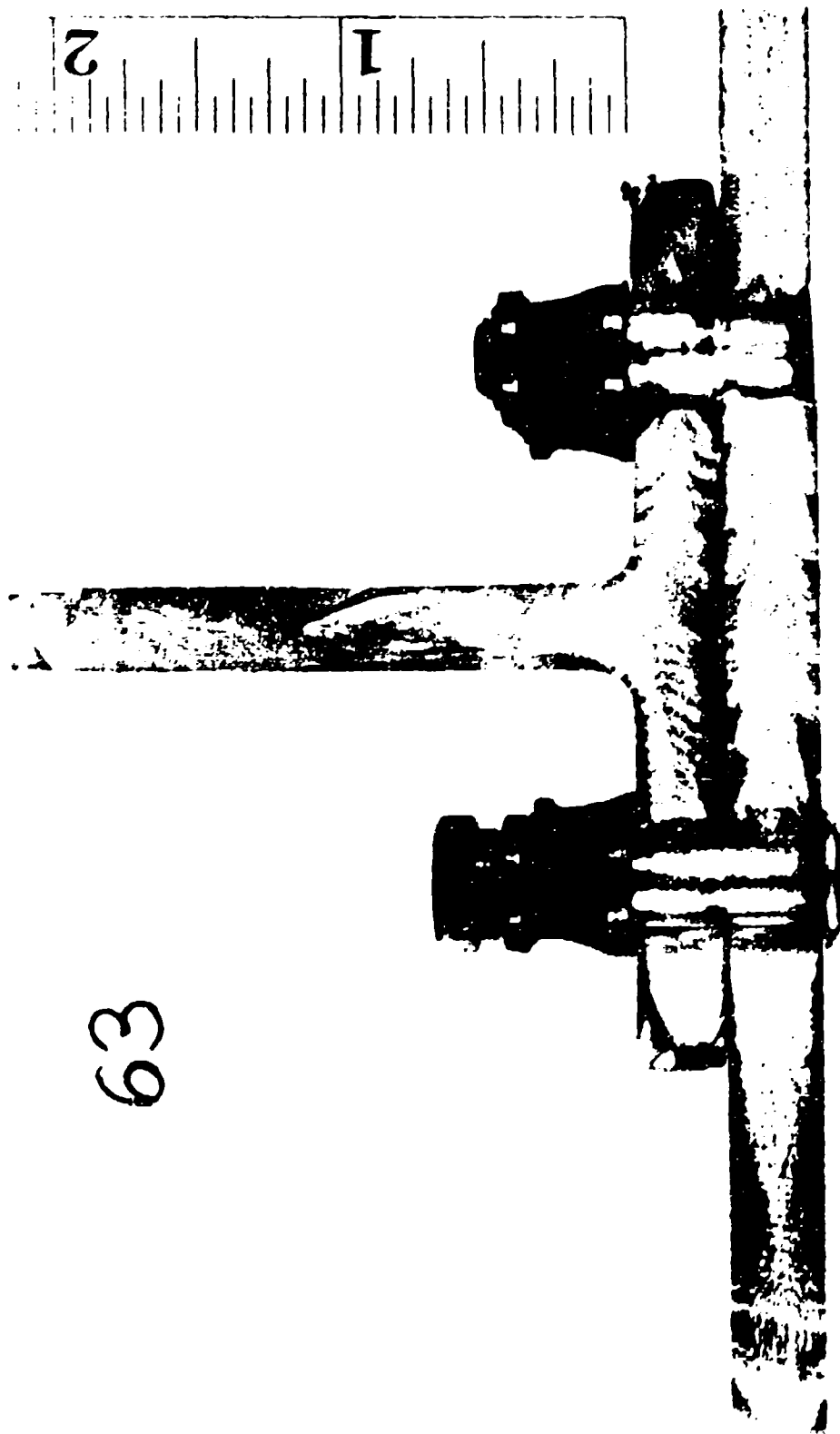
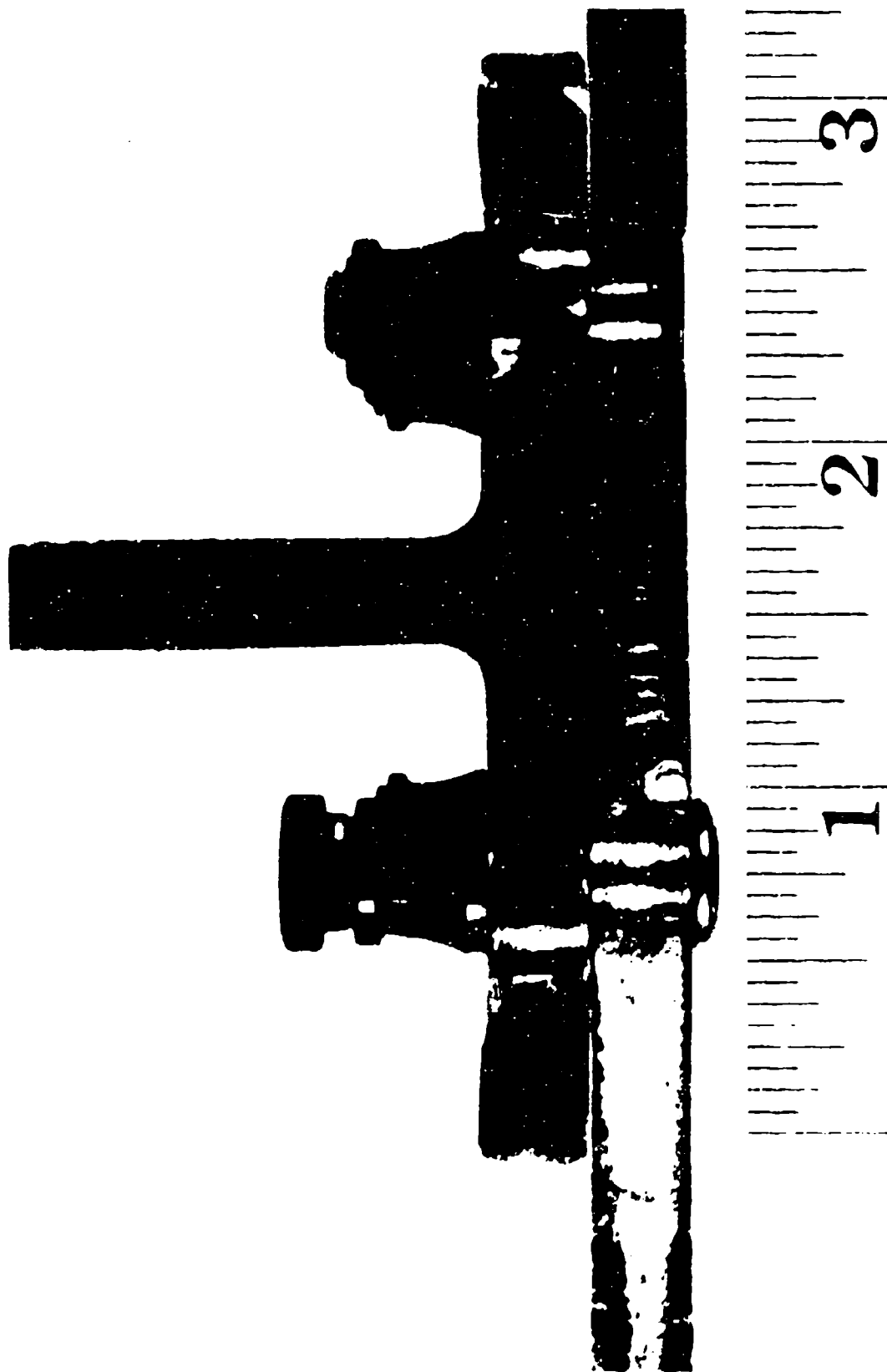


Figure 8-13C. Specimen No. 63 Fracture Surface Subsequent to Failure



64

Figure 8-14. Specimen No. 64 fracture Surface (Subjected to 'AMAVS' Loading Spectrum)

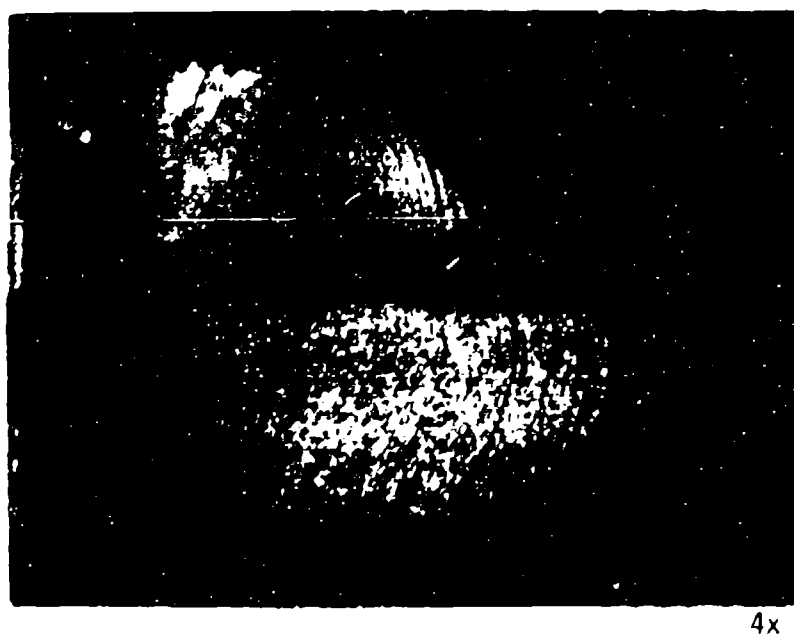
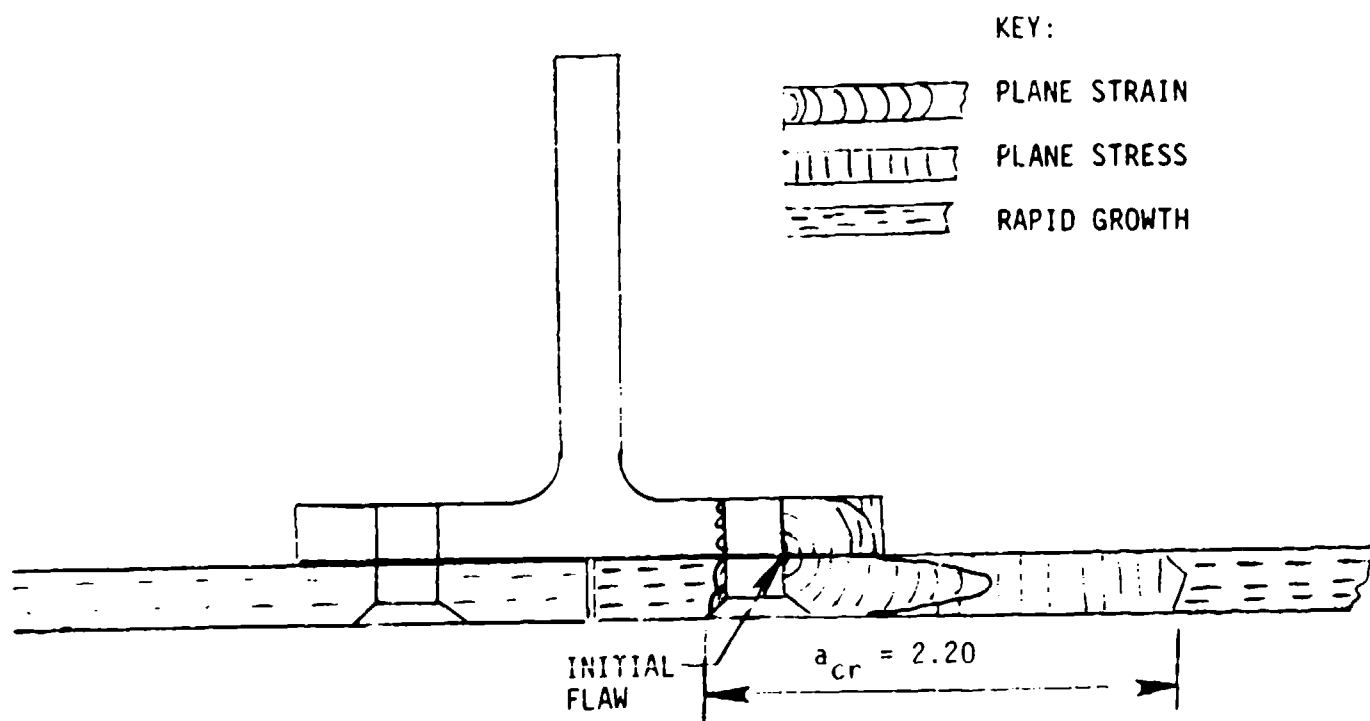


Figure 8-15A. Fractographic Examination of Specimen No. 67
(Subjected to AMAVS Loading Spectrum)

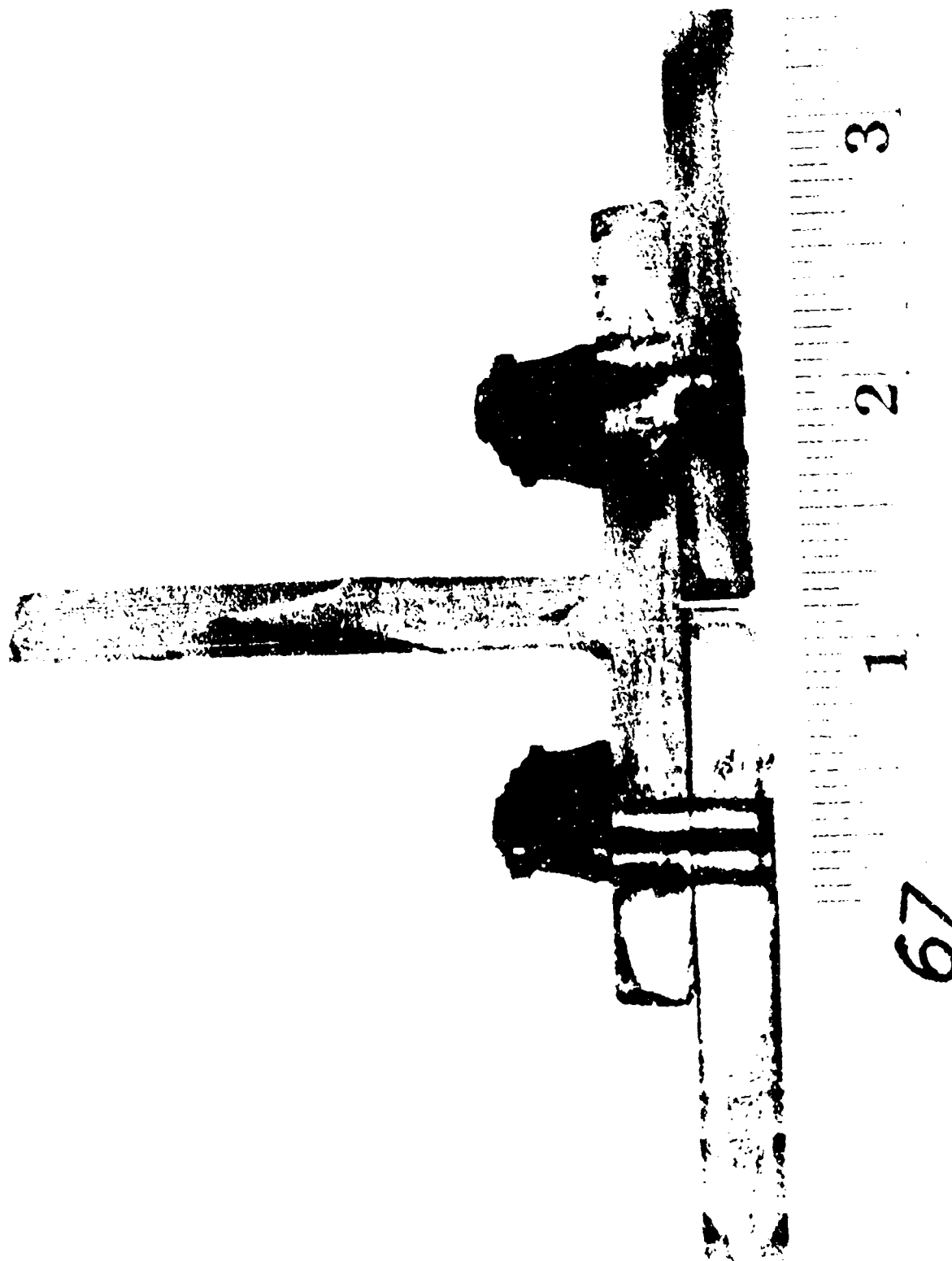


Figure 8-158. Specimen No. 67 Fracture Surface Subsequent to Failure



Figure 8-16. Specimen No. 70 Fracture Surface (Subjected
'AMVS' Loading Spectrum)

SPECIMEN NUMBER:	37	CYCLES TO FAILURE:	65560
SKIN/STRINGER:	S 1A S/N 1	% LIFE AT FAILURE:	
LOAD (KIP'S)	72.80		
SPECTRUM:	CONSTANT AMP		
HOLE SIZE (INCHES):	0.256		

231

TABLE 8-4. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 38

SPECIMEN NUMBER: 38
 SKIN/STRINGER: S-31 1A S/N 2 Cycles to Failure: 66030
 LOAD (KIPS): 72.80 % Life at Failure:
 SPECTRUM: CONST AMP CRK LGTH AT FAIL: 11.00
 HOLE SIZE (INCHES): 0.256

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH		
	SKIN		STRINGER		SKIN	SKIN	STRINGER
	R/FRONT	L/FRONT	R/BACK	L/BACK	FRONT	BACK	FRONT
0							
19400				0.000		0.425	
24400				0.169		0.448	
29400				0.192		0.525	
34000				0.269		0.603	0.360
39000				0.347		0.705	0.464
43000				0.449		0.805	0.520
47000				0.549		0.920	0.580
52000				0.672		1.073	0.685
56000				0.817		1.686	0.741
59520				1.430		2.047	0.774
62820			0.361	1.430	1.110	2.550	0.825
64290	0.854		0.864	1.430	1.631	3.255	1.529
64840	1.375		1.261	1.738	1.962	3.573	1.790
65130	1.706		1.578	1.739	2.232	3.856	1.923
65530	1.976		1.861	1.739	2.710	4.329	1.923
65830	2.454		2.334	1.739	3.193	4.824	2.332
65910	2.937		2.829	1.739	3.461	5.285	2.365
65950	3.205		3.081	1.948	5.972	5.740	FAILURE
65980	3.419	2.297	3.297	2.187	6.391	6.098	
66010	3.611	2.524	3.439	2.403	6.888	6.639	
66030	3.850	2.782	3.726	2.657	7.269	6.999	
66040	4.030	2.983	3.899	2.844	7.877	7.547	
66060	4.350	3.271	4.194	3.097	8.527	8.200	
66070	4.700	3.571	4.504	3.440	10.106	9.770	
66075	5.100	3.918	4.904	3.780	11.000	11.000	
66080	5.550	4.300	5.394	4.120			
	FAILURE	FAILURE	FAILURE	FAILURE			

SPECIMEN NUMBER:	39	CYCLES TO FAILURE:	208093
SKIN/STRINGER:	S-31 1A S/N 3	% LIFE AT FAILURE:	110
LOAD (KIPS):	153		
SPECTRUM:	A-10	FINAL CRACK LGTH:	4.30
HOLE DIA (INCHES):	0.255		

CRACKS WERE NOT FOUND ON THE FRONT SKIN BECAUSE THEY WERE HIDDEN BY THE STRINGER

TABLE 8-6. STRAIN SURVEY OF SPECIMEN NO. 40

CYCLES TO FAILURE: 174486
APPLIED LOAD(LBS): 63750

A-10
3.7

SPECTRUM:
FINAL CRACK LGTH:

