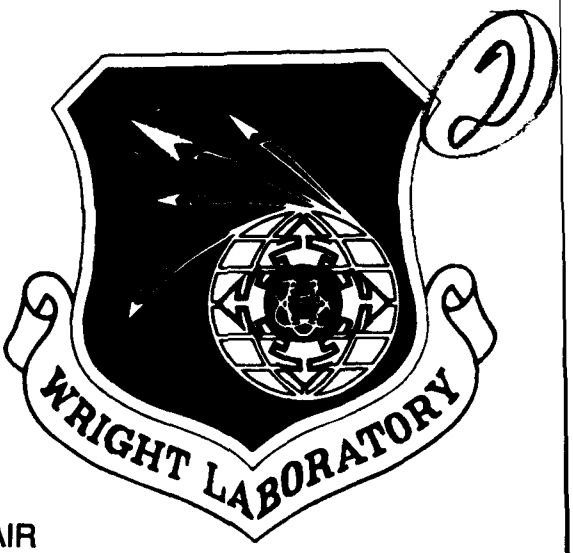

WL-TR-91-4132

THE MECHANICAL PROPERTY DATA BASE FROM AN AIR FORCE/INDUSTRY COOPERATIVE TEST PROGRAM ON ADVANCED ALUMINUM ALLOYS (IN905XL AND AL905XL FORGINGS)

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Interim Report for Period January 1987 - March 1991

Materials Directorate
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This technical report has been reviewed and is approved for publication.

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Development of mechanical property data base on Inco Alloys International aluminum-lithium structural alloys is detailed. Aluminum-lithium alloys tested were IN905XL Forgings and AL905XL Forgings. Basic mechanical property data consist of tension, compression, bearing, shear, and fracture toughness. Fatigue data were developed for both smooth and notched specimens. Constant amplitude fatigue crack growth rate data and spectrum test data were generated. Limited corrosion characteristics were also obtained. All other data developed by the participants are documented.

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AL905XL Tensile Spectrum
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2091 CW67 P/M
8090 7064 Compression Fatigue Crack Growth

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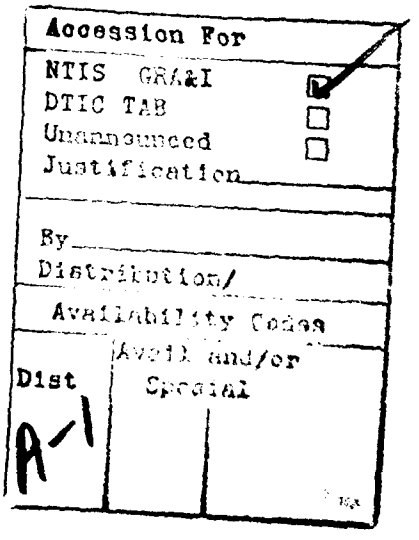
PREFACE

This report was prepared by the Materials Engineering Branch (WL/MLSE), Systems Support Division, Materials Directorate, Wright Laboratory, Wright-Patterson Air Force Base, Ohio, under Project 2418, "Metallic Structural Materials," Task 241807, "Systems Support," Work Unit 24180703, "Engineering and Design Data."

The authors would like to thank the participants LTV TX, Martin Marietta LA, McDonnell Aircraft MO, McDonnell Douglas Helicopter AR, NASA VA, Northrop CA, Sikorsky CT, Wyman Gordon, General Dynamic TX, and the Air Force for submitting their data.



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SECTION I
INTRODUCTION

High performance aerospace systems are dependent on materials that are lighter, have improved mechanical properties, and/or offer a cost savings. Aluminum alloys that met these criteria were the newly developed aluminum-lithium alloys and the second generation powder metallurgy alloys.

In 1985, the Air Force along with the aerospace community found it important to investigate the potential of these promising aluminum alloys. A cooperative program was formed by the Wright Laboratory Materials Directorate, Systems Support Division and a number of aerospace industries. The Air Force would obtain the test material from the producers, compile the test data, and submit reports to the participants. The participants agreed to support the program by performing mechanical property tests which includes tension, compression, bearing, shear, fracture toughness, and fatigue related properties (S/N, da/dn). The Air Force elected to perform spectrum fatigue crack growth testing on most alloys. A list of participants is shown in the following table.

This interim report contains the aluminum-lithium alloys produced by Inco Alloys International (Inco MAP); IN905XL jack fitting precision forging and AL905XL back up fitting precision forging. These two alloys are actually the same alloy but were produced in different years and production plants. The IN905XL forgings were produced in a pilot plant under developmental conditions of manufacturer in 1986. Significant variability in properties can be expected under such conditions.

In 1989, Inco Alloys International constructed a production facility to make the AL905XL and other mechanically alloyed aluminum alloys. Production practices through all stages of alloy manufacture were changed to yield greatly improved reproducibility. Comparisons to other materials, and ranking of materials is generally avoided since each potential application may be biased on different evaluation criteria.

Participants and Advanced Aluminum Alloys in the Cooperative Test Program

	ALUMINUM LITHIUM ALLOYS														P/M ALUMINUM ALLOYS					
	PECHINEY				ALCAN			IncoMAP		ALCOA				REYNOLDS	KAISER		ALCOA			
PARTICIPANTS	2091–T3 Sheet (0.063"T)	2091–T351 Plate (0.420"T)	2091–T6 Forging	8090–T651 T Extrusion	8090–T651 Extrusion	8090–T8771 Plate (1.75"T)	PM IN905XL Forging	PM AL905XL Forging	2091–T3 Sheet (0.063"T)	2091–T3 Sheet (0.144"T)	2091–T8 Plate (0.50"T)	8090 Extrusion	Weldalite 049 RX815 Plate (0.5"T)	7064–T74511 Extrusion	7064–T74 Forging	CW67 Sheet (0.063"T)	CW67 Plate (0.40"T)	CW67 Extrusion	CW67 Forging
Air Force WPAFB, OH		x			x	x	x	x	x	x	x	x	x	x	x			x	x
Army, MA													x						
AVCO, TN									x										
Boeing, WA	x	x	x	x															
Douglas Aircraft, CA								x	x	x	x	x	x						
General Dynamics, CA	x	x							x	x	x		x						
General Dynamics, TX	x	x	x	x			x		x	x	x	x							
Grumman Aerospace, NY	x	x			x		x							x	x			x	x
Jet Propulsion, CA								x					x						
Lockheed, CA	x			x				x	x		x								
Lockheed, GA			x		x				x	x					x				x
LTV, TX	x			x			x	x	x			x		x	x			x	
Martin Marietta, LA	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
McDonnell Douglas Astro, CA										x			x						
McDonnell Douglas Helicopter, AR								x											
McDonnell Douglas Missile Sys, MO													x						
McDonnell Aircraft, MO	x						x	x	x						x	x			x
NASA, VA					x		x	x					x						
Naval Air Development Center		x		x				x			x								x
Northrop, CA	x	x	x		x	x	x	x	x	x	x	x	x						
Sikorsky, CT							x		x						x		x		x
Sundstrand, IL													x						
Wyman–Gordon								x											

SECTION II

MATERIALS AND TESTS

The aluminum-lithium alloys tested were IN905XL forging (Figure G1) and AL905XL (Figure H1) which are a mechanically alloyed material exhibiting medium strength.

Basic mechanical tests were performed by the participants along with fatigue, fatigue crack growth, spectrum fatigue, and stress corrosion tests. ASTM standards were used for testing when applicable.

SECTION III

PRESENTATION

The purpose of this effort was to generate mechanical property data on newly developed aluminum alloys.

Each participant compiled a data package which contained the data they generated. Some of these data packages contain discussions, and in other cases, only the data were provided. The tensile, compression, bearing, shear, and fracture toughness data from each package were put in tabular form. Fatigue, fatigue crack growth, and spectrum fatigue crack growth data were placed in tabular and graphical form. Corrosion results were prepared in tabular form.

Constant amplitude fatigue crack growth tests were conducted according to ASTM E647 Standard unless otherwise specified. The A-N data supplied were reduced using a seven-point incremental polynomial method. This involves fitting a second-order polynomial (parabola) to sets of seven successive data points. K controlled methods were used by Northrop and General Dynamics. McDonnell Aircraft Company (MCAIR) used a WOL specimen geometry and therefore the seven-point incremental polynomial method was not used to generate the da/dn vs delta K data. The spectrums used were FALSTAFF and Mini-TWIST. Corrosion results were documented exactly as they were received from the participants.