SPECIMEN NUMBER: 40
SPECIMEN TYPE: CENTER T

CYCLES	% OF LIFE	SKIN CRACK LENGTH	STRINGER CRACK LENGTH	GAGE 1 L/F	GAGE 2 L/F	GAGE 3 S/R	STRAIN			MICROINCHES / INCH			GAGE 8 L/B	GAGE 11
							GAGE 4 R/F	GAGE 5 R/F	GAGE 6 R/B	GAGE 7 C/B	GAGE 9	GAGE 10		
0	0	0.000	0.000	1247	1321	1202	1397	1504	1401	1351	1347			
7717	4	0.000	0.000	1273	1335	1102	1424	1566	1443	1349	1356			
15435	8	0.000	0.000	1277	1339	1101	1429	1573	1450	1349	1361			
23155	12	0.000	0.000	1276	1341	1097	1430	1574	1452	1349	1360			
30874	16	0.000	0.000	1274	1341	1095	1431	1574	1453	1350	1359			
38590	20	0.000	0.000	1273	1341	1094	1432	1576	1453	1350	1359			
46313	24	0.000	0.000	1272	1342	1094	1434	1579	1456	1352	1359			
53044	28	0.000	0.000	1290	1347	1075	1439	1591	1459	1349	1362			
60766	32	0.000	0.000	1277	1347	1101	1442	1591	1464	1366	1364			
68486	36	0.000	0.000	1301	1367	1120	1466	1619	1487	1393	1386			
76205	40	0.000	0.279	1269	1336	1084	1439	1582	1461	1373	1356			
83922	44	0.361	0.332	1260	1330	1073	1436	1573	1457	1378	1348			
91646	48	0.388	0.358	1282	1335	1075	1497	1579	1465	1399	1352			
98376	52	0.417	0.377	1291	1342	1051	1516	1589	1466	1413	1351			
106094	56	0.441	0.385	1284	1335	1059	1571	1577	1470	1436	1351			
113813	60	0.469	0.407	1283	1335	1071	1540	1571	1473	1467	1350			
121534	64	0.501	0.429	1294	1334	1053	1563	1575	1489	1531	1349			
129252	68	0.700	0.442	1293	1334	1045	1580	1604	1508	1618	1348			
136974	72	0.757	0.465	1304	1337	1035	1621	1729	1542	1776	1351			
143704	76	0.832	0.481	1294	1346	1005	1680	1660	1579	1985	1345			
151424	80	0.901	0.595	1294	1347	1000	1654	1745	1654	2409	1351			
159144	84	0.996	0.783	1292	1356	924	1810	1746	1836	3424	1341			
163254	86	1.079	1.103	1293	1363	799	1987	1764	2114	4617	1360			
166861	88	1.238	1.143	1305	1431	606	2687	1870	3212	10096	1450			
170972	90	1.585	1.143	1310	1507	284	4456	1987	5672	OFFSCALE	1614			
174310	92	3.576	2.236	2298	9551	1934	OFFSCALE	3569	OFFSCALE	OFFSCALE	3749			
174566	92	FAILURE	FAILURE											

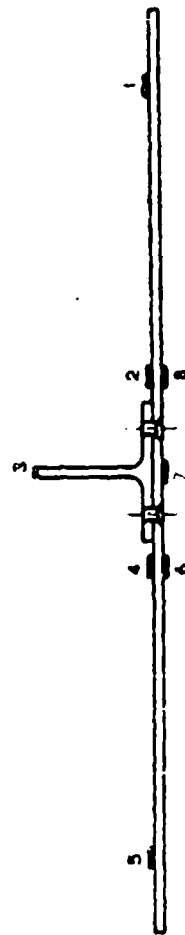


TABLE 8-7. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 40

SPECIMEN NUMBER: 40
 SKIN/STRINGER: S-31 1A S/N 4
 LOAD (KIPS): 153
 SPECTRUM: A-10
 HOLE DIA (INCHES): 0.249
 CYCLES TO FAILURE: 174486
 % LIFE AT FAILURE: 92
 FINAL CRACK LGTH: 3.70

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		S' STRINGER		TOTAL SKIN	CRACK		LENGTH
					R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT		SKIN	BACK	
0	0	0	0	0							0.249	0.249	0.249	0.249
1	10	61	40	76205						0.030	0.249	0.249	0.249	0.279
1	11	61	44	83922			0.112			0.083	0.249	0.361	0.361	0.332
1	12	61	48	91616			0.139			0.105	0.249	0.388	0.388	0.358
1	13	61	52	98376			0.168			0.128	0.249	0.417	0.417	0.377
1	14	61	56	106094			0.192			0.136	0.249	0.441	0.441	0.365
1	15	61	60	113813			0.220			0.158	0.249	0.469	0.469	0.407
1	16	61	64	121534			0.252			0.180	0.249	0.501	0.501	0.429
1	17	61	60	129252			0.297	0.154		0.193	0.249	0.700	0.700	0.442
1	18	61	72	136374			0.318	0.190		0.216	0.249	0.757	0.757	0.465
1	19	61	76	143704			0.348	0.235		0.232	0.249	0.832	0.832	0.481
1	20	61	80	151424			0.385	0.267	0.070	0.276	0.249	0.901	0.901	0.595
1	21	61	84	159144			0.431	0.316	0.157	0.377	0.249	0.996	0.996	0.783
1	22	16	85	161199			0.452	0.343	0.253	0.419	0.249	1.044	1.044	0.921
1	22	32	86	163254			0.462	0.368	0.383	0.471	0.249	1.079	1.079	1.103
1	27	48	87	165310			0.515	0.403	FAILURE	0.511	0.249	1.167	1.167	0.760
1	22	61	88	166861		0.412	0.569	0.420		0.511	0.661	1.238	1.238	0.760
1	23	16	89	168797	0.474		0.611	0.511	FAILURE	0.511	0.723	1.371	1.371	0.760
1	23	32	90	170972	0.580		0.745	0.591		0.511	0.837	1.585	1.585	0.760
1	23	48	91	173027	0.722		0.915	0.735		0.511	0.971	1.899	1.899	0.760
1	23	58	92	174310	1.345		1.979	1.348		0.511	1.594	3.576	3.576	2.236
1	23	60	92	174486	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	3.700	3.700	3.700	FAILURE
1											0.249	0.249	0.249	0.249

TABLE 8-8. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 41

SPECIMEN NUMBER: 41
 SKIN/STRINGER: S-31 LB S/N 1
 LOAD: RTF, 72.80
 SPECTRUM: CONST AMP
 HOLE SIZE (INCHES): 0.266
 CYCLES TO FAILURE: 55960
 % LIFE AT FAILURE:
 CRK LGTH AT FAIL: 10.55

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN R/FRONT	SKIN L/FRONT	SKIN R/BACK	SKIN L/BACK	STRINGER R/FRONT	STRINGER L/FRONT	SKIN FRONT	SKIN STRINGER BACK FRONT
0							0.266	0.266
21990				0.000	0.000		0.266	0.266
22440				0.138	0.031		0.266	0.266
23130				0.169	0.065		0.266	0.297
24280				0.161	0.094		0.266	0.331
25130				0.179	0.117		0.266	0.360
25530				0.197	0.141		0.266	0.383
26100				0.207	0.166		0.266	0.407
27330				0.222	0.194		0.266	0.432
28406				0.241	0.217		0.266	0.460
29243				0.262	0.242		0.266	0.483
30140				0.268	0.266		0.266	0.508
30470				0.299	0.300		0.266	0.532
30600				0.305	0.336		0.266	0.565
31500				0.308	0.368		0.266	0.571
32080				0.339	0.368		0.266	0.602
32640				0.365	0.368		0.266	0.634
33040				0.460	0.368		0.266	0.634
34620	0.458			0.565	0.368		0.724	0.634
44060	0.555			0.665	0.368		0.821	0.634
44860	0.649			0.765	0.368		0.915	0.634
45550	0.752			0.865	0.368		1.018	0.634
51170	0.845			0.162	0.368		1.111	0.634
53040	1.221			0.438	0.368		1.487	0.634
55680	1.531			1.559	0.368	0.254	1.797	0.888
55950	2.937			2.076	0.368	1.001	3.203	1.635
55960	3.488	2.233	2.253	3.496	0.368	1.001	5.987	1.635
	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE

STRINGER CRACK REACHED THE RIGHT EDGE AT CYCLE 30600

TABLE 8-9. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 42

SPECIMEN NUMBER: 42
 SKIN/STRINGER: S-31 1B S/N 2 CYCLES TO FAILURE: 74330
 LOAD TYPE: 72.80 % LIFE AT FAILURE:
 SPECTRUM: CONST AMP
 HOLE SIZE (INCHES): 0.263 CRK LGTH AT FAIL: 10.55

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN		STRINGER		SKIN		STRINGER	
	R/FRONT	L/FRONT	R/DACK	L/BACK	R/FRONT	L/FRONT	R/FRONT	L/FRONT
23530				0.041			0.304	
28530				0.084			0.347	
33530				0.211			0.474	
38530				0.292	0.025		0.555	0.208
43530	0.390			0.380	0.025		0.643	0.288
48530	0.439			0.504	0.062	0.653	0.702	0.325
53530	0.606			0.605	0.142	0.869	0.868	0.405
58560	0.751			0.745	0.236	1.014	1.000	0.499
63640	0.977		0.183	0.965	0.370	1.240	1.411	0.633
66470	1.192		0.452	1.190	0.370	1.455	1.905	0.633
68500	1.459		0.715	1.450	0.370	1.722	2.436	0.633
69930	1.710		1.007	1.716	0.370	1.973	2.906	0.652
70500	1.841		1.233	1.862	0.370	2.104	3.358	0.665
70960	2.005		1.295	2.017	0.370	2.268	3.575	0.673
71850	2.208		1.295	2.265	0.370	2.551	3.823	0.779
72430	2.544		1.295	2.536	0.370	2.807	4.094	0.922
72900	2.872		1.295	2.869	0.370	3.135	4.427	1.040
73430	3.373		1.295	3.372	0.370	3.636	4.930	1.160
73860	3.800		1.295	3.801	0.370	4.143	5.439	1.333
74140	4.400		1.295	4.389	0.370	4.663	5.947	1.720
74280	5.007	2.221	2.273	5.094	0.370	7.491	7.367	1.949
74330	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE

LEFT STRINGER CRACK OF .7 IS AN ESTIMATED VALUE

STRINGER BROKE FIRST THEN TOTAL FAILURE

TABLE 8-10. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 43

SPECIMEN NUMBER: 43 SKIN/STRINGER: S-31 1B S/N 3 LOAD (KIPS): 153 SPECTRUM: A-10 HOLE DIA (INCHES): 0.262										CYCLES TO FAILURE: & LIFE AT FAILURE:		FINAL CRACK LGTH:	
										201407		5.20	
LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN R/FRONT	SKIN L/FRONT	SKIN R/BACK	SKIN L/BACK	STRINGER R/FRONT	STRINGER L/FRONT	TOTAL SKIN FRONT	CRACK SKIN BACK	LENGTH STRINGER FRONT
0	0	0	0	0					0.000	0.000	0.262	0.262	0.262
1	9	61	36	68218					0.026	0.020	0.262	0.262	0.316
1	10	61	40	75906					0.032	0.019	0.262	0.262	0.313
1	11	61	44	83592					0.077	0.020	0.262	0.262	0.359
1	12	61	48	91285					0.091	0.020	0.262	0.262	0.373
1	13	61	52	97989					0.104	0.020	0.262	0.262	0.386
1	14	61	56	105678					0.119	0.020	0.262	0.262	0.401
1	15	61	60	113368				0.144	0.141	0.020	0.262	0.406	0.423
1	16	61	64	121058				0.173	0.172	0.020	0.262	0.435	0.454
1	17	61	68	128746				0.203	0.202	0.020	0.262	0.465	0.484
1	18	61	72	136440				0.231	0.264	0.035	0.262	0.493	0.561
1	19	61	76	143146				0.255	0.302	0.100	0.262	0.517	0.752
1	20	61	80	150037				0.292	0.303	0.247	0.262	0.554	0.892
1	21	61	84	158527			0.154	0.334	0.303	0.371	0.262	0.750	1.016
1	22	61	88	166216			0.198	0.375	0.303	0.427	0.262	0.835	1.072
1	23	61	92	173903			0.247	0.424	0.407	0.476	0.262	0.933	1.145
1	24	61	96	181598			0.295	0.479	0.453	0.509	0.262	1.036	1.224
1	25	61	100	188302			0.354	0.541	0.510	0.515	0.262	1.157	1.287
2	1	61	104	195990			0.472	0.659	0.630	0.558	0.262	1.393	1.450
2	2	38	106	200960			N/A	N/A	FAILURE	FAILURE	N/A	N/A	0.262
2	2	39	107	201033	1.854	1.909	1.957	1.835			4.105	4.054	0.262
2	2	43	107	201407	FAILURE	FAILURE	FAILURE	FAILURE			5.200	5.200	0.262

TABLE 8-11. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 44

SPECIMEN NUMBER: 44
 SKIN/STRINGER: S-31 10 S/N 4 CYCLES TO FAILURE: 202870
 LOAD (KIPS): 153 % LIFE AT FAILURE: 108
 SPECTRUM: A-10 FINAL CRACK LGTH: 5.20
 HOLE DIA(INCHES): 0.262

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		STRINGER	TOTAL		CRACK		LENGTH STRINGER FRONT
					R/FRONT	L/FRONT		R/FRONT	L/FRONT	SKIN BACK	SKIN FRONT	
0	0	0	0	0				0.000		0.262	0.262	0.262
1	10	61	40	15905				0.024		0.262	0.262	0.286
1	11	61	44	83593				0.066		0.262	0.262	0.328
1	12	61	48	91287				0.097		0.262	0.262	0.359
1	13	61	52	97991				0.117		0.262	0.262	0.379
1	14	61	56	105679			0.111	0.131		0.373	0.399	0.393
1	15	61	60	113369			0.137	0.155		0.262	0.262	0.417
1	16	61	64	121061			0.169	0.176		0.262	0.262	0.430
1	17	61	68	128747			0.186	0.190		0.262	0.262	0.460
1	18	61	72	136440			0.213	0.242		0.262	0.262	0.504
1	19	61	76	143144			0.243	0.332	0.018	0.617	0.612	0.612
1	20	61	80	150833		0.112	0.276	0.301	0.177	0.678	0.820	0.820
1	21	61	84	158522		0.140	0.314	0.301	0.290	0.760	0.933	0.933
1	22	61	88	166211		0.184	0.348	0.301	0.356	0.839	0.999	0.999
1	23	23	90	169000		0.229	0.372	0.301	0.400	0.890	1.051	1.051
1	23	31	90	170057		0.256	0.380	0.301	0.433	0.902	1.076	1.076
1	23	46	91	171970		0.260	0.386	0.301	0.436	0.925	1.079	1.079
1	23	61	92	173090	0.399	0.277	0.397	0.381	0.444	0.948	1.087	1.087
1	24	16	93	175824	0.408	0.313	0.418	0.301	0.449	0.993	1.092	1.092
1	24	31	94	177743	0.429	0.324	0.427	0.301	0.461	1.013	1.104	1.104
1	24	46	95	179658	0.439	0.338	0.447	0.381	0.479	1.047	1.122	1.122
1	24	61	96	181592	0.451	0.359	0.463	0.301	0.479	1.084	1.122	1.122
1	25	16	97	183513	0.466	0.377	0.482	0.381	0.482	1.121	1.125	1.125
1	25	31	98	185432	0.483	0.396	0.494	0.301	0.492	1.152	1.125	1.125
1	25	46	99	187350	0.499	0.416	0.519	0.301	0.482	1.197	1.125	1.125
1	25	61	100	188284	0.519	0.436	0.534	0.301	0.402	1.232	1.128	1.128
2	1	21	101	190859	0.534	0.482	0.588	0.381	0.405	1.332	1.169	1.169
2	1	31	102	192125	0.503	0.498	0.609	0.381	0.526	1.369	1.169	1.169
2	1	46	103	194046	0.602	0.523	0.633	0.381	0.544	1.418	1.187	1.187
2	1	61	104	195971	0.626	0.573	0.677	0.381	0.546	1.512	1.189	1.189
2	2	16	105	197896	0.663	0.691	0.782	0.381	0.546	1.735	1.189	1.189
2	2	31	106	199813	0.786	0.817	0.902	0.301	0.546	1.981	1.189	1.189
2	2	45	107	201609	0.906	N/A	0.902	0.301	0.546	2.368	1.490	1.490
2	2	53	107	202700	1.090	N/A	1.098	0.301	0.847	4.108	FAILURE	FAILURE
2	2	55	108	202870	1.720	2.202	1.724	FAILURE	FAILURE	5.200	FAILURE	FAILURE

TABLE 8-12. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 45

SPECIMEN NUMBER: 45
 SKIN/STRINGER: S-33 3A S/N 1
 LOAD (KTF): 63.30
 SPECTRUM: CONST AMP
 HOLE SIZE (INCHES): 0.192
 CYCLES TO FAILURE: 79950
 % LIFE AT FAILURE:
 CRACK LGTH AT FAIL: 11.20

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN R/FRONT	SKIN L/FRONT	R/BACK	SKIN L/BACK	STRINGER R/FRONT	STRINGER L/FRONT	SKIN FRONT	SKIN BACK
0							0.192	0.192
31210				0.131			0.192	0.192
34290				0.174			0.192	0.192
37450				0.200			0.192	0.323
39950				0.306	0.040		0.192	0.366
44160				0.350	0.047		0.192	0.392
47370				0.400	0.054		0.192	0.442
49670				0.450	0.058		0.192	0.490
52690				0.499	0.074		0.192	0.542
54940				0.618	0.080		0.192	0.592
59970	0.619			0.704	0.154		0.192	0.642
63380	0.702			0.797	0.184		0.192	0.691
66000	0.792			0.901	0.215		0.811	0.810
68230	0.881			1.013	0.242		0.894	0.943
70710	1.013			1.137	0.242		0.984	1.097
72380	1.132	0.362	0.449	1.423	0.242		1.073	1.304
74970	1.469	0.671	0.719	1.724	0.242		1.567	1.532
76900	1.781	0.867	0.958	2.029	0.242		1.773	1.792
78080	2.078	1.159	1.206	2.279	0.242	0.140	2.332	2.334
78560	2.342	1.453	1.467	2.737	0.242	0.283	2.840	2.874
79140	2.813	1.973	1.993	3.037	FAILURE	FAILURE	3.429	3.427
79380	3.121	2.320	2.314	3.317	FAILURE	FAILURE	3.987	3.938
79540	3.411	2.633	2.594	3.752	FAILURE	FAILURE	4.978	4.922
79710	3.828	3.117	3.080	4.201	FAILURE	FAILURE	5.633	5.543
79820	4.261	3.617	3.585	4.702	FAILURE	FAILURE	6.236	6.103
79900	4.793	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	7.137	7.024
79950	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	8.070	7.978
							4.975	4.894
							0.192	0.192
							0.192	0.192

TABLE 8-13. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 46

SPECIMEN NUMBER: 46
 SKIN/STRINGER: S-33 3A S/N 2
 LOAD (KIP): 63.27
 SPECTRUM: CONST AMP
 HOLE SIZE (INCHES): 0.194
 CYCLES TO FAILURE: 72100
 % LIFE AT FAILURE:
 CRACK LGTH AT FAIL: 12.25

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN		STRINGER		SKIN		SKIN STRINGER	
	R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	BACK	FRONT
22150				0.047			0.241	0.249
30770				0.137			0.331	0.283
33850				0.185	0.055		0.379	0.314
37160				0.217	0.089		0.431	0.332
40030				0.287	0.120		0.481	0.355
42130				0.306	0.130		0.500	0.369
44710				0.360	0.161		0.554	0.379
47420				0.409	0.175		0.603	0.409
50110				0.460	0.185		0.654	0.435
53050				0.513	0.215		0.707	0.448
57650			0.051	0.621	0.241		0.866	0.466
60610			0.160	0.719	0.254		1.073	0.401
63540	0.724	0.303	0.315	0.041	0.272	0.011	1.350	0.513
65440	0.867	0.417	0.434	0.942	0.276	0.013	1.570	0.524
67440	0.994	0.593	0.642	1.130	0.306	0.020	1.966	0.563
69440	1.165	0.841	0.878	1.396	0.310	0.032	2.460	0.602
70330	1.395	1.047	1.075	1.606	0.337	0.100	2.875	
71710	1.610	2.522	2.434	2.993	0.388	FAILURE	5.621	
71970	2.972	3.710	3.341	3.868	FAILURE	FAILURE	7.751	
72020	3.847	3.928	3.809	4.203			8.406	
72060	4.284	4.397	4.372	4.774			9.438	
72100	FAILURE	FAILURE	FAILURE	FAILURE			12.250	

LEFT STRINGER CRACK LENGTH OF .100 IS AN ESTIMATE

TABLE 8-14. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 47

SPECIMEN NUMBER: 47
 SKIN/STRINGER: S-33 3A S/N 3
 LOAD (KIPS): 133
 SPECTRUM: A-10
 HOLE DIA (INCHES): 0.194
 CYCLES TO FAILURE: 255661
 % LIFE AT FAILURE: 132
 FINAL CRACK LGTH: 5.40

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		L/FRONT	R/BACK	L/BACK	STRINGER		TOTAL SKIN FRONT	CRACK SKIN BACK		LENGTH STRINGER FRONT
					R/FRONT	L/FRONT				R/FRONT	L/FRONT				
1	1	0	0	0							0.000	0.194	0.194	0.194	0.194
1	8	61	32	66840							0.012	0.194	0.194	0.194	0.206
1	9	61	36	74500							0.033	0.194	0.194	0.194	0.227
1	10	61	40	82167							0.046	0.194	0.194	0.194	0.240
1	11	61	44	89825							0.064	0.194	0.194	0.194	0.258
1	12	61	48	97488							0.071	0.194	0.194	0.194	0.265
1	13	61	52	104166							0.082	0.194	0.194	0.194	0.276
1	14	61	56	111024							0.091	0.194	0.194	0.194	0.285
1	15	61	60	119404							0.099	0.194	0.194	0.194	0.293
1	16	61	64	127145					0.088		0.116	0.194	0.282	0.310	0.310
1	17	61	68	134803					0.110		0.110	0.194	0.304	0.312	0.312
1	18	61	72	142464					0.134		0.129	0.194	0.328	0.323	0.323
1	19	61	76	149142					0.154		0.139	0.194	0.348	0.333	0.333
1	20	61	80	156801					0.175		0.147	0.194	0.369	0.341	0.341
1	21	61	84	164461					0.189		0.157	0.194	0.383	0.351	0.351
1	22	61	88	172120					0.202		0.159	0.194	0.396	0.353	0.353
1	23	61	92	179776					0.231		0.176	0.194	0.509	0.370	0.370
1	24	61	96	187441				0.084	0.254		0.193	0.194	0.566	0.387	0.387
1	25	61	100	194119				0.118	0.274		0.198	0.194	0.609	0.392	0.392
2	1	61	104	201776				0.141	0.305		0.234	0.194	0.662	0.455	0.455
2	2	61	108	209434				0.163	0.327		0.235	0.194	0.703	0.465	0.465
2	3	61	112	217094				0.182	0.358		0.256	0.194	0.754	0.496	0.496
2	4	61	116	224753				0.202	0.393		0.284	0.194	0.827	0.551	0.551
2	5	61	120	232410				0.240	0.444		0.349	0.194	0.924	0.844	0.844
2	6	61	124	240072				0.286	0.537		0.422	0.194	1.099	0.967	0.967
2	7	61	128	246751				0.368	0.643		0.476	0.194	1.303	1.298	1.298
2	8	61	132	254413	1.420	1.257	1.143	0.466	1.307	FAILURE	FAILURE	2.871	2.644		
2				255661	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE				