SECTION IV

RESULTS AND DISCUSSION

This report contains the aluminum-lithium material produced by Inco Alloys International (IncoMAP). The appendix contains the results for a specific alloy and product form. The following table lists the form and aluminum-lithium alloy in the appendix.

Table
Contents of Appendix

Form	Aluminum-Lithium Alloy	Appendix
Forging	IN905XL	G
Forging	AL905XL	H

SECTION V

CONCLUSIONS

Ten aerospace laboratories participated in generating data on the IN905XL forging and AL905XL forging for the cooperative test program. These data combined with future interim reports on the Air Force/Industry Cooperative Test Program on Advanced Aluminum Alloys will provide an extensive data base on aluminum-lithium alloys.

APPENDIX G

IN905XL PRECISION FORGING

INTRODUCTION

The IN905XL forging was received the first quarter of 1987 and all the participants except General Dynamics TX tested the material in the as-received condition. General Dynamics TX exposed the forging to a two-step solution treatment and aging. Figure G1 shows the geometry of the IN905XL jack fitting precision forging.

TESTING

Basic mechanical properties (tension, compression, bearing, etc) were tested according to ASTM standards, unless otherwise specified.

Constant amplitude fatigue crack growth tests were conducted according to ASTM E647 standard. Northorp Corporation and General Dynamics performed constant amplitude fatigue crack growth test using K controlled methods. McDonnell Aircraft Company (MCAIR) used a WOL specimen geometry.

A mini-TWIST (moderately intense fatigue environment) spectrum test was performed by the Air Force.