TABLE 8-15. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 48

SPECIMEN NUMBER: 48
 SKIN/STRINGER: S-33 3A S/N 4 CYCLES TO FAILURE: 224761
 LOAD (KIPS): 133 & LIFE AT FAILURE: 119
 SPECTRUM: A-10
 HOLE DIA (INCHES): 0.155 FINAL CRACK LGTH: 9.50

LIFE	PASS	BLOCK	% OF LIFE	CYCLES		SKIN		SKIN		STRINGER		TOTAL SKIN FRONT	CRACK SKIN		LENGTH STRINGER FRONT
				R/FRONT	L/FRONT	R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT		BACK	FRONT	
1	1	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.195	0.195	0.195	0.195
1	6	61	24	45942				0.000	0.000	0.030		0.195	0.195	0.225	0.225
1	7	61	28	52671				0.000	0.000	0.034		0.195	0.195	0.229	0.229
1	8	61	32	60282				0.081	0.081	0.041		0.195	0.276	0.236	0.236
1	9	61	36	67943				0.082	0.082	0.051		0.195	0.277	0.246	0.246
1	10	61	40	75602				0.061	0.061	0.061		0.195	0.277	0.256	0.256
1	11	61	44	83259				0.004	0.004	0.072		0.195	0.279	0.267	0.267
1	12	61	48	90896				0.080	0.080	0.004	0.020	0.195	0.283	0.299	0.299
1	13	61	52	97574				0.090	0.090	0.091	0.024	0.195	0.293	0.310	0.310
1	14	61	56	105232				0.100	0.100	0.095	0.024	0.195	0.295	0.314	0.314
1	15	61	60	112892				0.112	0.112	0.107	0.028	0.195	0.307	0.330	0.330
1	16	61	64	120552				0.119	0.119	0.116	0.037	0.195	0.314	0.348	0.348
1	17	61	68	128232				0.086	0.086	0.127	0.042	0.195	0.281	0.364	0.364
1	18	61	72	135924				0.109	0.109	0.144	0.051	0.195	0.304	0.390	0.390
1	19	61	76	142629				0.123	0.123	0.155	0.060	0.195	0.318	0.410	0.410
1	20	61	80	150317				0.140	0.140	0.175	0.075	0.195	0.335	0.445	0.445
1	21	61	84	158007				0.158	0.158	0.202	0.096	0.195	0.353	0.493	0.493
1	22	61	88	165695				0.177	0.177	0.224	0.126	0.195	0.372	0.545	0.545
1	23	61	92	173382				0.203	0.203	0.271	0.195	0.195	0.398	0.661	0.661
1	24	61	96	181076				0.243	0.243	0.301	0.207	0.195	0.541	0.863	0.863
1	25	61	100	187781				0.126	0.269	0.301	0.207	0.195	0.590	0.863	0.863
2	1	61	104	195469				0.157	0.301	0.361	0.287	0.195	0.653	0.863	0.863
2	2	61	108	203156				0.200	0.342	0.301	0.207	0.195	0.737	0.863	0.863
2	3	61	112	210846				0.284	0.444	FAILURE	FAILURE	0.195	0.923	FAILURE	FAILURE
2	4	45	115	216537	0.542	0.436		0.420	0.579			0.195	1.173	1.194	1.194
2	5	9	117	219722	0.881	0.673		0.644	0.814			1.749	1.653	1.653	1.653
2	5	50	119	224761	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE			9.500	FAILURE	FAILURE	FAILURE

TABLE 8-16. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 49

SPECIMEN NUMBER:	49	CYCLES TO FAILURE:	56100
SKIN/STRINGER:	S-33 3B S/N 1	% LIFE AT FAILURE:	
LOAD (K LBS)	63.20		
SPECTRUM:	CONST AMP	CRCK LGTH AT FAIL:	11.30
HOLE SIZE(INCHES):	0.195		

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN		SKIN		SKIN		SKIN	
	R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	R/BACK	L/FRONT
0			0.000		0.195		0.195	0.195
26500			0.128		0.195		0.323	0.195
29000			0.185		0.195		0.300	0.195
32700			0.241		0.195		0.436	0.195
35700			0.295		0.195		0.490	0.195
38700		0.322	0.351		0.517		0.546	0.195
41000		0.380	0.416		0.583		0.611	0.195
43800		0.430	0.466		0.625		0.661	0.195
45800		0.481	0.514		0.676	0.057	0.709	0.252
47700		0.539	0.564		0.734	0.082	0.759	0.277
53300		0.697	0.721		0.892	0.119	1.022	0.314
61400	0.612	1.344	1.279	0.106	2.151	0.280	2.113	0.475
64300	1.219	1.892	1.971	1.252	3.306	0.280	3.418	0.475
65200	1.676	2.426	2.437	1.682	4.297	0.280	4.314	0.014
65800	2.431	3.280	3.310	2.432	5.906		5.937	
65900	2.780	3.885	3.754	2.881	6.860		6.830	
66000	3.380	4.295	4.304	3.371	7.870		7.870	
66100	3.870	4.895	4.894	3.881	8.960		8.970	
66100	FAILURE	FAILURE	FAILURE	FAILURE	11.300		11.300	

TABLE 8-17. STRAIN SURVEY OF SPECIMEN NO. 50

SPECIMEN NUMBER		50		SPECTRUM:		A-10		CYCLES TO FAILURE:		641585	
SPECIMEN TYPE:		CENTER L		FINAL CRACK LGTH:		9		APPLIED LOAD(LBS):		50000	
CYCLES	% OF LIFE	CRACK LENGTH		***		STRAIN		(MICRO INCHES / INCH)		***	
		SKIN	STRINGER	CAGE 1	CAGE 2	CAGE 3	CAGE 4	CAGE 5	CAGE 6	CAGE 7	CAGE 8
		INCHES	INCHES	L/FRONT	L/FRONT	STRINGER	R/FRONT	R/FRONT	R/STRING	L/STRING	R/BACK
											L/BACK
0	0	0.000	0.000	1236	1242	1145	1238	1235	1401	1410	1221
38948	20	0.000	0.000	1236	1243	1135	1244	1245	1409	1423	1227
106200	56	0.000	0.000	1223	1230	1124	1234	1233	1477	1428	1218
151365	80	0.000	0.000	1230	1238	1135	1242	1240	1648	1461	1224
188834	100	0.000	0.000	1229	1236	1134	1240	1239	1940	1480	1223
196523	104	0.000	0.000	1228	1236	1134	1240	1238	2005	1503	1222
204212	108	0.000	0.000	1229	1236	1134	1241	1239	2075	1510	1223
211904	112	0.000	0.000	1227	1237	1135	1240	1237	2144	1516	1222
219594	116	0.000	0.000	1227	1236	1134	1239	1237	OFFSCALE	1524	1222
234975	124	0.263	0.297	1235	1244	1145	1246	1245	1545	1545	1228
272440	144	0.296	0.307	1227	1237	1137	1240	1237	1616	1616	1224
294529	156	0.334	0.320	1226	1236	1140	1242	1239	1629	1629	1227
325174	172	0.359	0.351	1228	1240	1142	1243	1238	1666	1666	1232
354828	188	0.418	0.377	1232	1246	1151	1247	1242	1711	1711	1241
376828	200	0.451	0.406	1229	1247	1153	1249	1240	1807	1807	1244
384485	204	0.465	0.425	1227	1250	1156	1253	1239	1933	1933	1249
312944	208	0.632	0.475	1233	1266	1177	1269	1244	2417	2417	1258
399804	212	0.630	0.511	1237	1257	1185	1278	1247	3112	3112	1266
407463	216	0.657	0.511	1243	1283	1188	1285	1254	3523	3523	1293
415121	220	0.694	0.595	1239	1283	1180	1285	1251	OFFSCALE	OFFSCALE	1699
422783	224	0.726	0.633	1230	1278	1168	1283	1243	1695	1695	1935
444783	236	0.832	0.728	1252	1309	1179	1312	1265	1605	1605	1267
467760	248	0.944	0.825	1250	1315	1161	1321	1262	1460	1460	1280
489758	260	1.063	0.925	1230	1290	1131	1308	1246	919	919	1246
527077	280	1.281	1.109	1229	1318	1090	1342	1247	620	620	1299
534737	284	1.323	1.141	1232	1326	1082	1354	1249	683	683	1314
564394	300	1.514	1.468	1255	1393	1060	1430	1274	599	599	1423
587369	312	1.702	1.694	1258	1468	975	1538	1276	802	802	1546
610348	324	2.028	2.016	1280	1775	547	2361	1303	1907	1907	2243
617027	328	2.028	2.016	1293	2470	452	4098	1319	3807	3807	3215
624688	332	2.599	2.591	1321	4951	444	OFFSCALE	1351	OFFSCALE	OFFSCALE	1127
632349	336	3.141	3.154	1383	OFFSCALE	801	1294	1423	840	840	OFFSCALE
640007	340	6.099	FAILURE	2733		1294		3717			



TABLE 8-18. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 50

SPECIMEN NUMBER: 50
 SKIN/STRINGER: S-33 JO S/N 2
 LOAD (KIIPS): 104
 SPECTRUM: A-10
 HOGE DIA(INCHES): 0.195
 CYCLES TO FAILURE: 641505
 & LIFE AT FAILURE: 344
 FINAL CRACK LGTH: 9.00

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	R/FRONT	SKIN L/BACK	R/BACK	SKIN L/FRONT	R/FRONT	STRINGER L/FRONT	R/FRONT	TOTAL SKIN FRONT	CRACK SKIN BACK	CRACK SKIN FRONT
1	1	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.195	0.195	0.195
2	6	61	124	234975	0.068	0.068	0.068	0.102	0.102	0.102	0.102	0.195	0.263	0.297
2	7	61	120	241600	0.072	0.072	0.072	0.107	0.107	0.107	0.107	0.195	0.267	0.302
2	8	61	132	249673	0.074	0.074	0.074	0.043	0.043	0.043	0.043	0.195	0.269	0.238
2	9	61	136	257063	0.077	0.077	0.077	0.008	0.008	0.008	0.008	0.195	0.272	0.283
2	10	61	140	264752	0.080	0.080	0.080	0.107	0.107	0.107	0.107	0.195	0.275	0.302
2	11	61	144	272440	0.101	0.101	0.101	0.112	0.112	0.112	0.112	0.195	0.296	0.307
2	12	61	148	280135	0.119	0.119	0.119	0.116	0.116	0.116	0.116	0.195	0.314	0.311
2	13	61	152	286840	0.132	0.132	0.132	0.125	0.125	0.125	0.125	0.195	0.327	0.314
2	14	61	156	294529	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.195	0.334	0.320
2	15	61	160	302193	0.145	0.145	0.145	0.133	0.133	0.133	0.133	0.195	0.340	0.328
2	16	61	164	309854	0.157	0.157	0.157	0.142	0.142	0.142	0.142	0.195	0.352	0.337
2	17	61	168	317512	0.164	0.164	0.164	0.152	0.152	0.152	0.152	0.195	0.358	0.347
2	18	61	172	325174	0.192	0.192	0.192	0.156	0.156	0.156	0.156	0.195	0.359	0.351
2	19	61	176	332852	0.205	0.205	0.205	0.162	0.162	0.162	0.162	0.195	0.387	0.357
2	20	61	180	339511	0.217	0.217	0.217	0.171	0.171	0.171	0.171	0.195	0.400	0.366
2	21	61	184	347170	0.223	0.223	0.223	0.179	0.179	0.179	0.179	0.195	0.412	0.374
2	22	61	186	354020	0.232	0.232	0.232	0.182	0.182	0.182	0.182	0.195	0.418	0.377
2	23	61	192	362484	0.249	0.249	0.249	0.189	0.189	0.189	0.189	0.195	0.427	0.384
2	24	61	196	370150	0.256	0.256	0.256	0.200	0.200	0.200	0.200	0.195	0.444	0.395
2	25	61	200	376020	0.270	0.270	0.270	0.211	0.211	0.211	0.211	0.195	0.451	0.404
3	1	61	204	384485	0.290	0.290	0.290	0.230	0.230	0.230	0.230	0.195	0.465	0.425
3	2	61	208	392944	0.304	0.304	0.304	0.280	0.280	0.280	0.280	0.195	0.632	0.475
3	3	61	212	397007	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.195	0.630	0.511
3	4	61	216	407463	0.335	0.335	0.335	0.336	0.336	0.336	0.336	0.195	0.657	0.511
3	5	61	220	415121	0.352	0.352	0.352	0.359	0.359	0.359	0.359	0.195	0.694	0.595
3	6	61	224	422703	0.366	0.366	0.366	0.387	0.387	0.387	0.387	0.195	0.726	0.633
3	7	61	228	429461	0.386	0.386	0.386	0.398	0.398	0.398	0.398	0.195	0.753	0.662
3	8	61	232	437123	0.403	0.403	0.403	0.401	0.401	0.401	0.401	0.195	0.794	0.696
3	9	61	236	444703	0.429	0.429	0.429	0.421	0.421	0.421	0.421	0.195	0.832	0.728
3	10	61	240	452441	0.443	0.443	0.443	0.441	0.441	0.441	0.441	0.195	0.872	0.763
3	11	61	244	460097	0.459	0.459	0.459	0.464	0.464	0.464	0.464	0.195	0.907	0.801
3	12	61	248	467760	0.471	0.471	0.471	0.470	0.470	0.470	0.470	0.195	0.944	0.825
3	13	61	252	474430	0.492	0.492	0.492	0.485	0.485	0.485	0.485	0.195	0.972	0.859
3	14	61	256	480747	0.515	0.515	0.515	0.504	0.504	0.504	0.504	0.195	1.017	0.889
3	15	61	260	489759	0.538	0.538	0.538	0.526	0.526	0.526	0.526	0.195	1.063	0.923
3	16	61	264	497420	0.559	0.559	0.559	0.544	0.544	0.544	0.544	0.195	1.105	0.970
3	17	61	268	505070	0.583	0.583	0.583	0.565	0.565	0.565	0.565	0.195	1.141	0.999
3	18	61	272	512739	0.596	0.596	0.596	0.589	0.589	0.589	0.589	0.195	1.184	1.039
3	19	61	276	519417	0.632	0.632	0.632	0.607	0.607	0.607	0.607	0.195	1.227	1.057
3	20	61	280	527077	0.670	0.670	0.670	0.616	0.616	0.616	0.616	0.195	1.281	1.109
3	21	61	284	534737	0.681	0.681	0.681	0.637	0.637	0.637	0.637	0.195	1.323	1.141
3	22	61	288	542396	0.670	0.670	0.670	0.655	0.655	0.655	0.655	0.195	1.302	1.169
3	23	61	292	550051	0.681	0.681	0.681	0.669	0.669	0.669	0.669	0.195	1.415	1.195
3	24	61	296	557716	0.715	0.715	0.715	0.681	0.681	0.681	0.681	0.195	1.475	1.212
3	25	61	300	564394	0.730	0.730	0.730	0.700	0.700	0.700	0.700	0.195	1.514	1.268
4	1	61	304	572051	0.794	0.794	0.794	0.750	0.750	0.750	0.750	0.195	1.505	1.521
4	2	61	308	579079	0.827	0.827	0.827	0.847	0.847	0.847	0.847	0.195	1.671	1.615
4	3	61	312	587369	0.837	0.837	0.837	0.819	0.819	0.819	0.819	0.195	1.702	1.594
4	4	61	316	595029	0.881	0.881	0.881	0.703	0.703	0.703	0.703	0.195	1.779	1.586
4	5	61	320	602686	0.901	0.901	0.901	0.742	0.742	0.742	0.742	0.195	1.878	1.879
4	6	61	324	610348	1.017	1.017	1.017	0.816	0.816	0.816	0.816	0.195	2.028	2.016
4	7	61	328	617027	1.138	1.138	1.138	0.911	0.911	0.911	0.911	0.195	2.244	2.356
4	8	61	332	624608	1.233	1.233	1.233	0.971	0.971	0.971	0.971	0.195	2.599	2.591
4	9	61	336	632349	1.664	1.664	1.664	1.071	1.071	1.071	1.071	0.195	3.141	3.154
4	10	61	340	640007	2.572	2.572	2.572	1.281	1.281	1.281	1.281	0.195	6.099	FAILURE
4	11	61	344	641461	3.033	3.033	3.033	2.865	2.865	2.865	2.865	0.195	8.534	FAILURE
4	11	61	344	641461	4.344	4.344	4.344	3.96	3.96	3.96	3.96	0.195	9.001	FAILURE

TABLE 8-19. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 51

SPECIMEN NUMBER: 51
 SKIN/STRINGER: S-33 3B S/N 3
 LOAD (KIPS): 63.30
 SPECTRUM: CONST AMP
 HOLE SIZE(INCHES): 0.192
 CYCLES TO FAILURE: 79700
 % LIFE AT FAILURE:
 CRCK LGTH AT FAIL: 11.80

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN R/FRONT	SKIN L/FRONT	R/BACK	SKIN L/BACK	STRINGER R/FRONT	STRINGER L/FRONT	SKIN FRONT	SKIN BACK
0				0.000			0.192	0.192
36700			0.192	0.192			0.192	0.384
40060			0.247	0.247			0.192	0.439
44200			0.302	0.302			0.192	0.494
46000			0.333	0.333			0.192	0.525
47800			0.368	0.368		0.081	0.192	0.550
48500		0.375	0.376	0.376		0.087	0.567	0.568
51100		0.416	0.426	0.426		0.109	0.608	0.618
55900		0.508	0.514	0.514		0.136	0.700	0.706
62300		0.657	0.673	0.673		0.176	0.849	0.865
66800		0.790	0.705	0.705		0.239	0.982	0.897
70900		0.990	1.000	1.000	FAILURE	FAILURE	1.182	1.398
75200		1.411	1.523	1.523	0.132	1.000	1.603	2.414
77600	0.874	1.916	1.906	0.886	0.132	1.050	2.982	2.984
78600	1.362	2.419	2.435	1.381	0.355	1.000	3.973	4.008
79200	1.857	2.919	2.935	1.859	FAILURE		4.968	4.986
79400	2.346	3.408	3.863	2.363			5.946	6.418
79600	2.897	3.936	3.954	2.898			7.025	7.044
79700	5.000	4.942	4.955	5.000			10.135	10.147
79700	FAILURE	FAILURE	FAILURE	FAILURE			11.800	11.800

TABLE 8-20. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 52

SPECIMEN NUMBER: 52
 SKIN/STRINGER: S-33 3B S/N 4
 LOAD (KIPS): 104
 STUTUM: A-10
 HOLE DIA (INCHES): 0.195
 CYCLES TO FAILURE: 685542
 % LIFE AT FAILURE: 368
 FINAL CRACK LGTH: 9.70

LIFE	PASS	BLOCK	% OF LIFE	SKIN		SKIN		STRINGER		TOTAL SKIN		CRACK SKIN		LENGTH STRINGER FRONT
				CYCLES	R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	FRONT	BACK	BACK	
1	3	61	12	22973							0.195	0.195	0.195	0.195
1	15	61	60	112920							0.195	0.195	0.195	0.195
1	19	61	76	142585							0.195	0.195	0.195	0.195
2	11	61	144	270832			0.111				0.195	0.306	0.306	0.231
2	13	61	152	285174			0.133		0.036		0.195	0.328	0.328	0.249
2	15	61	160	300942			0.146		0.054		0.195	0.341	0.341	0.268
2	17	61	168	315811			0.166		0.073		0.195	0.361	0.361	0.265
2	19	61	176	330151			0.184		0.070		0.195	0.379	0.379	0.307
2	21	61	184	345467			0.207		0.112		0.195	0.402	0.402	0.307
2	23	61	192	360783			0.224		0.117		0.195	0.419	0.419	0.312
2	25	61	200	375121			0.245		0.128		0.195	0.440	0.440	0.323
3	1	61	204	382792			0.252		0.132		0.195	0.447	0.447	0.327
3	3	61	212	390101			0.270		0.145		0.195	0.465	0.465	0.340
3	5	61	220	413414			0.294		0.159		0.195	0.489	0.489	0.354
3	7	61	228	427755			0.315		0.170		0.195	0.510	0.510	0.365
3	9	61	236	443076			0.336		0.187		0.195	0.531	0.531	0.382
3	11	61	244	458391			0.360	0.094	0.212	0.010	0.195	0.649	0.649	0.417
3	13	61	252	472732			0.384	0.123	0.387	0.073	0.195	0.706	0.706	0.605
3	15	61	260	486050			0.425	0.166	0.424	0.031	0.195	0.786	0.786	0.650
3	17	61	268	503069			0.462	0.196	0.460	0.065	0.195	0.853	0.853	0.720
3	19	61	276	517709			0.494	0.232	0.490	0.103	0.195	0.921	0.921	0.788
3	21	61	284	533027			0.527	0.266	0.521	0.135	0.195	0.988	0.988	0.851
3	23	61	292	540342			0.573	0.316	0.563	0.171	0.195	1.084	1.084	0.929
3	25	61	300	562687			0.607	0.363	0.617	0.203	0.195	1.165	1.165	1.015
4	1	61	304	570345			0.644	0.389	0.637	0.223	0.195	1.228	1.228	1.055
4	3	61	312	585665			0.669	0.446	0.604	0.259	0.195	1.310	1.310	1.138
4	5	61	320	600981			0.756	0.500	0.731	0.305	0.195	1.451	1.451	1.231
4	7	61	328	615332			0.837	0.565	0.784	0.557	0.195	1.597	1.597	1.536
4	9	61	336	630642			0.880	0.644	0.869	0.640	0.195	1.719	1.719	1.704
4	11	61	344	645956			0.957	0.743	0.947	0.730	0.195	1.895	1.895	1.872
4	12	61	348	653621			1.020	0.800	0.996	0.704	0.195	2.023	2.023	1.975
4	13	61	352	660300			1.075	0.930	1.065	0.860	0.195	2.208	2.208	2.128
4	14	61	356	667959			1.173	0.993	1.153	0.970	0.195	2.361	2.361	2.318
4	15	61	360	675619			1.391	1.238	1.361	1.225	0.195	2.824	2.824	2.781
4	16	61	364	683281			1.892	1.791	1.886	1.777	0.195	3.878	3.878	3.858
4	17	61	368	685542			2.474	2.159	2.486	2.308	0.195	5.028	5.028	5.069
4				683155			FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	5.700	5.700	9.700

TABLE 8-21. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 53

SPECIMEN NUMBER: 53
 SKIN/STRINGER: S-35-SA S/N 1
 LOAD(KIPS): 104.50
 SPECTRUM: CONST AMP
 HOLE SIZE(INCHES): 0.261
 CYCLES TO FAILURE: 64725
 % LIFE AT FAILURE:

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN		STRINGER		SKIN		STRINGER	
	R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	R/BACK	L/BACK
0								
42568					0.000	0.000		
43456					0.265			
43694					0.330			
43900					0.370			
44141					0.424			
47075					0.470			
47452					0.470	0.165		
48023					0.470	0.219		
48353					0.470	0.273		
48703					0.470	0.335		
49000					0.470	0.385		
49301					0.470	0.446		
49500					0.470	0.537		
49700					0.470	0.628		
60587								
64720	4.270	2.800	2.898	0.123				
64725	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE

CRACK ALSO OCCURRED AT RADIUS IN GRIP REGION

TABLE 8-22. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 54

SPECIMEN NUMBER: 54
SKIN/STRINGER: S-35-5A S/N 2
LOAD, KTF: 104.50
SPECTRUM: CONST: AMP
HOLE SIZE(INCHES): 0.252

CYCLES	NEW CRACK LENGTH				TOTAL CRACK LENGTH			
	SKIN		SKIN		SKIN		SKIN	
	R/FRONT	L/FRONT	R/DACK	L/DACK	R/FRONT	L/FRONT	R/DACK	L/FRONT
0			0.000				0.252	0.252
38090			0.142				0.252	0.252
43000			0.226				0.252	0.252
48030			0.307				0.394	0.252
52300			0.417				0.478	0.252
56890			0.539				0.559	0.252
61000		0.545	0.702			0.190	0.669	0.442
65570		0.723	1.087			0.475	0.791	0.727
66560		1.081	1.237	0.303		0.475	0.954	0.727
66850		1.238	1.316	0.516	0.100	0.475	1.612	0.827
68000		1.314	1.819	0.689	0.213	0.475	2.005	0.940
68060		1.820	2.321	0.689	0.661	0.475	2.257	1.388
68760		2.318	2.560	1.047	1.061	0.475	2.760	1.788
69020		2.556	2.817	1.204	1.061	0.475	3.620	1.788
69230		2.810	3.045	1.475	1.077	0.475	4.016	1.788
69350	1.903	3.030	3.588	1.975	1.332	0.475	4.544	1.804
69460	2.075	3.554	4.047	2.075	FAILURE	FAILURE	5.185	2.059
69530	2.075	4.036	4.923	2.075	FAILURE	FAILURE	5.881	5.915
69540	2.075	4.937	5.923	2.075	FAILURE	FAILURE	6.363	6.374
69542	2.075	5.955	7.373	2.075	FAILURE	FAILURE	7.264	7.250
69545	2.075	7.425	FAILURE	2.075	FAILURE	FAILURE	8.282	8.250
69547	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	9.752	9.700
							12.900	12.900

TABLE 8-23. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 55

SPECIMEN NUMBER: 55
 SKIN/STRINGER: S-35-SA S/N 3
 LOAD (KIPS): 219.7
 SPECTRUM: A-10
 HOLE DIA(INCHES): 0.253
 CYCLES TO FAILURE: 100823
 % LIFE AT FAILURE: 53
 FINAL CRACK LGTH: 3.10

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		L/BACK	R/FRONT	STRINGER		TOTAL SKIN FRONT	CRACK		LENGTH STRINGER FRONT
					R/FRONT	L/FRONT			R/FRONT	L/FRONT		SKIN BACK	SKIN BACK	
1	1	0	0	0							0.253	0.253	0.253	0.253
1	8	61	32	60801			0.000				0.253	0.337	0.337	0.253
1	9	44	35	66450			0.084				0.253	0.358	0.358	0.253
1	9	61	36	60526			0.105				0.253	0.371	0.371	0.253
1	10	44	39	74180			0.118				0.253	0.389	0.389	0.253
1	10	61	40	76246			0.136				0.253	0.396	0.396	0.253
1	11	61	44	83965			0.143				0.253	0.429	0.429	0.253
1	12	44	47	89618			0.217		0.106		0.253	0.470	0.470	0.359
1	12	61	48	91689			0.223		0.140		0.253	0.476	0.476	0.393
1	13	44	51	97343			0.272	0.110	0.240		0.253	0.635	0.635	0.501
1	13	53	51	98421			0.298	0.151	0.440		0.253	0.702	0.702	0.693
1	14	19	53	100823			FAILURE	FAILURE	FAILURE	FAILURE	3.109	3.100	3.100	FAILURE

TABLE 8-24. STRAIN SURVEY OF SPECIMEN NO. 56

SPECIMEN NUMBER: 56		SPECTRUM: A-10		CYCLES TO FAILURE: 160900										
SPECIMEN TYPE: EDGE L		FINAL CRACK LGTH: 5		APPLIED LOAD(LBS): 132000										
CYCLES	% OF LIFE	CRACK LENGTH		STRAIN (MICRO INCHES / INCH)										
		SKIN INCHES	STRINGER INCHES	GAGE 1 L/STRING	GAGE 2 L/STRING	GAGE 3 SKIN/F	GAGE 4 R/STRING	GAGE 5 R/STRING	GAGE 6 B/C/SKIN	GAGE 7 B/C/SKIN	GAGE 8 B/SKIN	GAGE 9 B/SKIN		
0	0	0.000	0.000	1614	1959	2108	1927	1599	2093	2069	2192	2262	2150	2031
23170	12	0.000	0.000	1525	1934	2181	1815	1554	2174	2133	2276	2316	2200	2026
46336	24	0.000	0.000	1519	1932	2176	1806	1546	2165	2134	2275	2311	2197	2024
68523	36	0.000	0.000	1530	1949	2192	1827	1567	2183	2168	2303	2329	2211	2041
91685	48	0.000	0.000	1533	1951	2199	1867	1571	2184	2176	2311	2330	2213	2042
106137	56	0.000	0.000	1533	1951	2213	1944	1575	2184	2181	2317	2333	2214	2045
121581	64	0.000	0.418	1542	1962	2260	2340	1599	2195	2167	2328	2344	2223	2054
123637	65	0.000	0.447	1538	1961	2275	2631	1604	2202	2165	2337	2352	2228	2056
125692	66	0.000	0.460	1539	1960	2256	2644	1602	2189	2158	2331	2343	2220	2050
127748	67	0.000	0.481	1541	1963	2292	2972	1617	2198	2172	2348	2349	2224	2054
129299	68	0.000	0.556	1543	1964	2289	2089	1617	2186	2164	2346	2346	2223	2055
131354	69	0.000	0.720	1540	1963	2350	6026	1671	2178	2184	2384	2356	2226	2055
133410	70	0.000	0.878	1542	1963	2403	10316	1725	2181	2240	2404	2359	2226	2054
135465	71	0.000	0.999	1541	1963	2500	OFFSCALE	1816	2233	2390	2449	2371	2229	2055
137022	72	0.000	1.158	1542	1965	2589	OFFSCALE	1908	2309	2523	2495	2382	2231	2055
139077	73	0.000	1.399	1528	1959	2797		2207	2603	2763	2586	2406	2228	2045
147866	78	0.330	1.399	1541	1965	2830		2232	2601	2998	2560	2409	2237	2056
151530	81	0.349	1.863	1534	1959	2865		2266	2649	3545	2561	2416	2237	2054
155586	82	0.473	1.903	1537	1959	2881		2269	2662	3719	2572	2409	2232	2050
157642	83	0.598	2.014	1531	1952	3002		2388	2773	2537	2695	2417	2232	2047
159196	84	0.657	2.071	1535	1955	3135		2468	2872	788	2816	2421	2230	2046
160900	85	5.000	FAILURE											

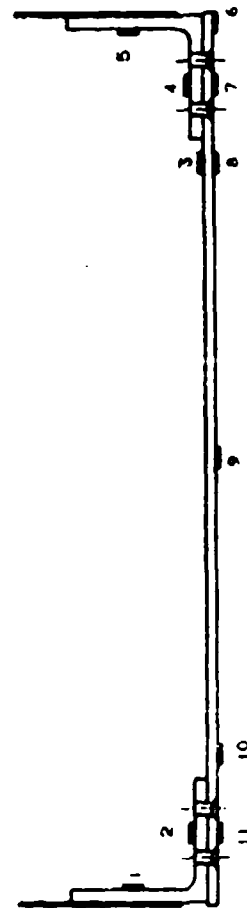


TABLE 8-25. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 56

SPECIMEN NUMBER: 56
 SKIN/STRINGER: S-35-SA-S/N 4
 LOAD (KIPS): 219.7
 SPECTRUM: A-10
 HOLE DIA (INCHES): 0.253
 CYCLES TO FAILURE: 160900
 % LIFE AT FAILURE: 85
 FINAL CRACK LGTH: 5.00

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN R/FRONT	SKIN L/FRONT	R/BACK	L/BACK	STRINGER R/FRONT	STRINGER L/FRONT	TOTAL SKIN FRONT	CRACK SKIN BACK	LENGTH STRINGER FRONT
1	1	0	0	0			0.000			0.000	0.253	0.253	0.253
1	16	61	64	121581			0.000			0.165	0.253	0.253	0.418
1	17	16	65	123637			0.000			0.194	0.253	0.253	0.447
1	17	32	66	125692			0.000			0.207	0.253	0.253	0.460
1	17	48	67	127748						0.220	0.253	0.253	0.481
1	17	61	68	129299					0.062	0.241	0.253	0.253	0.556
1	18	16	69	131354					0.096	0.371	0.253	0.253	0.720
1	18	32	70	133410					0.169	0.456	0.253	0.253	0.878
1	18	48	71	135465					0.290	0.456	0.253	0.253	0.999
1	18	61	72	137022					0.449	0.456	0.253	0.253	1.158
1	19	16	73	139077					0.690	0.456	0.253	0.253	1.399
1	20	32	78	147866			0.077		0.690	0.456	0.253	0.330	1.399
1	21	16	81	153530			0.096		1.154	0.456	0.253	0.349	1.863
1	21	32	82	155586			0.106	0.114	1.194	0.456	0.253	0.473	1.903
1	21	48	83	157642			0.126	0.219	1.305	0.456	0.253	0.598	2.014
1	21	61	84	159196			0.156	0.240	1.362	0.456	0.253	0.657	2.071
1	22	13	85	160900	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	5.000	5.000	FAILURE

NO CRACK WAS OBSERVED ON THE FRONT SKIN BEFORE FAILURE

TABLE 8-26. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 57

SPECIMEN NUMBER: 57
 SKIN/STRINGER: S-35-5B S/N 1
 LOAD (KIP): 104.50
 SPECTRUM: CONST AMF
 HOLE SIZE (INCHES): 0.252

CYCLES TO FAILURE: 92784
 % LIFE AT FAILURE:

CYCLES	SKIN		NEW CRACK LENGTH		STRINGER		TOTAL CRACK LENGTH	
	R/FRONT	L/FRONT	R/BACK	SKIN L/BACK	R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK
0	0.000			0.000			0.252	0.252
31669				0.155			0.252	0.407
36669				0.272			0.252	0.524
41669				0.363			0.252	0.615
46668				0.474			0.252	0.726
51668				0.623			0.252	0.875
56684				0.780			0.252	1.032
59736				0.981			0.252	1.233
60040	1.071			1.120			1.323	1.372
65040	1.071		0.088	1.120			1.323	1.460
70949	1.071		0.676	1.120			1.323	2.048
81676	1.071		1.110	1.120			1.323	2.482
87389	1.071	1.522	1.540	1.120			2.845	2.912
88859	1.071	2.026	2.049	1.120			3.349	3.421
89834	1.071	2.525	2.555	1.120			3.840	3.927
90408	1.071	2.936	2.995	1.120			4.259	4.367
90970	1.071	3.462	3.522	1.120			4.785	4.894
91358	1.071	3.963	4.011	1.120			5.286	5.303
91636	1.071	4.408	4.450	1.120			5.731	5.822
91089	1.071	4.918	4.996	1.120			6.241	6.368
92073	1.071	5.366	5.412	1.120			6.689	6.784
92252	1.071	5.893	5.945	1.120			7.216	7.317
92382	1.071	6.338	6.361	1.120			7.661	7.777
92506	1.071	6.879	6.900	1.120			8.202	8.272
92604	1.071	7.394	7.413	1.120			8.717	8.785
92681	1.071	7.856	7.880	1.120			9.179	9.252
92750	1.071	8.386	8.400	1.120			9.709	9.772
92783	1.071	10.364	10.347	1.120			11.687	11.719
92784	FAILURE	FAILURE	FAILURE	FAILURE			11.700	FAILURE

NO CRACK APPEARED ON STRINGER PRIOR TO FAILURE

TABLE 8-28. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 59

SPECIMEN NUMBER: 59
 SKIN/STRINGER: 9-33 30 9/N 3
 LOAD (KIPS): 219.8
 SPECTRUM: A-10
 HOLE DIA (INCHES): 0.248
 CYCLES TO FAILURE: 173713
 % LIFE AT FAILURE: 92
 FINAL CRACK LGTH: 3.50

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		STRINGER		TOTAL SKIN FRONT	CRACK SKIN BACK		LENGTH STRINGER FRONT
					R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT				
1	1	0	0	0				0.000			0.248	0.248		0.248
1	13	61	52	98414				0.096			0.248	0.344		0.248
1	14	61	56	106113				0.115			0.248	0.363		0.248
1	15	61	60	113856				0.171			0.248	0.419		0.248
1	16	61	64	121579				0.212			0.248	0.460		0.248
1	17	61	68	129290				0.258			0.248	0.506		0.248
1	18	61	72	137021				0.291			0.248	0.539		0.248
1	19	61	76	143754				0.340	0.127		0.248	0.588		0.375
1	20	61	80	151474				0.377	0.166		0.248	0.625		0.414
1	21	61	84	159195				0.431	0.203		0.248	0.679		0.451
1	22	61	88	166915				0.520	0.259	0.854	0.248	0.768	1.361	
1	23	55	92	173913	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	3.500	3.500		FAILURE

NO CRACK AS DETECTED ON THE FRONT SKIN

TABLE 8-29. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 60

SPECIMEN NUMBER: 60
 SKIN/STRINGER: S-35-50 S/N 4
 LOAD (KIPS): 219.8
 SPECTRUM: A-10
 HOLE DIA(INCHES): 0.251
 CYCLES TO FAILURE: 130030
 % LIFE AT FAILURE: 68
 FINAL CRACK LGTH: 3.10

I.IFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		R/BACK	SKIN		L/BACK	STRINGER		TOTAL SKIN	CRACK		LENGTH STRINGER FRONT
					R/FRONT	L/FRONT		R/BACK	L/BACK		R/FRONT	L/FRONT		SKIN	BACK	
1	1	0	0	0						0.000			0.251	0.251	0.251	0.251
1	10	61	40	76237						0.090			0.251	0.341	0.341	0.251
1	11	44	43	81090						0.132			0.251	0.383	0.383	0.251
1	11	61	44	83305						0.147			0.251	0.398	0.398	0.251
1	12	44	47	89609						0.187			0.251	0.438	0.438	0.251
1	12	61	48	91600						0.190			0.251	0.441	0.441	0.251
1	13	31	50	95663						0.217			0.251	0.468	0.468	0.251
1	13	53	51	90411						0.234			0.251	0.485	0.485	0.251
1	14	51	55	102394						0.252			0.251	0.503	0.503	0.251
1	14	61	56	106131						0.278			0.251	0.529	0.529	0.342
1	15	31	50	110114				0.123		0.310			0.251	0.604	0.604	0.358
1	15	61	60	113852				0.153		0.340			0.251	0.752	0.752	0.384
1	16	31	62	117034				0.210		0.396			0.251	0.857	0.857	0.406
1	16	61	64	121574				0.261		0.446			0.251	0.958	0.958	0.440
1	17	31	66	125557				0.372		0.567			0.251	1.190	1.190	0.477
1	17	46	67	127479				0.706		1.075			0.251	2.032	2.032	0.529
1	17	57	68	128037				1.295		1.075		0.101	0.251	2.621	2.621	0.687
1	17	61	68	129293				1.394		1.075		0.140	0.251	2.720	2.720	0.752
1	18	3	68	129589				1.549		1.075		0.208	0.251	2.875	2.875	0.870
1	18	5	68	129891				1.730		1.075		0.294	1.972	3.056	3.056	1.012
1	18	6	68	130030				FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	3.100	3.100	3.100	FAILURE

TABLE 8-30. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 61

SPECIMEN NUMBER: 61
 SPECIMEN TYPE: CENTER T
 SKIN/STRINGER: S-37-7A S/N 1
 LOAD (KIPS): 219.9
 STRESS (KSI): 30.5
 SPECTRUM : AMAVS
 CYCLES TO FAILURE: 146742
 % LIFE AT FAILURE: 100
 LOAD AT FAILURE: 159390
 FINAL CRACK LGTH: 4.6
 HOLE DIA (INCHES): 0.311

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		STRINGER		TOTAL CRACK LENGTH	
					R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK
1	1	0	0	0					0.000		0.311	0.311
1	7	88	54	79019					0.221		0.311	0.532
1	8	88	62	90306			0.132		0.348		0.311	0.659
1	9	88	69	101595			0.259		0.440		0.311	0.751
1	10	88	77	112882			0.372		0.489		0.311	0.800
1	11	88	85	124168			0.498		0.526		0.311	0.837
1	12	88	92	135455			0.678		0.526		0.311	0.989
1	13	88	100	146742	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	4.600	FAILURE

FAILURE OCCURRED AT 159390 POUNDS

TABLE 8-31. STRAIN SURVEY OF SPECIMEN NO. 62

SPECIMEN NUMBER: 62 SPECTRUM: AMAS CYCLES TO FAILURE: 540007
 SPECIMEN TYPE: CENTER T FINAL CRACK LGTH: 2.8 APPLIED LOAD(LBS): 132000