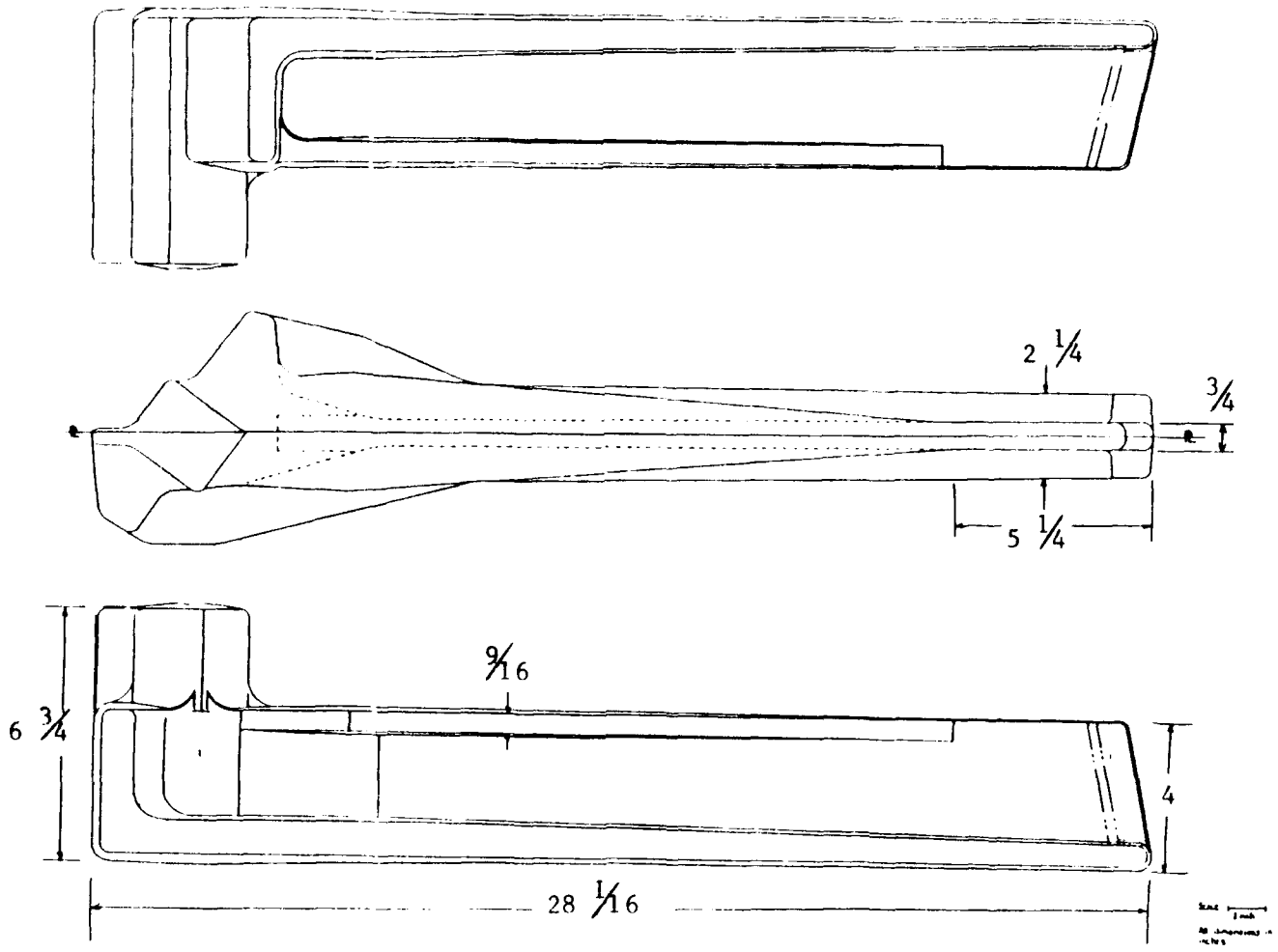

Figure G1 IN°05XL Jack Fitting Precision Forging

TABLE G1

TENSILE RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)	COMMENT
AIR FORCE	RT	LONG	66.6	52.0	11.5	23.0		(1)
			65.9	50.6	11.9	21.0		(1)
			66.1	52.0	11.8	25.0		(1)
			64.3	51.6	13.6	27.6		(2)
			63.7	48.7	10.4	12.4		(2)
			62.7	49.5	11.0	19.4		(2)
			67.7	56.0	13.0	30.3		(1)
			68.0	56.1	13.0	25.3		(1)
			68.3	57.7	13.0	28.0		(1)
MCAIR	RT	LONG	75.0	65.0	9.0	18.2	11.6	(1)
			75.5	64.5	8.0	15.6	11.9	(1)
			74.5	62.0	9.0	20.3	12.4	(1)
LTV	RT	LONG	68.0	51.5	13.0	21.6	10.8	(1)
			67.9	54.8	12.0	17.4	10.8	(1)
			64.7	50.2	11.0	9.2	10.8	(1)
NORTHROP	RT	LONG	67.4	55.4	10.0		11.6	(1)
				55.7			12.1	(1)
			67.0	55.3	12.0		12.2	(1)
			64.3	53.9	12.0		11.5	(2)
			65.0	53.3	11.0		11.9	(2)
			64.7	51.7	12.0		11.3	(2)
MARTIN MARIETTA	RT	LONG	75.1	62.2	12.0	13.9	11.4	
			75.9	63.8	10.0	14.7	11.4	
			78.1	64.9	10.0	13.2	11.6	
SIKORSKY	RT	LONG	67.5	57.7	7.5		12.4	(1)
			67.8	55.9	14.0		12.2	(1)
			68.0	55.3	13.0		12.6	(1)
			67.8	54.7	13.0		12.1	(1)
			68.9	57.0	13.0		12.7	(1)
			68.5	56.1	14.0		12.0	(1)
NASA LANGLEY	RT	LONG	67.0	57.3	7.0		11.5	
			67.9	57.8	9.0		11.4	
			67.6	58.1	7.0		11.5	
		AVERAGE	68.4	56.0	11.2	19.8	11.7	
		STANDARD DEVIATION	3.9	4.5	2.0	6.0	0.5	

(1): THIN SECTION (WEB/FLANGE SECTION)
(2): THICK SECTION (END SECTION)

TABLE G2

TENSILE RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)	COMMENT
AIR FORCE	RT	L TRANS	66.9	54.1	9.3	16.8		(1)
			67.2	53.9	7.0	11.7		(1)
			67.8	54.7	8.0	15.8		(1)
			64.9	51.2	13.3	19.9		(2)
			64.4	50.4	11.1	19.0		(2)
			64.4	49.7	9.3	13.5		(2)
			64.8	50.9	9.0	18.3		(1)
			64.1	50.1	11.0	12.3		(1)
			63.5	49.5	8.0	17.6		(1)
MCAIR	RT	L TRANS	74.5	66.0	8.0	15.1	12.4	(1)
			74.5	61.5	9.0	18.5	12.6	(1)
			74.5	64.5	8.0	16.3	11.5	(1)
LTV	RT	L TRANS	66.8	55.2	10.0	19.2	11.2	(1)
			67.0	54.7	10.0	18.6	11.5	(1)
			67.4	55.2	12.0	17.7	11.2	(1)
NORTHROP	RT	L TRANS	66.3	54.9	10.0		11.6	(1)
			65.8	54.3	11.0		11.5	(1)
			66.6	54.9	12.5		11.6	(1)
			64.8	51.4	6.0		11.9	(2)
			65.0	52.5	8.0		11.7	(2)
			65.3	52.9	8.0		11.9	(2)
MARTIN MARIETTA	RT	L TRANS	69.5	54.9	4.0	1.6	11.3	
			69.8	54.8	3.0	1.6	11.1	
			69.3	54.6	4.0	3.2	11.0	
SIKORSKY	RT	L TRANS	68.1	56.7	14.0		12.7	(1)
			67.9	56.8	10.0		11.8	(1)
			69.0	57.8	13.0		13.5	(1)
			68.7	58.1	9.0		11.1	(1)
NASA LANGLEY	RT	L TRANS	67.9	58.1	8.0		11.5	
			67.8	58.4	8.0		11.4	
			68.0	58.4	8.0		11.5	
		AVERAGE	67.5	55.2	9.0	14.3	11.7	
	STANDARD DEVIATION		2.9	4.0	2.6	6.1	0.6	

(1): THIN SECTION (WEB/FLANGE SECTION)
(2): THICK SECTION (END SECTION)

TABLE G3

TENSILE RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)	COMMENT
LTV	RT	S TRANS	64.7	50.8	8.0	7.7	11.2	(2)
			67.3	54.8	12.0	28.4	10.9	(2)
			63.2	50.8	8.0	10.3	11.2	(2)
NORTHROP	RT	S TRANS	64.1	52.6	6.5		11.4	(1)
			64.3	52.2	8.0		12.1	(1)
			64.7	51.5	8.0		11.9	(1)
MARTIN MARIETTA	RT	S TRANS	74.1	61.2	6.0	4.8	11.6	
			75.5	62.0	6.0	4.0	11.3	
			72.6	60.8	4.0	4.8	11.2	
SIKORSKY	RT	S TRANS	67.7	54.8	9.0		11.6	(1)
			65.3	50.8	5.0		12.8	(1)
NASA LANGLEY	RT	S TRANS	63.9	53.3	5.0		11.2	
			63.1	53.7	5.0		11.4	
			63.8	53.6	5.0		11.3	
		AVERAGE	66.7	54.5	6.8	10.0	11.5	
	STANDARD DEVIATION		4.2	4.0	2.1	9.3	0.5	

(1): THIN SECTION (WEB/FLANGE SECTION)
(2): THICK SECTION (END SECTION)

TABLE G4

TENSILE RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENTATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)	COMMENT
GENERAL DYNAMICS	RT	LONG	69.7	57.6				*
			67.1	59.2	9.7			*
		AVERAGE	68.4	58.4	9.7			
		STANDARD DEVIATION	1.8	1.1				

(*): THIN SECTION
NOTE: HEAT TREATED WITH THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G5

TENSILE RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENTATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)	COMMENT
GENERAL DYNAMICS	RT	L TRANS	71.2	58.7	8.6			*
			67.9	56.6	9.7			*
		AVERAGE	69.6	57.7	9.2			
		STANDARD DEVIATION	2.3	1.5	0.8			

(*): THIN SECTION
NOTE: HEAT TREATED WITH THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G6

COMPRESSION RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCAIR	RT	LONG	65.9	11.9
			65.9	10.4
			65.6	11.8
LTV	RT	LONG	59.1	11.9
			53.3	12.1
			60.5	12.0
NORTHROP	RT	LONG	56.6	11.7
			57.1	12.2
			57.4	12.0
MARTIN MARIETTA	RT	LONG	70.3	12.4
			70.9	12.3
			71.0	12.3
SIKORSKY	RT	LONG	57.9	13.2
			56.6	11.2
NASA LANGLEY	RT	LONG	60.7	11.7
			61.4	11.7
			61.6	11.7
		AVERAGE	61.9	11.9
		STANDARD DEVIATION	5.5	0.6

NOTE: NORTHROP SPECIMENS TAKEN FROM WEB/FLANGE SECTION.