CYCLES	% OF LIFE	CRACK LENGTH		GAGE 1	GAGE 2	GAGE 3	STRAIN			THICK 0 INCHES / INCH									
		SKIN INCHES	STRINGER INCHES	L/F/SKIN	L/F/SKIN	F/STRING	R/F/SKIN	R/F/SKIN	R/F/SKIN	L/B/SKIN	C/B/SKIN	R/B/SKIN	GAGE 8	GAGE 9	GAGE 10	GAGE 11			
0	0	0.000	0.000	1746	1727	1227	1779	1753	1689	1715	1749								
67736	46	0.000	0.000	1741	1737	1187	1788	1776	2205	1720	1744								
101609	69	0.000	0.000	1754	1747	1203	1800	1788	2245	1731	1752								
158042	108	0.000	0.000	1736	1737	1202	1789	1775	1960	1723	1741								
203197	138	0.000	0.000	1717	1717	1316	1708	1737	1757	1711	1731								
259639	177	0.000	0.000	1732	1729	2486	2031	1754	1785	1724	1742								
293500	200	0.000	0.000	1731	1729	3712	2850	1753	1783	1724	1742								
304790	207	0.000	0.000	1722	1720	6574	4233	1743	1776	1715	1733								
327368	223	0.000	0.000	1719	1719	5174	3173	1741	1774	1715	1732								
338655	230	0.000	0.000	1719	1717	14300	2680	1741	1773	1713	1733								
349942	238	0.000	0.454	1721	1719	10455	6760	1746	1773	1714	1733								
355597	242	0.000	0.457	1736	1724	OFFSCALE	12466	1745	1772	1714	1738								
383809	261	0.000	0.473	1720	1720	4607	4899	1747	1774	1712	1733								
406382	276	0.000	0.496	1726	1727	1695	1730	1758	1780	1715	1740								
412036	280	0.424	0.498	1718	1724	1334	1716	1729	1745	1710	1729								
440370	300	0.426	0.508	1714	1727	1336	1728	1748	1755	1709	1733								
474228	323	0.426	0.523	1707	1722	1329	1750	OFFSCALE	1751	1692	1724								
485516	330	0.426	0.529	1708	1725	1337	2581	OFFSCALE	1753	1688	1729								
508095	346	0.426	0.535	1710	1729	1339	5470		1759	1681	1729								
519385	353	0.426	0.538	1709	1735	1344	1737	1725	1766	1677	1730								
530673	361	0.426	0.549	1711	1742	1338	1746	1724	1772	1658	1732								
541962	369	0.426	0.553	1726	1699	1318	1812	1737	1839	1534	1641								
544007	370	FAILURE	FAILURE																

AS CAN BE SEEN IN THE ABOVE TABLE SEVERAL PROBLEMS WERE ENCOUNTERED IN RECORDING STRAIN DATA WHERE THE STRAIN BECAME ABNORMALLY HIGH. IN MOST CASES THIS WAS DUE TO A DISCONNECT OF THE LEADWIRE

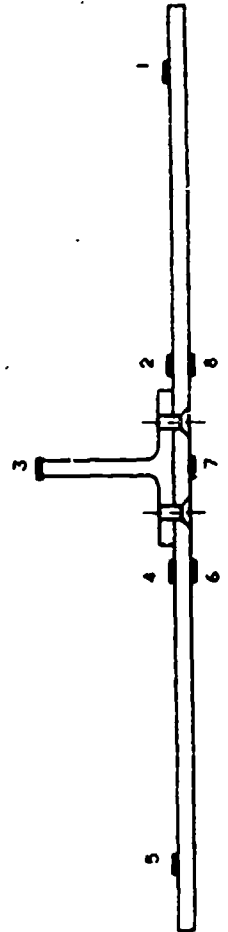


TABLE 8-32. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 62

SPECIMEN NUMBER: 62
 SPECIMEN TYPE: CENTER T
 SKIN/STRINGER: S-37-7A S/N 2
 LOAD (KIPS): 219
 STRESS (KSI): 30.5
 SPECTRUM: AMAVS

CYCLES TO FAILURE: 544007
 % LIFE AT FAILURE: 371
 FAILURE LOAD(LBS): N/A
 FINAL CRACK LGTH: 2.8
 HOLE DIA (INCHES): 0.312

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		STRINGER		TOTAL CRACK LENGTH	
					R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK
1	1	0	0	0			0.000		0.000	0.000	0.312	0.312
3	5	88	238	349942					0.142	0.142	0.312	0.312
3	6	44	242	355597					0.145	0.145	0.312	0.312
3	6	88	246	361231					0.151	0.151	0.312	0.312
3	7	44	250	366887					0.156	0.156	0.312	0.312
3	7	88	254	372520					0.161	0.161	0.312	0.312
3	8	44	258	378176					0.161	0.161	0.312	0.312
3	8	88	262	383809					0.161	0.161	0.312	0.312
3	9	44	265	384463					0.161	0.161	0.312	0.312
3	9	88	269	395097					0.161	0.161	0.312	0.312
3	10	44	273	400750					0.170	0.170	0.312	0.312
3	10	88	277	406383					0.184	0.184	0.312	0.312
3	11	44	281	412036					0.186	0.186	0.312	0.312
3	11	88	288	423323			0.112		0.191	0.191	0.312	0.312
3	12	44	292	429084			0.115		0.191	0.191	0.312	0.312
3	12	88	296	434737			0.114		0.196	0.196	0.312	0.312
3	13	44	300	440370			0.114		0.196	0.196	0.312	0.312
3	13	88	304	446024			0.114		0.196	0.196	0.312	0.312
4	1	44	308	451582			0.114		0.197	0.197	0.312	0.312
4	1	88	312	457312			0.114		0.205	0.205	0.312	0.312
4	2	44	315	462943			0.114		0.207	0.207	0.312	0.312
4	2	88	319	468597			0.114		0.211	0.211	0.312	0.312
4	3	44	323	474228			0.114		0.211	0.211	0.312	0.312
4	3	88	327	479883			0.114		0.216	0.216	0.312	0.312
4	4	44	331	485516			0.114		0.217	0.217	0.312	0.312
4	4	88	335	491172			0.114		0.222	0.222	0.312	0.312
4	5	44	338	496806			0.114		0.223	0.223	0.312	0.312
4	5	88	346	508095			0.114		0.223	0.223	0.312	0.312
4	6	44	354	519385			0.114		0.226	0.226	0.312	0.312
4	7	88	362	530673			0.114		0.237	0.237	0.312	0.312
4	8	44	369	541962			0.114		0.241	0.241	0.312	0.312
4	9	88	371	544007			FAILURE		FAILURE	FAILURE	2.800	2.800
4	10	16									FAILURE	FAILURE

FAILURE OF THE SKIN DID NOT OCCUR AT THE RIVET
 LOCATION CONTAINING THE PRE-CRACK

TABLE 8-33. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 63

SPECIMEN NUMBER: 63
 SPECIMEN TYPE: CENTER T
 SKIN/STRINGER S-37-7B S/N 1
 LOAD (KIPS): 219.9
 STRESS (KSI): 30.5
 SPECTRUM: AMMS
 CYCLES TO FAILURE: 156117
 % LIFE AT FAILURE: 106
 FAILURE LOAD(LBS): 173800
 FINAL CRACK LGTH: 7.2
 HOLE DIA (INCHES): 0.315

LIFT	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		STRINGER R/FRONT	STRINGER L/FRONT	TOTAL CRACK LENGTH		
					R/FRONT	L/FRONT	R/BACK	L/BACK			SKIN FRONT	SKIN BACK	STRINGER FRONT
1	1	0	0	0	0.000		0.000	0.000			0.315	0.315	0.315
1	7	88	54	79629					0.122		0.315	0.315	0.437
1	8	88	62	90319				0.203			0.315	0.518	0.481
1	9	88	69	101611				0.324			0.315	0.639	0.615
1	10	44	73	107264				0.376			0.315	0.691	0.695
1	10	88	77	112897				0.452			0.315	0.767	0.792
1	11	16	78	114837				0.469			0.817	0.784	0.792
1	11	44	81	118530	0.502			0.522			0.884	0.837	0.792
1	11	88	85	124183	0.618			0.609			0.933	0.924	0.792
1	12	44	88	129336	0.688			0.686			1.003	1.001	0.792
1	12	88	92	135468	0.792			0.800		0.203	1.107	1.115	0.995
1	13	44	96	141122	0.909			0.923		0.448	1.224	1.238	1.240
1	13	88	100	146755	1.071			1.105		0.448	1.386	1.420	1.240
2	1	44	104	152303	1.364		0.082	1.396		0.448	1.679	1.793	1.240
2	1	61	105	154514	1.585		0.262	1.624		0.448	1.900	2.201	1.240
2	1	64	106	154966	1.678		0.390	1.718		0.448	1.993	2.423	1.240
2	1	67	106	155320	1.736		0.519	1.808		0.448	2.051	2.642	1.240
2	1	70	106	155637	1.902		0.715	2.161		0.448	2.217	3.191	1.240
2	1	70	106	155662	2.202		0.892	2.331		0.448	2.517	3.538	1.240
2	1	72	106	155901	2.335		1.118	2.505		0.448	2.650	3.938	1.760
2	1	73	106	156008	2.516		1.420	2.708		0.448	2.831	4.443	1.845
2	1	73	106	156103	2.758		1.512	2.930		0.448	3.073	4.757	1.948
2	1	73	105	156117	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	7.200	7.200	FAILURE

TABLE 8-34. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 64

SPECIMEN NUMBER: 64
 SPECIMEN TYPE: CENTER T
 SKIN/STRINGER: S-37-78 S/N 2
 LOAD (KIPS): 219.9
 STRESS (KSI): 36.5
 SPECTRUM: AMMS
 CYCLES TO FAILURE: 204191
 % LIFE AT FAILURE: 139
 FAILURE LOAD(LBS): 146190
 FINAL CRACK LOH: 6.5
 HOLE DIA (INCHES): 0.316

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		STRINGER	TOTAL CRACK LENGTH	
					R/FRONT	L/FRONT	R/BACK	L/BACK		SKIN FRONT	SKIN BACK
1	1	0	0	0						0.316	0.316
1	11	88	85	124176				0.128		0.316	0.316
1	12	44	88	129830				0.274		0.316	0.316
1	12	88	92	135464				0.331		0.316	0.316
1	13	44	96	141118				0.383		0.316	0.316
1	13	88	100	146751				0.447		0.316	0.316
2	1	44	104	152465				0.501		0.316	0.316
2	1	88	108	158033				0.563		0.316	0.316
2	2	44	112	163693	0.593			0.621		0.316	0.316
2	2	88	115	169327	0.666			0.689		0.909	0.937
2	3	44	119	174983	0.742			0.762		0.982	1.005
2	3	88	123	180617	0.821			0.829		1.058	1.078
2	4	44	131	191905	1.061		0.116	0.889		1.137	1.145
2	4	88	135	197560	1.326		0.249	1.045		1.245	1.321
2	5	44	136	199101	1.408		0.606	1.336		1.377	1.610
2	5	56	137	200900	1.649		0.698	1.423		1.642	2.258
2	5	84	138	202399	2.117		0.946	1.685		1.724	2.437
2	5	88	138	203193	3.396		1.417	2.193		1.965	2.947
2	6	7	139	204003	FAILURE		1.417	3.470		2.433	3.926
2	6	8	139	204191	FAILURE		1.147	FAILURE	FAILURE FAILURE2	3.712	5.203
2	6	8	139	204191	FAILURE		FAILURE	FAILURE	FAILURE FAILURE2	6.500	6.500
2	6	8	139	204191	FAILURE		FAILURE	FAILURE	FAILURE FAILURE2	6.500	6.500

TABLE 8-33. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 65

SPECIMEN NUMBER: 65
 SPECIMEN TYPE: CENTER T - SPLIT SKIN
 SKIN/STRINGER: S-37-9A-S/N 1
 LOAD (PIPS): 21C
 STRESS (KSI): 36.35
 SPECTRUM: AMAVS
 CYCLES TO FAILURE: 259515
 % LIFE AT FAILURE: 177
 FAILURE LOAD(LBS): N/A
 FINAL CRACK LGTH: 2.3
 HOLE DIA (INCHES): 0.314

LIFE	PASS	BLOCK	% OF LIFE	SKIN		CYCLES	SKIN		R/BACK	L/BACK	STRINGER		TOTAL CRACK LENGTH	
				R/FRONT	L/FRONT		R/BACK	L/BACK			R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK
1	1	0	0			0					0.000		0.314	0.314
1	9	88	69	101612		101612					0.128		0.314	0.442
1	10	44	73	107265		107265					0.172		0.314	0.486
1	10	88	77	112899		112899					0.209		0.314	0.523
1	11	44	81	118553		118553					0.245		0.314	0.559
1	11	88	85	124186		124186					0.292		0.314	0.606
1	12	44	88	129840		129840					0.329		0.314	0.643
1	12	88	92	135473		135473					0.372		0.314	0.686
1	13	44	96	141127		141127					0.413		0.314	0.727
1	13	88	100	146760		146760					0.457		0.314	0.771
2	1	44	104	152415		152415					0.476		0.314	0.790
2	1	88	108	158048		158048					0.502		0.314	0.816
2	5	88	138	203200		203200		0.105			0.502		0.314	0.816
2	6	44	142	208855		208855		0.125			0.502		0.314	0.816
2	6	88	146	214488		214488		0.151			0.502		0.314	0.816
2	7	44	150	220144		220144		0.173			0.502		0.314	0.816
2	7	88	154	225777		225777		0.199			0.502		0.314	0.816
2	8	44	158	231433		231433		0.226			0.502		0.314	0.816
2	8	88	162	237067		237067		0.266			0.923		0.314	0.816
2	9	44	165	242721		242721		0.297			1.042		0.314	1.356
2	9	88	169	248357		248357		0.317		0.167	1.233		0.314	1.714
2	10	39	173	253367		253367		0.396		0.456	1.390		0.314	2.160
2	10	66	175	256835		256835		0.459		FAILURE	FAILURE		0.314	FAILURE
2	10	87	177	259502		259502							0.314	0.773
2	10	87	177	259515		259515							0.314	1.628
2	10	87	177	259515		259515							2.300	2.300

THE CONSTANT VALUE OF .502 FOR THE LEFT FRONT CRACK ON THE STRINGER IS AN ESTIMATED VALUE BETWEEN CYCLES 203200 AND 231433.

TABLE 8-36. STRAIN SURVEY OF SPECIMEN NO. 66

SPECIMEN NUMBER: 66
 SPECIMEN TYPE: CENTER T - SPLIT

SPECTRUM: AMAYS
 FINAL CRACK LGTH: 6.5

CYCLES TO FAILURE: 101023
 APPLIED LOAD(LBS): 132000

CYCLES	% OF LIFE	CRACK LENGTH		GAGE 1 L/SKIN	GAGE 2 L/SKIN	GAGE 3 L/STRING	S T R A I N		(M I C R O I N C H E S / I N C H)									
		SKIN INCHES	STRINGER INCHES				GAGE 4 C/STRING	GAGE 5 R/STRING	R/SKIN	GAGE 6 R/SKIN	GAGE 7 R/SKIN	GAGE 8 L/B/SKIN	GAGE 9 L/B/SKIN	GAGE 10 R/B/SKIN	GAGE 11 R/B/SKIN			
0	0	0.000	0.000	1758	1707	1581	1268			1756	1879	1803	1831	1850	1853			
53865	23	0.000	0.000	1738	1717	OFFSCALE	1274			1767	2531	1809	1836	1647	2615			
67732	46	0.523	0.000	1735	1713	OFFSCALE	1254			1774	2925	1815	1856	4494	9253			
74427	51	0.563	0.000	1732	1707	OFFSCALE	1247			1777	2995	1816	1859	OFFSCALE	OFFSCALE			
74427	51	0.563	0.000	1731	1746	1630	1293	1584		1748	1767	1795	1806	GAGE FAIL	INCORRECT			
79020	54	0.642	0.000	1797	1747	1300	1280	1588		1754	1770	1801	1817					
84579	58	0.890	0.494	1783	1698	2242	1248	1608		1770	1779	1815	1848					
90312	61	0.890	0.414	1777	1679	2928	1252	1627		1772	1782	1811	1840					
95969	65	1.141	0.536	1769	1638	4148	1212	1629		1777	1786	1816	1861					
99442	68	1.878	0.618	1741	OFFSCALE		1149	1732		1834	1812	1854	1928					
100015	68	2.091	0.648	1734	1094		1094	1784		1858	1818	1863	1959					
100227	68	2.276	0.646	1738	1077		1077	1799		1868	1833	1872	1973					
100333	68	2.590	0.649	1738	1049		1049	1844		1889	1847	1885	1990					
100357	68	2.820	0.654	1738	1015		1015	1896		1917	1849	1903	2021					
100482	68	3.038	0.662	1750	981		981	1944		1941	1859	1921	2052					
100590	68	3.292	0.670	1768	957		957	1984		1965	1372	1940	2078					
100695	69	3.741	0.673	1812	909		909	2059		1991	1901	1952	2086					
100799	69	3.894	0.578	1828	894		894	2092		2015	1897	1978	2127					
100812	59	4.254	0.692	1900	856		856	2165		2042	1915	2010	2166					
100898	69	4.539	0.692	1973	813		813	2218		2048	1934	2009	2157					
100904	69	6.382	FAILURE	3915	645		645	2549		2216	1986	2182	2442					

SOME DIFFICULTY WAS ENCOUNTERED IN OBTAINING EARLY STRAIN DATA
 A NEW CALIBRATION WAS MADE AT 74427 CYCLES

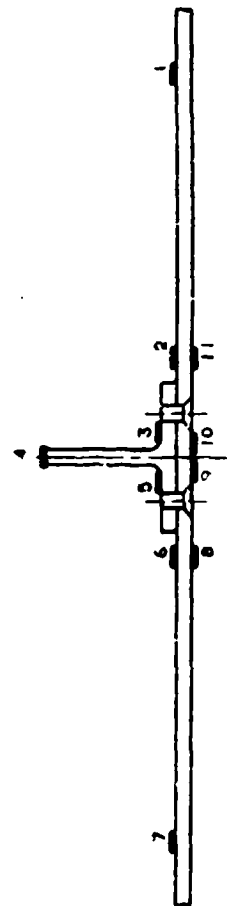


TABLE 8-37. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 66

SPECIMEN NUMBER: 66
 SPECIMEN TYPE: CENTER T - SPLIT SKIN
 SKIN/STRINGER: S-37-9A S/N 2
 LOAD (KIPS): 218
 STRESS (KSI): 30.35
 SPECTRUM: AMMS
 CYCLES TO FAILURE: 101023
 % LIFE AT FAILURE: 84
 FAILURE LOAD(LBS): N/A
 FINAL CRACK LGTH: 6.5
 HOLE DIA (INCHES): 0.313

LIFE	PASS	BLOCK	% OF LIFE	SKIN		SKIN		STRINGER		SKIN		TOTAL CRACK LENGTH	
				R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK
1	1	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.313	0.313
1	6	88	46	67732		0.210						0.313	0.313
1	7	53	51	74427		0.250						0.313	0.313
1	7	88	54	79020		0.329						0.313	0.313
1	8	44	58	84679		0.577				0.153		0.313	0.466
1	8	88	62	90313		0.577				0.181		0.313	0.494
1	9	44	65	95969		0.577				0.223		0.313	0.536
1	9	71	68	99442		0.577	0.251			0.305		1.226	1.878
1	9	76	68	100015	0.913	0.577	0.988			0.335		1.469	2.091
1	9	78	68	100227	1.156	0.577	1.201			0.333		1.670	2.276
1	9	78	68	100333	1.357	0.577	1.386			0.336		1.959	2.590
1	9	79	68	100357	1.646	0.577	1.700			0.341		2.135	2.820
1	9	80	69	100482	1.822	0.577	1.930			0.349		2.371	3.038
1	9	80	69	100590	2.058	0.577	2.148			0.357		2.639	3.292
1	9	81	69	100695	2.326	0.577	2.402			0.360		3.021	3.741
1	9	82	69	100799	2.708	0.577	2.851			0.365		3.239	3.894
1	9	82	69	100812	2.926	0.577	3.004			0.379		3.510	4.254
1	9	82	69	100898	3.197	0.577	3.364			0.379		3.779	4.539
1	9	83	69	100904	3.466	0.577	3.649			FAILURE	FAILURE	5.499	6.382
1	9	83	69	100904	5.186	0.577	5.492			FAILURE	FAILURE	6.500	6.500
1	9	83	69	100913	FAILURE	0.577	FAILURE						
1	9	84	69	101023	FAILURE	FAILURE	FAILURE						

TABLE 8-38. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 67

SPECIMEN NUMBER: 67										
SPECIMEN TYPE: CENTER T - SPLIT SKIN										
SKIN/STRINGER: S-37-9B S/N 1										
LOAD (KIPS): 218										
STRESS (KSI): 30.35										
SPECTRUM: ANAVS										
CYCLES TO FAILURE: 152511										
% LIFE AT FAILURE: 104										
FAILURE LOAD(LBS): N/A										
FINAL CRACK LGTH: 2.5										
HOLE DIA (INCHES): 0.315										
LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN R/FRONT	SKIN L/FRONT	SKIN R/BACK	SKIN L/BACK	STRINGER R/FRONT L/FRONT	TOTAL CRACK LENGTH SKIN FRONT SKIN BACK SKIN STRINGER FRONT
1	1	0	0	0						0.315 0.315 0.315
1	5	88	38	56443			0.000	0.092		0.315 0.407 0.315
1		88	54	79022			0.098	0.098		0.315 0.413 0.315
1	4	88	62	90311			0.100	0.100		0.315 0.415 0.315
1	9	44	65	95966			0.197	0.197		0.315 0.512 0.315
1	9	88	69	101600			0.260	0.260		0.315 0.575 0.315
1	10	44	73	107253			0.321	0.321		0.315 0.636 0.315
1	10	88	77	112886			0.398	0.398		0.315 0.713 0.315
1	11	44	81	118539	0.524		0.466	0.466		0.315 0.781 0.315
1	11	88	85	124172	0.592		0.560	0.560		0.315 0.875 0.315
1	12	44	88	129825	0.664		0.650	0.650		0.315 0.965 0.315
1	12	88	92	135459	0.794		0.782	0.782	0.181	0.315 1.109 0.496
1	13	44	96	141112	0.981		0.956	0.956	0.261	0.315 1.296 0.576
1	13	88	100	146745	1.314		1.315	1.315	0.473	0.315 1.629 0.788
2	1	22	102	149573	1.456		FAILURE	FAILURE	FAILURE	1.771 1.776 FAILURE
2	1	44	104	152400	FAILURE		FAILURE	FAILURE	FAILURE	2.500 2.500 FAILURE
2	1	45	104	152511	FAILURE		FAILURE	FAILURE	FAILURE	2.500 2.500 FAILURE

TABLE 8-39. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 68

SPECIMEN NUMBER: 68
 SPECIMEN TYPE: CENTER T - SPLIT SKIN
 SKIN/STRINGER: 3-37-98 S/N 2
 LOAD (KIPS): 218
 STRESS (KSI): 30.35
 SPECTRUM : AMVS
 CYCLES TO FAILURE: 176213
 % LIFE AT FAILURE: 120
 FAILURE LOAD(LE3): 172810
 FINAL CRACK LGTH: 1.8
 HOLE DIA (INCHES): 0.314

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		STRINGER	TOTAL CRACK LENGTH	
					R/FRONT	L/FRONT	R/BACK	L/BACK		SKIN FRONT	SKIN BACK
1	1	0	0	0					0.000	0.314	0.314
1	11	88	85	124169					0.129	0.314	0.314
1	12	44	88	129822					0.159	0.314	0.443
1	12	88	92	135456					0.207	0.314	0.473
1	13	44	96	141109				0.160	0.239	0.314	0.521
1	13	88	100	146743				0.240	0.289	0.314	0.553
2	1	44	104	152399				0.302	0.348	0.314	0.603
2	1	88	108	158032				0.385	0.459	0.314	0.662
2	2	44	112	163688	0.485			0.465	0.459	0.314	0.699
2	2	88	115	169321	0.598			0.607	FAILURE	0.799	0.773
2	3	44	119	174977	0.785			0.783	FAILURE	0.921	FAILURE
2	3	53	120	176014	FAILURE	FAILURE	0.200	FAILURE	FAILURE	1.099	1.097
2	3	54	120	176213	FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	1.800	1.800

TABLE 8-40. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 69

SPECIMEN NUMBER: 69										CYCLES TO FAILURE: 285354									
SPECIMEN TYPE: S-39-11A S/N 1										% LIFE AT FAILURE: 194									
LOAD (KIPS): 220										FAILURE LOAD(LBS): N/A									
STRESS (KSI): 21.48										FINAL CRACK LGTH: 8									
SPECTRUM: ANAVS										HOLE DIA (INCHES): 0.324									
LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN R/FRONT	SKIN L/FRONT	R/BACK	L/BACK	STRINGER R/FRONT	STRINGER L/FRONT	SKIN FRONT	SKIN BACK	STRINGER FRONT	STRINGER BACK	SKIN FRONT	SKIN BACK	STRINGER FRONT	STRINGER BACK	SKIN FRONT
1	1	0	0	0			0.000		0.000		0.324	0.324			0.324	0.324			0.324
1	13	88	100	146751			0.086		0.196		0.324	0.410			0.324	0.520			0.520
2	1	88	108	158038			0.179		0.262		0.324	0.503			0.324	0.586			0.586
2	2	44	112	163694			0.222		0.288		0.324	0.546			0.324	0.612			0.612
2	2	88	115	169327			0.262		0.343		0.324	0.586			0.324	0.667			0.667
2	3	44	119	174982			0.297		0.399		0.324	0.621			0.324	0.723			0.723
2	3	88	123	180617			0.337		0.500		0.324	0.661			0.324	0.824			0.824
2	4	44	127	186270			0.384		0.613		0.324	0.708			0.324	0.884			0.884
2	4	88	131	191903			0.431		0.613		0.324	0.755			0.324	0.937			0.937
2	5	44	135	197558			0.477		0.613		0.324	0.801			0.324	0.937			0.937
2	5	88	138	203192			0.529		0.613		0.324	0.853			0.324	0.937			0.937
2	6	44	142	208847			0.574		0.613		0.324	0.898			0.324	0.937			0.937
2	6	88	146	214481			0.635		0.613		0.324	0.959			0.324	0.937			0.937
2	7	44	150	220136		0.693	0.688		0.613		1.017	1.012			1.017	1.012			1.012
2	7	88	154	225768		0.753	0.754		0.613		1.077	1.078			1.077	1.078			1.078
2	8	44	158	231423		0.813	0.825		0.613		1.137	1.149			1.137	1.149			1.149
2	8	88	162	237057		0.873	1.031		0.613		1.197	1.355			1.197	1.355			1.355
2	9	44	165	242711		0.948	1.106		0.613		1.272	1.430			1.272	1.430			1.430
2	9	88	169	248344		1.039	1.195		0.613		1.363	1.519			1.363	1.519			1.519
2	10	44	173	253997		1.117	1.267		0.613		1.441	1.591			1.441	1.591			1.591
2	10	88	177	259630		1.220	1.350		0.613		1.544	1.674			1.544	1.674			1.674
2	11	44	181	265284		1.323	1.464		0.613		1.647	1.788			1.647	1.788			1.788
2	11	88	185	270917		1.474	1.454		0.613	0.274	1.798	1.778			1.798	1.778			1.778
2	12	22	187	273744		1.534	1.504		0.613	0.380	1.858	1.828			1.858	1.828			1.828
2	12	44	188	276571		1.633	1.607		0.613	0.582	1.957	1.931			1.957	1.931			1.931
2	12	66	190	279397		1.750	1.729		0.613	0.778	2.074	2.159			2.074	2.159			2.159
2	12	87	192	282083		2.533	2.462	0.106	0.613	0.778	2.857	3.588			2.857	3.588			3.588
2	13	8	193	283202		2.767	2.735	0.802	0.613	0.778	3.091	3.861			3.091	3.861			3.861
2	13	15	194	284122		3.054	3.044	0.802	0.613	0.778	3.378	4.170			3.378	4.170			4.170
2	13	17	194	284352		3.485	3.463	0.802	0.613	0.778	3.809	4.589			3.809	4.589			4.589
2	13	22	194	285031		4.667	4.697	0.802	0.613	0.778	4.991	5.823			4.991	5.823			5.823
2	13	23	194	285151		5.252	5.276	0.802	0.613	0.778	5.576	6.402			5.576	6.402			6.402
2	13	25	194	285346		6.320	6.322	0.802	0.613	0.778	6.644	7.448			6.644	7.448			7.448
2	13	25	194	285354		FAILURE	FAILURE	FAILURE	FAILURE	FAILURE	8.000	8.000			8.000	8.000			8.000

TABLE 8-41. STRAIN SURVEY OF SPECIMEN NO. 70

SPECIMEN NUMBER: 70
 SPECIMEN TYPE: THICK EDGE L
 SPECTRUM: AMAYS
 FINAL CRACK LGTH: 5.8
 CYCLES TO FAILURE: 234218
 APPLIED LOAD(LBS): 132000

CYCLES	% OF LIFE	CRACK LENGTH		GAGE 1 L/STRING	GAGE 2 L/STRING	GAGE 3 SKIN/RF	S T R A I N		(M I C R O I N C H E S / I N C H)		GAGE 9 C/BACK	GAGE 10 R/BACK	GAGE 11 R/BACK	
		SKIN INCHES	STRINGER INCHES				GAGE 4 R/STRING	GAGE 5 R/STRING	GAGE 6 L/BACK	GAGE 7 L/BACK				GAGE 8 L/BACK
0	0	0.000	0.000	982	1263	1426	1253	1048	1408	1335	1448	1468	1432	1364
33864	23	0.000	0.000	948	1235	1467	1276	1025	1464	1387	1497	1494	1461	1391
79022	54	0.000	0.000	942	1231	1477	1283	1021	1460	1400	1497	1494	1463	1392
112883	77	0.000	0.000	945	1233	1511	1325	1027	1459	1422	1500	1498	1469	1396
124169	84	0.000	0.490	947	1237	1529	1347	1032	1452	1440	1505	1501	1472	1400
129822	89	0.463	0.527	940	1228	1532	1352	1023	1450	1453	1509	1499	1466	1390
135456	92	0.499	0.571	938	1228	1533	1354	1027	1436	1474	1504	1491	1462	1388
141110	96	0.545	0.605	933	1222	1545	1361	1023	1441	1491	1512	1493	1461	1383
146743	100	0.586	0.655	932	1222	1566	1378	1029	1425	1501	1513	1488	1457	1382
152397	104	0.628	0.762	930	1220	1591	1417	1029	1422	1510	1516	1491	1458	1380
158031	108	0.650	0.950	930	1221	1646	1514	1071	1401	1577	1577	1493	1456	1381
163685	111	0.725	0.950	926	1216	1662	1521	1065	1400	1581	1580	1493	1455	1376
169318	115	0.782	0.950	925	1216	1674	1530	1066	1388	1590	1588	1487	1450	1376
174974	119	0.835	0.950	923	1214	1698	1537	1064	1403	1612	1613	1490	1452	1372
180608	123	0.897	0.950	927	1219	1734	1554	1072	1405	1625	1648	1492	1453	1378
186263	127	0.964	0.950	930	1221	1777	1558	1077	1415	1652	1694	1500	1460	1380
191896	131	1.029	0.950	933	1225	1866	1579	1084	1406	1658	1749	1500	1460	1385
197551	134	1.105	0.950	932	1223	1959	1580	1083	1412	1690	1841	1505	1463	1382
203184	138	1.191	0.950	933	1226	2191	1613	1092	1407	1703	2061	1504	1464	1386
208639	142	1.281	0.950	931	1221	2664	1636	1090	1407	1744	2594	1506	1463	1382
214472	146	1.375	0.950	935	1227	4268	1951	1109	1398	1766	4966	1511	1466	1387
220127	150	1.508	1.365	937	1230	OFFSCALE	OFFSCALE	1193	1436	1723	OFFSCALE	1530	1473	1388
225761	154	1.699	2.450	941	1237			1429	1447	2375		1554	1479	1393

BETWEEN CYCLES 208839 AND 214472 THE FATIGUE CRACK PASSED GAGES 3 AND 8
 BETWEEN CYCLES 214472 AND 220127 THE FATIGUE CRACK PASSED GAGE 4

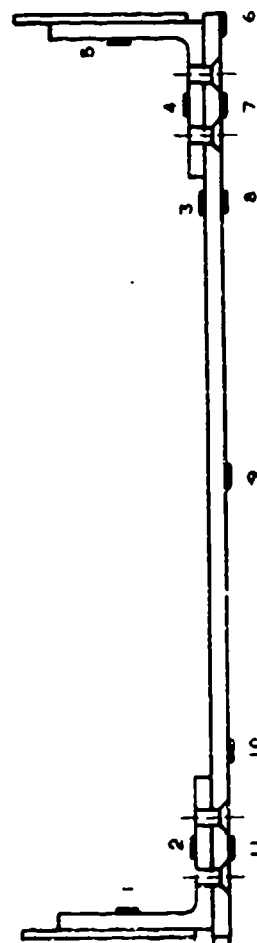


TABLE 8-42. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 70

SPECIMEN NUMBER: 70
 SPECIMEN TYPE: EDGE L
 SKIN/STRINGER: S-39-11A S/N 2
 LOAD (KIPS): 220
 STRESS (KSI): 21.48
 SPECTRUM: ANAVS
 CYCLES TO FAILURE: 234218
 % LIFE AT FAILURE: 160
 FAILURE LOAD (LBS): N/A
 FINAL CRACK LGTH: 5.8
 HOLE DIA (INCHES): 0.313

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		R/FRONT	L/FRONT	R/BACK	L/BACK	STRINGER		TOTAL CRACK LENGTH		
					R/FRONT	L/FRONT	R/BACK	L/BACK					R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK	STRINGER FRONT
1	1	0	0	0			0.000								0.313	0.313	0.313
1	11	88	85	124169			0.000						0.177		0.313	0.313	0.490
1	12	44	88	129822			0.150						0.214		0.313	0.463	0.527
1	12	88	92	135456			0.186						0.258		0.313	0.499	0.571
1	13	44	96	141110			0.232						0.292		0.313	0.545	0.605
1	13	88	100	146743			0.273						0.342		0.313	0.586	0.655
2	1	44	104	152397			0.315						0.449		0.313	0.628	0.762
2	1	88	108	158031			0.337						0.637		0.313	0.650	0.950
2	2	44	112	163685			0.412						0.637		0.313	0.725	0.950
2	2	88	115	169318			0.469						0.637		0.313	0.782	0.950
2	3	44	119	174974			0.522						0.637		0.313	0.835	0.950
2	3	88	123	180608			0.584						0.637		0.313	0.897	0.950
2	4	44	127	186263			0.651		0.680				0.637		0.993	0.964	0.950
2	4	88	131	191896			0.716		0.742				0.637		1.029	1.029	0.950
2	5	44	135	197551			0.792		0.787				0.637		1.100	1.105	0.950
2	5	88	138	203184			0.878		0.901				0.637		1.214	1.191	0.950
2	6	44	142	208839			0.968		0.986				0.637		1.299	1.281	0.950
2	6	88	146	214472			1.062		1.094				0.637		1.407	1.375	0.950
2	7	44	150	220127			1.195		1.229				0.637	0.415	1.542	1.508	1.365
2	7	88	154	225761			1.386		1.406				0.637	1.500	1.719	1.699	2.450
2	8	66	160	234218			FAILURE		FAILURE				FAILURE	FAILURE	5.800	5.800	FAILURE

TABLE 8-43. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 71

SPECIMEN NUMBER: 71
 SPECIMEN TYPE: EDGE L
 SKIN/STRINGER: S-39-11B S/N 1
 LOAD (KIPS): 220
 STRESS (KSI): 21.48
 SPECTRUM: AMAVS
 CYCLES TO FAILURE: 629051
 % LIFE AT FAILURE: 421
 FAILURE LOAD (LBS): N/A
 FINAL CRACK LGTH: 3.7
 HOLE DIA (INCHES): 0.313

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN R/BACK	SKIN L/BACK	STRINGER		TOTAL CRACK LENGTH		
					R/FRONT	L/FRONT			R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK	STRINGER FRONT
1	1	0	0	0				0.000			0.313	0.313	0.313
4	4	88	331	496676				0.140			0.313	0.453	0.313
4	5	88	338	507964				0.168			0.313	0.481	0.313
4	6	88	346	519253				0.216			0.313	0.529	0.313
4	7	88	354	530541				0.279			0.313	0.592	0.313
4	8	88	362	541830				0.358			0.313	0.671	0.313
4	9	88	369	553118				0.438	0.149		0.313	0.751	0.462
4	10	88	377	564404				0.520	0.149		0.313	0.833	0.462
4	11	88	385	575691				0.601	0.239		0.313	0.914	0.552
4	12	88	392	586977				0.785	0.320		0.313	1.098	0.633
4	13	88	400	598263				1.432	0.380		0.313	2.183	0.693
4	14	9	401	599301			0.438	1.432	0.421		0.313	2.545	0.734
4	15	88	415	620836			0.800	1.432	0.421	0.173	0.313	2.545	0.907
4	16	33	418	625502			0.800	1.432	0.421	0.749	0.313	2.545	1.483
4	16	65	421	629051			FAILURE	FAILURE	FAILURE	FAILURE	3.700	3.700	FAILURE

TABLE 8-44. CRACK GROWTH MEASUREMENTS OF SPECIMEN NO. 72

SPECIMEN NUMBER: 72
 SPECIMEN TYPE: EDGE L
 SKIN/STRINGER: S-33-11B S/N 2
 LOAD (KIPS): 220
 STRESS (KSI): 21.48
 SPECTRUM: AMMS
 CYCLES TO FAILURE: 441256
 % LIFE AT FAILURE: 301
 FAILURE LOAD(LBS): N/A
 FINAL CRACK LGTH: 2.4
 HOLE DIA (INCHES): 0.313

LIFE	PASS	BLOCK	% OF LIFE	CYCLES	SKIN		SKIN		STRINGER		TOTAL CRACK LENGTH	
					R/FRONT	L/FRONT	R/BACK	L/BACK	R/FRONT	L/FRONT	SKIN FRONT	SKIN BACK
1	1	0	0	0					0.000		0.313	0.313
2	4	88	131	191898					0.150		0.313	0.463
2	5	88	138	203187					0.196		0.313	0.509
2	6	88	146	214476					0.293		0.313	0.606
2	7	88	154	225764					0.274		0.313	0.587
2	8	88	162	237053					0.300		0.313	0.613
2	9	88	169	248341					0.328		0.313	0.641
2	10	88	177	259628					0.371		0.313	0.684
2	11	88	185	270915					0.374		0.313	0.687
2	12	88	192	282201					0.403		0.313	0.716
2	13	88	200	293488					0.413		0.313	0.726
3	1	88	208	304777					0.422		0.313	0.735
3	2	88	215	316066					0.464		0.313	0.777
3	3	88	223	327355					0.488		0.313	0.801
3	4	88	231	338644					0.488		0.313	0.801
3	7	88	254	372509					0.488	0.187	0.313	0.988
3	8	61	259	380319					0.488	0.422	0.313	1.223
3	8	88	262	383798					0.488	0.774	0.313	1.575
3	10	88	277	406373					0.448	0.774	0.313	1.535
3	11	44	281	412027			0.085		0.448	0.774	0.313	1.535
3	11	88	285	417660			0.184		0.448	0.774	0.313	1.535
3	12	44	288	423313			0.293		0.448	0.774	0.313	1.535
3	12	88	292	428947			0.334		0.448	0.774	0.313	1.535
3	13	35	295	433327			0.579		0.448	0.774	0.313	1.535
3	13	88	300	440233			1.155		0.448	0.774	0.313	1.535
4	1	8	301	441256			1.222		0.448	0.774	2.400	2.690
							FAILURE	FAILURE	FAILURE	FAILURE	2.400	FAILURE

APPENDIX A

A-1 INTRODUCTION

Appendix A presents the randomized loading spectra of the A-10A and the AMAVS Flight Spectrum. The loading sequences, as they are described in the Appendix, represent one block (Pass) of repeated loading. The loading conditions are normalized about 100% of maximum loads. They are proportionally applied during the shear-lap and the stringer reinforced test program.

A-1.1 'A-10A' LOADING SPECTRUM

The A-10A randomized flight-by-flight loading spectrum is presented in Tables A-1 through A-3. Table A-1 provides a listing of 219 flight and ground conditions. The loading conditions are normalized about condition No. 64. Table A-2 presents the randomized conditions and the number of occurrences associated with each condition. One pass of randomized loading represents 4% of life or 240 hours of flight and ground conditions. There are 7416.5 cycles per one block which is equal to 120 flights. Table A-3 presents the marker band block (=4%) used during the test program. Table A-4 presents the sequences of the marker band application within one (1) life time of the A-10A spectrum.

A-1.2 'AMAVS' LOADING SPECTRUM

The randomized loading conditions of the AMAVS flight and ground spectrum is presented in Table A-5. One block (Pass) of Table A-5 represents 7.8125% of one life. The total number of cycles in one block is 11245 cycles, which is equal to 100 flights of the AMAVS spectrum. One life of the AMAVS is equal to 13500 flight hours. Each block contains marker band cycles inserted within it. The loading conditions at Table A-5 were normalized about condition No. 17.