TABLE G7

COMPRESSION RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCAIR	RT	L TRANS	64.2	12.1
			62.5	12.4
			62.0	12.7
LTV	RT	L TRANS	57.3	11.5
			58.9	12.3
			56.5	12.2
NORTHROP	RT	L TRANS	56.2	11.9
			56.0	11.8
			56.0	11.9
MARTIN MARIETTA	RT	L TRANS	67.2	12.3
			67.2	12.2
			67.3	12.3
SIKORSKY	RT	L TRANS	56.2	12.5
			55.5	11.8
			55.4	12.4
NASA LANGLEY	RT	L TRANS	59.3	11.7
			59.2	11.6
			59.2	11.7
		AVERAGE	59.8	12.1
		STANDARD DEVIATION	4.3	0.3

NOTE: NORTHROP SPECIMENS TAKEN FROM WEB/FLANGE SECTION.

TABLE G8

COMPRESSION RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
LTV	RT	S TRANS	54.1	11.5
			59.3	12.0
			53.7	11.8
NORTHROP	RT	S TRANS	50.8	11.9
			51.1	11.9
			50.1	11.8
MARTIN MARIETTA	RT	S TRANS	57.1	12.2
			57.1	12.1
			56.5	12.0
NASA LANGLEY	RT	S TRANS	56.5	11.6
		AVERAGE	54.6	11.9
		STANDARD DEVIATION	3.2	0.2

NOTE: NORTHROP SPECIMENS TAKEN FROM WEB/FLANGE SECTION.

TABLE G9

COMPRESSION RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
GENERAL DYNAMICS (*)	RT	LONG	58.0	11.4

(*): HEAT TREATED TO THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G10

COMPRESSION RESULTS FOR

IN905XL FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
GENERAL DYNAMICS (*)	RT	L TRANS	59.3	11.7
			55.9	11.7
		AVERAGE	57.6	11.7
		STANDARD DEVIATION	2.4	0.0

(*): HEAT TREATED TO THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G11

IOSIPESCU SHEAR RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
LTV	LONG	41.8
		41.7
	AVERAGE	41.8
	STANDARD DEVIATION	0.1

TABLE G12

IOSIPESCU SHEAR RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
LTV	L TRANS	40.4
		41.4
		41.7
		41.1
	AVERAGE	41.2
	STANDARD DEVIATION	0.6

TABLE G13

AMSLER DOUBLE SHEAR RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS (*)	L - S	37.7
		37.9
	AVERAGE	37.8
	STANDARD DEVIATION	0.1

(*): HEAT TREATED TO THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G14

AMSLER DOUBLE SHEAR RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
NORTHROP	L - S	39.6
		39.3
		39.3
NASA-LANGLEY	L - S	41.0
		40.9
		40.7
	AVERAGE	40.1
	STANDARD DEVIATION	0.8

TABLE G15

AMSLER DOUBLE SHEAR RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
NASA-LANGLEY	T - S	40.9
		41.0
		40.7
	AVERAGE	40.9
	STANDARD DEVIATION	0.2

TABLE G16

SLOTTED SHEAR RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
MCAIR	LONG	44.5
		41.5
		38.0
	AVERAGE	41.3
	STANDARD DEVIATION	3.3

TABLE G17

BEARING RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
LTV	LONG	1.5	97.0	82.5
			95.9	83.7
NORTHROP	LONG	1.5	102.0	83.9
			89.4	77.7
			100.8	82.3
NASA-LANGLEY	LONG	1.5	88.4	79.3
			92.6	78.7
		AVERAGE	97.0	82.0
		STANDARD DEVIATION	5.0	2.5

NOTE: NORTHROP SPECIMENS TAKEN FROM WEB/FLANGE SECTION.

TABLE G18

BEARING RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
LTV	L TRANS	1.5	118.0	91.5
			115.0	97.9
NORTHROP	L TRANS	1.5	85.3	77.3
			98.1	82.3
			86.7	77.2
		AVERAGE	100.6	85.2
		STANDARD DEVIATION	15.4	9.2

NOTE: NORTHROP SPECIMENS TAKEN FROM WEB/FLANGE SECTION.