TABLE A-1. A-10A NORMALIZED LOADING CONDITIONS

1	9.95	-4.66	9.95
2	9.83	0.10	9.83
3	9.95	0.20	9.95
4	10.01	0.28	10.01
5	9.83	24.44	9.83
6	9.95	24.54	9.95
7	10.01	24.62	10.01
8	9.83	29.28	9.83
9	9.95	29.40	9.95
10	10.01	29.46	10.01
11	9.83	34.16	9.83
12	9.95	34.27	9.95
13	10.01	34.34	10.01
14	9.83	39.03	9.83
15	9.95	39.13	9.95
16	10.01	39.21	10.01
17	9.95	44.02	9.95
18	10.01	44.07	10.01
19	9.95	48.88	9.95
20	10.01	48.93	10.01
21	9.95	53.74	9.95
22	10.01	53.79	10.01
23	9.95	58.60	9.95
24	10.01	58.66	10.01
25	9.95	63.47	9.95
26	9.95	68.33	9.95
27	10.01	68.41	10.01
28	10.01	87.86	10.01
29	10.01	92.72	10.01
30	11.94	-17.39	11.94
31	11.84	-11.63	11.84
32	11.94	-11.51	11.94
33	11.84	-5.78	11.84
34	11.94	-5.65	11.94
35	12.02	-5.60	12.02
36	11.84	0.10	11.84
37	11.94	0.20	11.94
38	12.02	0.28	12.02
39	11.84	29.43	11.84
40	11.94	29.53	11.94
41	12.02	29.61	12.02
42	11.84	35.29	11.84
43	11.94	35.41	11.94
44	12.02	35.46	12.02
45	11.84	41.17	11.84
46	11.94	41.27	11.94
47	12.02	41.34	12.02
48	11.94	47.15	11.94
49	12.02	47.20	12.02
50	11.94	52.98	11.94
51	12.02	53.08	12.02
52	11.94	58.88	11.94
53	12.02	58.94	12.02
54	11.94	64.71	11.94
55	12.02	64.79	12.02

56	11.94	70.60	11.94
57	12.02	70.67	12.02
58	11.94	76.43	11.94
59	12.02	76.53	12.02
60	11.94	82.33	11.94
61	12.02	82.41	12.02
62	12.02	88.26	12.02
63	12.02	94.14	12.02
64	12.02	100.00	12.02
65	12.12	-5.73	12.12
66	11.99	0.10	11.99
67	12.12	0.20	12.12
68	12.19	0.28	12.19
69	11.99	29.84	11.99
70	12.12	29.96	12.12
71	12.19	30.02	12.19
72	11.99	35.79	11.99
73	12.12	35.90	12.12
74	12.19	35.97	12.19
75	12.12	41.85	12.12
76	12.19	41.90	12.19
77	12.12	47.81	12.12
78	12.19	47.86	12.19
79	12.12	53.74	12.12
80	12.19	53.82	12.19
81	12.12	59.70	12.12
82	12.19	59.75	12.19
83	12.12	65.63	12.12
84	12.19	65.71	12.19
85	12.12	71.59	12.12
86	12.19	71.64	12.19
87	12.19	77.60	12.19
88	12.19	83.55	12.19
89	13.90	-6.62	13.90
90	13.90	0.10	13.90
91	13.90	34.65	13.90
92	14.08	34.83	14.08
93	14.03	41.68	14.03
94	14.08	41.73	14.08
95	14.03	48.57	14.03
96	14.08	48.63	14.08
97	14.03	55.47	14.03
98	14.08	55.55	14.08
99	14.03	62.37	14.03
100	14.08	62.45	14.08
101	14.03	69.30	14.03
102	14.08	76.27	14.08
103	9.83	9.83	9.83
104	9.95	9.95	9.95
105	10.01	10.01	10.01
106	9.83	9.83	9.83
107	9.95	9.95	9.95
108	10.01	10.01	10.01
109	9.83	9.83	9.83
110	9.95	9.95	9.95

111	10.01	10.01	10.01
112	9.83	9.83	9.83
113	9.95	9.95	9.95
114	11.99	11.99	11.99
115	12.12	12.12	12.12
116	12.19	12.17	12.19
117	11.99	11.99	11.99
118	12.12	12.12	12.12
119	12.19	12.17	12.19
120	11.99	11.99	11.99
121	12.12	12.12	12.12
122	11.99	11.99	11.99
123	12.12	12.12	12.12
124	12.17	12.17	12.17
125	11.99	11.99	11.99
126	12.12	12.12	12.12
127	12.17	12.17	12.17
128	9.83	24.44	9.83
129	9.95	24.54	9.95
130	10.01	24.62	10.01
131	9.83	29.28	9.83
132	9.95	29.40	9.95
133	10.01	29.46	10.01
134	9.83	34.16	9.83
135	9.95	34.27	9.95
136	10.01	34.34	10.01
137	9.83	39.03	9.83
138	9.95	39.13	9.95
139	10.01	39.21	10.01
140	9.95	44.02	9.95
141	9.95	48.88	9.95
142	9.95	53.72	9.95
143	10.01	53.79	10.01
144	9.95	63.17	9.95
145	10.01	78.13	10.01
146	9.83	24.44	9.83
147	9.95	24.54	9.95
148	9.83	29.40	9.83
149	9.95	29.28	9.95
150	11.99	29.84	11.99
151	12.12	29.96	12.12
152	12.19	30.02	12.19
153	11.99	35.79	11.99
154	12.12	35.90	12.12
155	12.19	35.97	12.19
156	11.99	41.73	11.99
157	12.12	41.85	12.12
158	12.19	41.90	12.19
159	12.12	47.81	12.12
160	12.19	47.86	12.19
161	12.12	53.74	12.12
162	12.19	53.82	12.19
163	12.12	59.70	12.12
164	12.19	59.75	12.19
165	12.12	65.63	12.12

166	12.19	65.71	12.19
167	12.12	71.59	12.12
168	12.19	71.66	12.19
169	12.12	77.55	12.12
170	12.19	77.60	12.19
171	12.12	83.48	12.12
172	12.19	83.55	12.19
173	11.99	29.84	11.99
174	12.12	29.96	12.12
175	12.19	30.02	12.19
176	11.99	35.77	11.99
177	12.12	35.90	12.12
178	12.19	35.97	12.19
179	11.99	41.73	11.99
180	12.12	41.85	12.12
181	12.19	41.90	12.19
182	12.12	47.81	12.12
183	12.19	47.86	12.19
184	12.12	53.74	12.12
185	12.12	59.70	12.12
186	12.12	65.63	12.12
187	12.19	65.68	12.19
188	12.12	71.59	12.12
189	12.19	83.55	12.19
190	9.83	24.44	9.83
191	9.95	24.54	9.95
192	10.01	24.62	10.01
193	11.84	29.43	11.84
194	11.94	29.53	11.94
195	12.02	29.61	12.02
196	11.99	29.84	11.99
197	12.12	29.99	12.12
198	12.19	30.02	12.19
199	13.90	34.65	13.90
200	14.08	34.83	14.08
201	10.01	97.61	10.01
202	12.19	89.49	12.19
203	14.08	83.17	14.08
204	11.84	-23.37	11.84
205	11.84	-23.24	11.84
206	3.56	9.60	3.56
207	3.56	9.16	3.56
208	3.56	8.02	3.56
209	3.56	8.71	3.56
210	3.56	1.96	3.56
211	7.13	4.56	7.13
212	7.13	5.65	7.13
213	3.56	-0.25	3.56
214	7.13	0.56	7.13
215	7.13	3.92	7.13
216	3.56	1.93	3.56
217	3.56	1.58	3.56
218	0.0	0.0	0.0
219	11.94	11.94	11.94

TABLE A-2. A-10A RANDOMIZED LOADING SPECTRUM

115	1	153	1	123	1	116	1	196	1
167	1	115	1	155	1	115	1	119	1
114	1	151	1	125	1	115	2	154	1
69	1	123	1	115	1	157	1	114	1
124	2	69	1	122	1	40	1	55	1
59	1	48	1	43	1	58	1	44	1
194	1	43	1	49	1	40	1	48	1
55	1	52	1	46	1	55	1	43	3
52	1	46	1	39	1	52	1	46	1
44	1	47	1	194	1	38	1	40	1
46	1	54	1	50	1	48	1	43	1
40	1	56	1	52	2	48	1	43	1
194	1	53	1	49	1	5	3	103	2
208	1	210	1	213	3	210	1	213	1
210	1	213	1	126	1	69	1	123	1
115	1	69	1	196	1	69	1	154	1
124	1	115	1	123	1	72	1	115	1
124	1	157	1	123	1	126	1	151	1
119	1	115	1	116	1	157	1	175	1
69	1	123	1	50	1	43	1	37	1
49	1	40	1	46	1	48	1	194	1
37	1	43	1	44	1	40	1	44	1
40	1	195	1	46	1	48	1	46	1
40	1	48	2	50	1	195	1	42	1
46	1	59	1	43	1	59	1	194	1
44	1	48	1	194	1	61	1	43	1
47	1	40	1	43	1	46	1	56	1
61	1	41	1	37	1	50	1	103	1
128	1	19	1	112	1	5	1	208	1
210	1	213	3	210	1	213	1	210	1
213	1	69	1	116	2	118	1	123	1
151	1	163	1	124	1	123	1	124	1
159	1	196	1	115	1	123	1	115	1
124	1	118	1	115	3	196	1	124	1
69	1	115	2	46	1	53	1	194	1
40	1	52	1	43	1	219	1	37	1
52	1	38	1	48	1	44	1	39	1
47	1	57	1	49	1	64	1	40	1
43	1	38	1	194	1	43	1	41	1
194	1	46	1	49	1	51	1	48	1
59	1	46	1	44	1	60	1	55	1
46	1	53	1	43	1	44	1	40	1
54	1	56	1	43	1	56	1	48	1
195	1	14	1	8	1	5	1	103	1
5	1	8	1	208	1	210	1	213	3
210	1	213	1	210	1	213	1	114	1
123	1	114	1	153	1	150	1	114	1
118	1	165	1	114	1	123	2	115	1
114	1	115	2	123	1	122	1	125	1
126	1	125	1	151	1	159	1	115	2
123	1	165	1	118	1	46	1	36	1
39	1	42	1	43	1	42	1	43	1
39	1	46	1	50	1	46	1	42	1
40	1	39	1	46	2	46	2	49	1
56	1	43	1	52	1	48	1	43	1

52	1	43	1	39	2	52	1	43	1
50	1	46	1	37	1	54	1	48	1
193	1	48	1	50	2	42	1	194	2
39	1	194	1	45	1	46	2	42	1
193	1	42	1	48	1	39	1	48	1
50	1	44	1	40	1	194	1	43	2
11	1	208	1	210	1	213	3	210	1
213	1	210	1	213	1	72	1	123	1
69	1	114	1	75	1	115	1	119	1
77	1	115	1	69	1	157	1	123	1
124	1	162	1	169	1	165	1	116	1
114	1	116	2	161	1	72	1	115	1
114	1	115	1	44	1	48	1	41	1
43	1	49	1	50	1	46	1	56	1
48	1	39	1	51	1	219	1	43	2
44	1	43	1	64	1	57	1	194	1
33	1	194	1	43	2	47	1	37	1
195	1	40	1	63	1	46	1	48	1
54	1	43	1	37	2	48	1	61	1
54	1	43	1	62	1	50	1	54	1
47	1	54	1	37	1	104	1	5	2
8	1	5	1	103	1	208	1	210	1
213	3	210	1	213	1	210	1	213	1
116	2	115	2	157	1	185	1	115	1
116	1	123	1	174	1	119	1	115	2
196	1	150	1	115	3	117	1	115	4
114	1	115	1	62	1	40	1	43	2
39	1	44	1	50	1	195	1	43	1
47	1	48	1	43	1	40	1	43	1
44	1	54	1	194	1	54	1	43	1
37	1	43	1	44	1	43	1	48	1
43	1	48	1	38	1	37	1	41	1
44	1	61	1	46	1	54	1	194	1
52	1	40	1	54	1	40	1	48	1
46	1	45	1	44	1	46	1	5	3
109	1	14	1	8	1	208	1	210	1
213	3	210	1	213	1	210	1	213	1
115	1	114	2	124	1	115	1	182	1
115	4	156	1	122	1	115	1	114	1
115	1	118	1	115	1	151	1	115	1
114	1	115	2	156	1	151	1	115	1
125	1	151	1	48	1	42	1	46	1
39	1	50	1	42	1	52	1	45	1
42	1	45	1	43	2	48	1	43	1
46	1	52	1	43	1	46	1	48	1
46	1	42	1	195	1	48	1	46	1
39	1	40	1	194	1	45	2	43	1
42	1	193	1	43	1	194	1	43	1
50	1	48	1	43	1	194	1	39	1
45	1	42	1	36	1	40	1	45	1
194	1	42	1	40	1	45	1	194	1
40	1	43	1	39	1	43	1	48	1
39	1	45	1	40	1	194	1	5	1
209	1	210	1	213	3	210	1	213	1
210	1	213	1	123	1	115	2	116	1

115	3	116	1	123	1	115	2	118	1
126	1	150	1	163	1	115	1	123	1
151	1	150	1	124	1	115	1	124	1
115	1	127	1	69	1	46	1	41	1
37	1	56	1	39	1	40	1	57	1
44	1	194	1	51	1	39	1	43	1
40	1	61	1	43	1	46	1	48	1
46	2	53	1	40	1	53	1	37	1
46	1	52	1	43	1	40	1	44	1
46	1	40	1	48	1	194	2	37	1
43	2	42	1	43	1	46	1	58	1
49	1	37	1	62	1	128	1	109	1
103	2	28	1	5	1	208	1	210	1
213	3	210	1	213	1	210	1	213	1
159	1	153	1	115	1	161	1	117	1
114	1	122	1	162	1	123	1	115	1
124	1	117	1	150	1	115	1	117	1
115	1	161	1	123	1	150	1	115	2
150	1	115	2	123	1	159	1	115	1
45	1	43	1	193	1	45	1	52	1
42	1	54	1	42	2	45	1	42	1
45	1	194	1	46	1	48	1	46	1
52	1	45	1	52	1	46	1	42	1
45	1	54	1	42	1	43	1	39	1
43	1	39	1	46	1	40	1	39	1
48	1	43	2	45	1	50	1	40	1
39	1	194	1	43	1	39	1	193	1
46	1	193	1	46	1	42	1	194	1
43	1	46	1	42	1	39	1	193	1
42	1	48	1	195	1	39	1	48	1
42	1	48	2	8	1	209	1	210	1
213	3	210	1	213	1	210	1	213	1
196	1	116	1	122	1	123	1	115	1
167	1	123	1	151	1	81	1	115	1
151	1	124	1	123	3	115	1	114	2
159	1	123	1	116	1	124	1	115	1
69	1	150	1	63	1	40	2	194	2
56	2	40	1	43	1	54	1	44	1
43	1	50	1	54	1	40	1	46	1
58	1	50	1	40	1	37	1	43	1
47	1	40	1	46	1	37	1	39	1
50	1	37	1	52	1	56	1	49	1
43	1	56	1	49	1	43	2	46	2
40	1	43	1	48	1	37	1	194	1
5	1	190	1	11	1	5	1	8	1
17	1	209	1	210	1	213	3	210	1
213	1	210	1	213	1	216	1	114	1
115	1	114	1	122	1	115	2	122	1
123	1	114	1	115	1	123	1	159	1
115	1	122	1	114	1	115	1	118	1
123	1	114	1	123	1	115	4	157	1
114	1	154	1	115	1	32	1	39	1
48	1	42	1	39	1	44	1	34	1
43	1	48	1	193	1	54	1	39	1
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61	1	37	2	194	1	46	1	57	1
40	1	57	1	49	1	59	1	62	1
48	1	47	1	46	1	194	1	59	1
40	1	52	1	195	1	62	1	51	1
58	1	63	1	62	1	39	1	50	1
38	1	42	1	50	1	47	1	43	1
44	1	47	1	51	1	60	1	61	1
194	1	60	1	194	1	43	1	23	1
103	2	8	1	103	1	5	1	209	1
210	1	213	3	210	1	213	1	118	1
77	1	72	1	114	1	116	1	72	1
126	1	124	1	115	1	150	1	69	1
118	1	157	1	153	1	157	1	123	1
115	3	114	1	81	1	122	1	124	1
116	1	85	1	69	1	42	1	194	1
54	1	38	1	194	1	54	1	37	1
63	1	61	1	39	1	50	1	34	1
194	1	52	1	195	1	41	1	36	1
47	1	39	1	48	1	194	1	40	1
46	1	61	1	46	1	54	1	48	1
193	1	40	1	56	1	40	2	43	1
37	1	39	1	43	2	50	2	194	1
48	1	40	1	48	2	5	1	106	1
128	1	103	1	11	1	8	1	207	1
210	1	213	3	210	1	213	1	157	1
69	1	159	1	115	1	158	1	115	2
117	1	124	1	114	1	69	1	115	3
157	1	72	1	115	1	114	1	160	1
114	1	115	2	157	1	123	1	114	1
115	1	49	1	38	1	194	1	50	1
47	1	40	1	194	1	56	1	48	1
62	1	50	1	194	1	43	1	48	1
42	1	45	1	39	1	54	1	50	1
58	1	40	1	59	1	43	1	39	1
38	1	46	1	52	1	40	1	54	1
46	1	48	1	44	1	50	1	49	1
52	1	41	1	50	1	37	2	194	1
37	1	46	1	48	1	46	1	5	1
8	1	103	1	8	1	190	1	5	1
209	1	210	1	213	3	210	1	213	1
159	1	122	1	123	1	177	1	154	1
114	1	116	1	119	1	116	1	69	1
174	1	69	1	157	1	123	1	122	1
123	1	115	1	161	1	152	1	177	1
115	4	170	1	182	1	48	1	36	1
53	1	46	1	55	1	48	1	47	1
52	1	51	1	43	1	54	1	56	1
43	1	48	1	49	1	55	1	194	1
39	1	49	1	62	1	37	1	47	1
46	1	194	1	57	1	43	1	46	1

54	1	52	1	61	1	48	1	46	1
51	1	195	1	37	1	50	1	46	1
38	1	43	1	194	1	52	1	43	2
46	1	190	1	103	2	5	1	14	1
109	1	208	1	210	1	213	3	210	1
213	1	126	1	69	1	114	1	151	1
123	2	124	1	115	1	69	1	157	1
69	1	154	1	75	1	115	1	116	1
119	1	124	1	123	1	127	1	172	1
126	1	115	1	118	1	115	1	153	1
116	1	195	1	48	1	47	1	59	1
37	1	57	1	47	1	41	1	34	1
43	1	44	1	194	1	53	1	44	2
48	1	194	1	41	1	43	1	39	1
37	1	43	1	40	1	43	1	194	1
48	1	55	1	48	1	52	1	46	1
51	1	194	1	48	1	43	1	40	1
53	1	57	1	46	1	51	1	63	1
56	1	50	1	37	1	54	1	5	1
21	1	5	1	17	1	8	1	5	1
209	1	210	1	213	3	210	1	213	1
69	1	123	1	114	1	115	1	69	1
88	1	151	1	164	1	161	1	151	1
114	1	69	1	123	1	72	1	114	1
72	1	115	1	157	1	123	1	159	1
115	2	114	1	125	1	115	1	123	1
37	2	48	1	43	1	40	1	52	2
46	1	53	1	37	1	46	1	48	1
46	1	195	1	52	1	50	1	37	1
54	1	47	1	50	2	43	1	38	1
59	1	58	1	194	1	195	1	56	1
193	1	48	1	40	1	50	1	41	1
194	1	57	1	43	1	50	1	43	1
39	1	193	1	43	1	40	1	48	1
57	1	5	2	109	1	5	1	190	1
5	1	209	1	210	1	213	3	210	1
213	1	216	1	118	2	123	1	116	2
123	1	153	1	114	1	72	1	118	1
127	1	123	1	118	1	115	1	116	1
160	1	157	2	116	1	151	1	77	1
123	1	115	2	123	1	116	1	50	1
46	1	54	1	37	1	194	1	48	1
52	1	62	1	43	1	48	1	49	1
55	1	52	1	43	1	195	1	52	1
41	1	40	4	37	1	40	1	63	1
42	1	38	1	40	1	37	1	42	2
44	1	56	2	195	1	38	1	44	1
42	1	38	1	46	1	43	1	49	1
48	1	45	1	48	1	5	2	128	1
5	1	14	1	11	1	207	1	210	1
213	3	210	1	213	1	214	1	212	1
211	1	212	1	214	1	212	1	214	1
211	1	212	1	93	1	91	1	93	1
91	4	77	1	115	1	69	1	75	1
115	1	198	1	123	1	115	1	76	1

151	1	197	1	80	1	115	1	116	1
73	2	78	1	114	1	159	1	116	1
114	1	123	1	115	1	116	1	79	1
67	1	77	1	79	1	126	1	71	1
115	1	150	1	70	1	155	1	79	1
124	1	77	1	124	1	80	1	75	1
124	1	197	1	68	1	76	1	40	1
51	1	36	1	46	1	40	1	195	1
46	1	43	1	38	1	48	1	40	1
48	1	50	1	53	1	194	1	48	1
40	1	44	1	111	1	5	1	7	1
11	1	2	1	9	1	135	1	6	1
4	1	191	1	14	1	104	1	9	1
19	1	6	1	192	1	14	1	12	1
9	1	12	1	19	1	9	1	11	1
103	2	130	1	5	1	208	1	210	1
213	3	210	1	213	1	116	1	115	1
155	1	159	1	72	1	115	1	124	1
154	1	122	1	157	1	87	1	116	1
123	2	154	1	152	1	163	1	151	1
69	1	123	1	125	1	115	2	157	1
150	1	115	1	51	1	48	2	46	1
48	1	49	1	48	1	41	1	46	1
194	1	51	1	45	1	42	1	54	1
52	1	194	1	47	1	37	1	43	1
38	1	54	1	47	1	43	2	47	1
52	1	35	1	59	1	43	1	46	1
56	1	52	1	48	1	44	1	194	1
41	1	193	1	52	1	48	1	40	1
47	1	43	1	40	1	54	1	8	1
5	1	8	1	103	1	5	1	103	1
209	1	210	1	213	3	210	1	213	1
159	1	118	1	115	2	122	1	157	1
117	1	159	1	153	1	114	3	115	1
152	1	159	1	115	2	161	1	118	1
123	1	115	2	116	1	123	1	115	1
123	1	124	1	115	1	50	1	39	1
43	1	50	1	39	2	45	1	48	1
49	1	37	1	45	2	44	1	52	1
39	1	43	1	45	1	48	1	51	1
40	1	42	1	39	1	40	1	52	1
50	1	37	1	40	1	47	1	46	1
52	1	43	1	45	1	39	1	195	1
39	1	46	1	43	1	40	1	42	1
36	1	45	1	46	1	43	1	52	1
43	1	48	1	193	2	39	1	42	1
48	1	193	1	43	2	42	1	47	1
56	1	193	1	195	1	194	1	209	1
210	1	213	3	210	1	213	1	69	1
114	1	156	1	69	1	161	1	114	1
124	1	117	1	123	1	115	2	124	1
115	3	151	1	215	1	150	1	69	1
115	1	151	1	116	1	124	1	115	1
127	1	151	1	194	1	43	1	46	1
48	1	43	1	37	1	43	1	37	1

46	2	43	1	37	1	50	1	40	1
44	1	46	1	194	1	40	1	43	1
195	1	43	1	219	1	37	1	54	1
50	1	42	1	53	1	194	1	52	1
64	1	46	1	195	1	48	1	41	1
43	1	48	2	40	1	39	1	194	1
44	1	43	1	205	-15	50	1	195	1
50	1	104	1	11	2	8	1	145	1
5	1	207	-3	209	1	210	1	213	3
210	1	213	1	208	1	210	1	213	3
210	1	213	1	216	1	90	1	97	1
99	1	90	1	91	1	200	1	91	1
124	1	67	1	166	1	78	1	114	1
115	2	159	1	78	1	115	1	82	1
114	1	79	1	119	1	115	1	116	1
115	1	118	1	114	1	118	1	115	1
73	1	158	1	116	1	83	1	154	1
197	1	115	1	75	1	124	1	157	1
115	1	151	1	123	1	86	1	71	1
77	1	73	1	197	1	162	1	77	1
165	1	127	1	118	1	194	1	40	1
47	1	49	1	37	1	48	1	195	1
46	1	50	1	46	1	38	1	43	2
39	1	53	1	40	1	195	1	194	1
5	1	132	1	9	1	109	1	15	1
192	1	109	1	2	1	104	1	5	1
104	1	6	1	8	1	110	1	12	1
6	1	9	1	2	1	104	1	13	1
9	1	16	1	9	1	104	1	15	1
111	1	8	1	209	1	210	1	213	3
210	1	213	1	218	1				

TABLE A-3. A-10A MARKER BAND CONDITIONS

5	75	69	415	11	34	72	353	14	13
45	243	140	7	159	175	161	69	142	37
161	69	163	17	144	45	165	11	27	2
57	34	86	7	59	22	87	7	61	16
88	4	28	11	29	1	63	8	64	2
5	75	69	415	11	34	72	353	14	13
45	243	140	7	159	175	161	69	142	37
161	69	163	17	144	45	165	11	27	2
57	34	86	7	59	22	87	7	61	16
88	4	28	11	29	1	63	8	64	2
5	75	69	415	11	34	72	353	14	13
45	243	140	7	159	175	161	69	142	37
161	69	163	17	144	45	165	11	27	2
57	34	86	7	59	22	87	7	61	16
88	4	28	11	29	1	63	8	64	2
5	75	69	415	11	34	72	353	14	13
45	243	140	7	159	175	161	69	142	37
161	69	163	17	144	45	165	11	27	2
57	34	86	7	59	22	87	7	61	16
88	4	28	11	29	1	63	8	64	2
218	1								

TABLE A-4. A-10A MARKER BAND CYCLES APPLICATION

PASS NUMBER	% OF LIFE ACCOMPLISHED	SEQUENCE TYPE	DEFINED ENDPOINTS
1	0 - 4%	Random	31404
2	4% - 8%	Random	31407
3	8% - 12%	Random	31413
4	12% - 16%	Random	31410
5	16% - 20%	Random	31404
6	20% - 24%	Random	31419
7	24% - 28%	Marker	20127
8	28% - 32%	Random	31416
9	32% - 36%	Random	31413
10	36% - 40%	Random	31407
11	40% - 44%	Random	31404
12	44% - 48%	Random	31422
13	48% - 52%	Marker	20127
14	52% - 56%	Random	31407
15	56% - 60%	Random	31416
16	60% - 64%	Random	31416
17	64% - 68%	Random	31407
18	68% - 72%	Random	31419
19	72% - 76%	Marker	20127
20	76% - 80%	Random	31410
21	80% - 84%	Random	31413
22	84% - 88%	Random	31407
23	88% - 92%	Random	31404
24	92% - 96%	Random	31428
25	96% - 100%	Marker	20127

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[illegible]

[illegible]

12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2
12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8
10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5
23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0
-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6
-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1
-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2
36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3
6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0
28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8
16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4
16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0
24.0	66.8	23.4	66.8	-12.0	1.3	-11.0	5.2	-7.0	45.0
-10.0	2.7	-11.0	2.5	-17.0	8.1	-14.0	3.0	-15.0	2.9
-22.0	87.3	42.3	76.7	22.9	78.1	30.3	69.4	51.2	61.6
36.4	51.2	26.7	73.9	36.2	64.4	41.2	59.4	22.5	83.3
29.2	74.5	50.3	64.4	34.9	50.3	1.4	50.1	6.6	40.2
23.6	31.8	4.9	35.2	9.6	28.4	5.6	50.0	5.5	39.1
23.0	52.0	21.4	77.6	28.2	69.4	52.0	63.9	35.1	52.0
23.9	88.7	31.8	79.4	52.6	68.3	38.7	52.6	23.0	78.1
30.3	69.4	51.2	61.6	3.8	24.8	5.8	22.5	12.8	35.7
15.0	33.3	27.3	48.9	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	4

18.7	69.5	20.5	61.5	18.6	63.7	23.9	56.4	14.7	65.5
16.6	57.5	23.2	70.1	29.6	63.1	20.7	75.7	26.1	66.8
46.6	57.0	-6.0	1.7	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	5.2	-11.0	1.3	-7.0	1.6
-11.0	66.8	24.0	61.5	-11.0	5.2	-11.0	2.5	-17.0	8.1
-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2
36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3
6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0
28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9
15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8
16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4
16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0
24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9
-22.0	76.7	30.3	69.4	51.2	61.6	26.4	51.2	36.2	64.4
41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2
23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4
52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6
30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9
21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5
29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8
24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8
-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7
30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4
29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8
9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9
35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4
51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2
11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8

12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1
23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4
52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6	5	

[illegible]

12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	23.4	66.8	-12.0	1.3
-11.0	5.2	-7.0	45.0	-10.0	2.7	-11.0	2.5	-17.0	8.1
-14.0	3.0	-15.0	2.9	-22.0	87.3	42.3	76.7	22.9	78.1
30.3	69.4	51.2	61.6	36.4	51.2	26.7	73.9	36.2	64.4
41.2	59.4	22.5	83.3	29.2	74.5	50.3	64.4	34.9	50.3
1.4	50.1	6.6	40.2	23.6	31.8	4.9	35.2	9.6	28.4
5.6	50.0	5.5	39.1	23.0	52.0	21.4	77.6	28.2	69.4
52.0	63.9	35.1	52.0	23.9	88.7	31.8	79.4	52.6	

10.1	20.8	10.1	20.8	13.2	42.0	16.1	38.9	31.8	52.4
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	18.7	69.5	20.5	61.5	18.6	63.7
23.9	56.4	14.7	65.5	16.6	57.5	23.2	70.1	29.6	63.1
20.7	75.7	26.1	66.8	46.6	57.0	-6.0	1.7	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	5.2
-11.0	1.3	-7.0	1.6	-11.0	66.8	24.0	61.5	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1
23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4
52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5
15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	

[illegible]

12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1
23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4
52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5
15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12	

28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9
15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8
16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4
16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0
24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9
-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4
41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2
23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4
52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6
30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9
21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5
29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8
24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8
23.4	66.8	-12.0	1.3	-11.0	5.2	-7.0	45.0	-10.0	2.7
-11.0	2.5	-17.0	8.1	-14.0	3.0	-15.0	2.9	-22.0	87.3
42.3	76.7	22.9	78.1	30.3	69.4	51.2	61.6	36.4	51.2
26.7	73.9	36.2	64.4	41.2	59.4	22.5	83.3	29.2	74.5
50.3	64.4	34.9	50.3	1.4	50.1	6.6	40.2	23.6	31.8
4.9	35.2	9.6	28.4	5.6	50.0	5.5	39.1	23.0	52.0
21.4	77.6	28.2	69.4	52.0	63.9	35.1	52.0	23.9	88.7
31.8	79.4	52.6	68.3	38.7	52.6	23.0	78.1	30.3	69.4
51.2	61.6	3.8	24.8	5.8	22.5	12.8	35.7	15.0	33.3
27.3	48.9	29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2

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26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1
23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4
52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5
15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2
12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8
10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9	12	

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12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	55.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1
23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4
52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5
15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2
12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8
10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5
23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0
-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6
-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1
-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2
36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3
6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0
28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12	

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-22.0	87.3	42.3	76.7	22.9	78.1	30.3	69.4	51.2	61.6
36.4	51.2	26.7	73.9	36.2	64.4	41.2	59.4	22.5	83.3
29.2	74.5	50.3	64.4	34.9	50.3	1.4	50.1	6.6	40.2
23.6	31.8	4.9	35.2	9.6	28.4	5.6	50.0	5.5	39.1
23.0	52.0	21.4	77.6	28.2	69.4	52.0	63.9	35.1	52.0
23.9	88.7	31.8	79.4	52.6	68.3	38.7	52.6	23.0	78.1
30.3	69.4	51.2	61.6	3.8	24.8	5.8	22.5	12.8	35.7
15.0	33.3	27.3	48.9	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	9.9	33.6	12.3	30.9	14.3	29.0	15.3	27.9
21.0	26.0	5.1	25.7	7.7	23.0	10.1	20.8	10.1	20.8
13.2	42.0	16.1	38.9	31.8	52.4	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
18.7	69.5	20.5	61.5	18.6	63.7	23.9	56.4	14.7	65.5
16.6	57.5	23.2	70.1	29.6	63.1	20.7	75.7	26.1	66.8
46.6	57.0	-6.0	1.7	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	5.2	-11.0	1.3	-7.0	1.6
-11.0	66.8	24.0	61.5	-11.0	5.2	-11.0	2.5	-17.0	8.1
-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2
36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3
6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0
28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9
15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8
16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4
16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0
24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9
-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4
41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2
23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4
52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6
30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8

12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9
21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5
29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8
24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8
-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7
30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4
29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8
9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9
35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4
51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2
11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	3	

15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1
23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4
52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5
15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2
12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8
10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5
23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0
-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6
-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1
-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2
36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3
6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0
28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9
15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8
16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4
16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0
24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9
-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4
41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2
23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4
52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6
30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8

20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	23.4	66.8	-12.0	1.3
-11.0	5.2	-7.0	45.0	-10.0	2.7	-11.0	2.5	-17.0	8.1
-14.0	3.0	-15.0	2.9	-22.0	87.3	42.2	76.7	22.9	78.1
30.3	69.4	51.2	61.6	36.4	51.2	26.7	73.9	36.2	64.4
41.2	59.4	22.5	33.3	29.2	74.5	50.3	64.4	34.9	50.3
1.4	50.1	6.6	40.2	23.6	31.8	4.9	35.2	9.6	28.4
5.5	50.0	5.5	39.1	23.0	52.0	21.4	77.6	28.2	69.4
52.0	63.9	35.1	52.0	23.9	88.7	31.8	79.4	52.6	68.3
38.7	52.6	23.0	78.1	30.3	69.4	51.2	61.6	3.8	24.8
5.8	22.5	12.8	35.7	15.0	33.3	27.3	48.9	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	13.8	38.2	9.9	33.6	12.3	30.9
14.3	29.0	15.3	27.9	21.0	26.0	5.1	25.7	7.7	23.0
10.1	20.8	10.1	20.8	13.2	42.0	16.1	38.9	31.8	52.4
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	18.7	69.5	20.5	61.5	18.6	63.7
23.9	56.4	14.7	65.5	16.6	57.5	23.2	70.1	29.6	63.1
20.7	75.7	26.1	66.8	46.6	57.0	-6.0	1.7	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	5.2
-11.0	1.3	-7.0	1.6	-11.0	66.8	24.0	61.5	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	30.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2

[illegible]

12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9
21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5
29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8
24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8
-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7
30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4
29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8
9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9
35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4
51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2
11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1

21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5
29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8
24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8
23.4	66.8	-12.0	1.3	-11.0	5.2	-7.0	45.0	-10.0	2.7
-11.0	2.5	-17.0	8.1	-14.0	3.0	-15.0	2.9	-22.0	87.3
42.3	76.7	22.9	78.1	30.3	69.4	51.2	61.6	36.4	51.2
26.7	73.9	36.2	64.4	41.2	59.4	22.5	83.3	29.2	74.5
50.3	64.4	34.9	50.3	1.4	50.1	6.6	40.2	23.6	31.8
4.9	35.2	9.6	28.4	5.6	50.0	5.5	39.1	23.0	52.0
21.4	77.6	28.2	69.4	52.0	63.9	35.1	52.0	23.9	88.7
31.8	79.4	52.6	68.3	38.7	52.6	23.0	78.1	30.3	69.4
51.2	61.6	3.8	24.8	5.8	22.5	12.8	35.7	15.0	33.3
27.3	48.9	29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2
9.9	33.6	12.3	30.9	14.3	29.0	15.3	27.9	21.0	26.0
5.1	25.7	7.7	23.0	10.1	20.8	10.1	20.8	13.2	42.0
16.1	38.9	31.8	52.4	34.5	49.7	11.6	50.9	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0	18.7	69.5
20.5	61.5	18.6	63.7	23.9	56.4	14.7	65.5	16.6	57.5
23.2	70.1	29.6	63.1	20.7	75.7	26.1	66.8	46.6	57.0
-6.0	1.7	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	5.2	-11.0	1.3	-7.0	1.6	-11.0	66.8
24.0	61.5	-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9
-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4
41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2
23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4
52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6
30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2

24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8
-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7
30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4
29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8
9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9
35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4
51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2
11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4		

12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2
12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8
10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5
23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0
-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6
-11.0	46.0	24.0	66.8	23.4	66.8	-12.0	1.3	-11.0	5.2
-7.0	45.0	-10.0	2.7	-11.0	2.5	-17.0	8.1	-14.0	3.0
-15.0	2.9	-22.0	87.3	42.3	76.7	22.9	78.1	30.3	69.4
51.2	61.6	36.4	51.2	26.7	73.9	36.2	64.4	41.2	59.4
22.5	83.3	29.2	74.5	50.3	64.4	34.9	50.3	1.4	50.1
6.6	40.2	23.6	31.8	4.9	35.2	9.6	28.4	5.6	50.0
5.5	39.1	23.0	52.0	21.4	77.6	28.2	69.4	52.0	63.9
35.1	52.0	23.9	88.7	31.8	79.4	52.6	68.3	38.7	52.6
23.0	78.1	30.3	69.4	51.2	61.6	3.8	24.8	5.8	22.5
12.8	35.7	15.0	33.3	27.3	48.9	29.6	46.7	24.2	54.2
11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	9.9	33.6	12.3	30.9	14.3	29.0
15.3	27.9	21.0	26.0	5.1	25.7	7.7	23.0	10.1	20.8
10.1	20.8	13.2	42.0	16.1	38.9	31.8	52.4	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	18.7	69.5	20.5	61.5	18.6	63.7	23.9	56.4
14.7	65.5	16.6	57.5	23.2	70.1	29.6	63.1	20.7	75.7
26.1	66.8	46.6	57.0	-6.0	1.7	-7.0	1.6	-11.0	66.8
24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	5.2	-11.0	1.3
-7.0	1.6	-11.0	66.8	24.0	61.5	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1

10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5
23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0
-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6
-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1
-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2
36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3
6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0
28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9
15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8
16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4
16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6
11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0
24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9
22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4
41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2
23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4
52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6
30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9
21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8	16	

51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2
11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2
-11.0	2.5	-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4
51.2	61.6	36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5
50.3	64.4	34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4
5.5	39.1	23.0	52.0	28.2	69.4	52.0	63.9	35.1	52.0
31.8	79.4	52.6	68.3	38.7	52.6	30.3	69.4	51.2	61.6
5.8	22.5	15.0	33.3	29.6	46.7	24.2	54.2	11.1	47.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0	7.7	23.0
10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7	11.6	50.9
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0
20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8
46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8
-7.0	1.6	-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5
-17.0	8.1	-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6
36.4	51.2	36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4
34.9	50.3	6.6	40.2	23.6	31.8	9.6	28.4	5	

12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5
23.9	56.4	16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0
-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6
-11.0	46.0	24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1
-15.0	2.9	-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2
36.2	64.4	41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3
6.6	40.2	23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0
28.2	69.4	52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3
38.7	52.6	30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
15.3	27.9	21.0	26.0	7.7	23.0	10.1	20.8	10.1	20.8
16.1	38.9	34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	27.0	44.0	20.5	61.5	23.9	56.4
16.6	57.5	29.6	63.1	26.1	66.8	46.6	57.0	-7.0	1.6
-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6	-11.0	46.0
24.0	66.8	-11.0	5.2	-11.0	2.5	-17.0	8.1	-15.0	2.9
-22.0	76.7	30.3	69.4	51.2	61.6	36.4	51.2	36.2	64.4
41.2	59.4	29.2	74.5	50.3	64.4	34.9	50.3	6.6	40.2
23.6	31.8	9.6	28.4	5.5	39.1	23.0	52.0	28.2	69.4
52.0	63.9	35.1	52.0	31.8	79.4	52.6	68.3	38.7	52.6
30.3	69.4	51.2	61.6	5.8	22.5	15.0	33.3	29.6	46.7
24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	13.8	38.2	12.3	30.9	1	

11.1	47.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	13.8	38.2	12.3	30.9	15.3	27.9	21.0	26.0
7.7	23.0	10.1	20.8	10.1	20.8	16.1	38.9	34.5	49.7
11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
27.0	44.0	20.5	61.5	23.9	56.4	16.6	57.5	29.6	63.1
26.1	66.8	46.6	57.0	-7.0	1.6	-11.0	66.8	24.1	61.5
26.1	66.8	-7.0	1.6	-11.0	46.0	24.0	66.8	23.4	66.8
-12.0	1.3	-11.0	5.2	-7.0	45.0	-8.0	2.9	-10.0	2.7
-11.0	2.5	-17.0	8.1	-11.0	3.2	-14.0	3.0	-15.0	2.9
-22.0	100.0	33.3	87.3	42.3	76.7	12.6	88.1	22.9	78.1
30.3	69.4	51.2	61.6	36.4	51.2	15.1	85.5	26.7	73.9
36.2	64.4	41.2	59.4	15.1	92.1	22.5	83.3	29.2	74.5
50.3	64.4	34.9	50.3	12.1	61.6	1.4	50.1	6.6	40.2
23.6	31.8	1.1	42.3	4.9	35.2	9.6	28.4	15.8	61.4
5.6	50.0	5.5	39.1	23.0	52.0	13.2	83.1	21.4	77.6
28.2	69.4	52.0	63.9	35.1	52.0	14.7	98.9	23.9	88.7
31.8	79.4	52.6	68.3	38.7	52.6	12.6	88.1	23.0	78.1
30.3	69.4	51.2	61.6	1.1	27.6	3.8	24.8	5.8	22.5
9.7	38.8	12.8	35.7	15.0	33.3	24.7	51.6	27.3	48.9
29.6	46.7	24.2	54.2	11.1	47.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8
12.1	45.8	12.1	45.8	12.1	45.8	12.1	45.8	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2	12.7	42.2
12.7	42.2	12.7	42.2	12.7	42.2	13.8	38.2	7.3	36.6
9.9	33.6	12.3	30.9	13.4	29.6	14.3	29.0	15.3	27.9
21.0	26.0	2.5	2.6	5.1	25.7	7.7	23.0	10.1	33.8
10.1	20.8	13.2	42.0	16.1	38.9	28.7	55.5	31.8	52.4
34.5	49.7	11.6	50.9	12.8	47.8	12.8	47.8	12.8	47.8
12.8	47.8	12.8	47.8	12.8	47.8	15.4	42.4	15.4	42.4
15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4	15.4	42.4
15.4	42.4	27.0	44.0	12.5	78.6	18.7	69.5	20.5	61.5
13.7	71.0	18.6	63.7	23.9	56.4	8.6	74.5	14.7	65.5
16.6	57.5	14.5	78.9	23.2	70.1	29.6	63.1	15.7	86.6
20.7	75.7	26.1	66.8	46.6	57.0	-5.0	1.7	-6.0	1.7
-7.0	1.6	-11.0	66.8	24.1	61.5	26.1	66.8	-7.0	1.6
-11.0	5.2	-11.0	1.3	-7.0	1.6	-11.0	66.8	24.0	61.5
0.0	0.0								