TABLE G19

BEARING RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCAIR	LONG	2.0	125.0	104.0
			125.0	107.0
			124.0	102.0
LTV	LONG	2.0	118.0	91.5
			115.0	97.9
NORTHROP	LONG	2.0	125.1	96.5
			125.9	95.7
			125.9	93.7
		AVERAGE	123.0	98.5
		STANDARD DEVIATION	4.1	5.3

TABLE G20

BEARING RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS (*)	LONG	2.0	111.0	93.4
			113.3	92.9
		AVERAGE	112.2	93.2
		STANDARD DEVIATION	1.6	0.4

(*): HEAT TREATED TO THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G21

BEARING RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCAIR	L TRANS	2.0	105.0	101.0
			123.0	103.0
			122.0	103.0
LTV	L TRANS	2.0	117.2	100.5
			124.7	97.3
NORTHROP	L TRANS	2.0	117.5	89.0
			124.2	92.2
			115.7	89.0
		AVERAGE	118.7	96.9
		STANDARD DEVIATION	6.5	6.0

TABLE G22

BEARING RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS (*)	L TRANS	2.0	108.4	89.3
			107.9	90.4
		AVERAGE	108.2	89.9
		STANDARD DEVIATION	0.4	0.8

(*): HEAT TREATED TO THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G23

FRACTURE TOUGHNESS RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
MCAIR	L-T	18.8		VALID
		24.9		VALID
NORTHROP	L-T		37.9	(1)
			38.3	(1)
MARTIN MARIETTA	L-T		27.7	(2)
	AVERAGE	21.9	34.6	
	STANDARD DEVIATION	4.3	6.0	

(1): INVALID DUE TO Pmax/Pq > 1.10
(2): INVALID DUE TO PRE-CRACK GROWTH > 0.55W

NOTE: NORTHROP SPECIMENS TAKEN FROM END SECTION.

TABLE G24

FRACTURE TOUGHNESS RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
MCAIR	T-L	23.5		VALID
		21.0		VALID
LTV	T-L		33.9	(1)
			35.4	(1)
			31.5	(1)
			33.4	(1)
NORTHROP	T-L		34.4	(1)
			33.4	(1)
MARTIN	T-L		22.8	(2)
MARIETTA			21.7	(2)
	AVERAGE	22.3	30.8	
	STANDARD DEVIATION	1.7	5.4	

(1): INVALID DUE TO Pmax/Pq > 1.10
(2): INVALID DUE TO PRE-CRACK GROWTH > 0.55W

NOTE: NORTHROP SPECIMENS TAKEN FROM END SECTION.

TABLE G25

FRACTURE TOUGHNESS RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
LTV	T-S		34.1	(1)
			33.3	(1)
	AVERAGE		33.7	
	STANDARD DEVIATION		0.6	

(1): INVALID DUE TO Pmax/Pq > 1.10

TABLE G26

FRACTURE TOUGHNESS RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
MCAIR	S-T	17.8		VALID
		19.3		VALID
MARTIN	S-T	15.6		
MARIETTA		16.3		
			15.0	(1)
	AVERAGE	17.2	15.0	
	STANDARD DEVIATION	1.6		

(1): INVALID DUE TO PRE-CRACK GROWTH > 0.55W

TABLE G27

FRACTURE TOUGHNESS RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
MARTIN	S-L	19.5		VALID
MARIETTA			19.1	(1)
			23.8	(2)
	AVERAGE	19.5	21.5	
	STANDARD DEVIATION		3.3	

(1): INVALID DUE TO ASSYMETRIC CRACK GROWTH
(2): INVALID DUE TO PRE-CRACK GROWTH > 0.55W

TABLE G28

FRACTURE TOUGHNESS RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
GENERAL DYNAMICS	L-T		32.4	(1),(2)
			35.1	(1),(2)
	AVERAGE		33.8	
	STANDARD DEVIATION		1.9	

(1): SPECIMEN THICKNESS LESS THAN REQUIRED FOR VALIDITY
(2): HEAT TREATED TO THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH
STEP 4 - 230F FOR 24 HRS

TABLE G29

FRACTURE TOUGHNESS RESULTS FOR

IN905XL FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
GENERAL DYNAMICS	T-L		29.8	(1),(2)
			30.7	(1),(2)
	AVERAGE		30.3	
	STANDARD DEVIATION		0.6	

(1): SPECIMEN THICKNESS LESS THAN REQUIRED FOR VALIDITY
(2): HEAT TREATED TO THE FOLLOWING SCHEDULE:
STEP 1 - 850F FOR 2 HRS
STEP 2 - 665F FOR 2 HRS
STEP 3 - WARM WATER QUENCH

Novamet IN905XL Forging

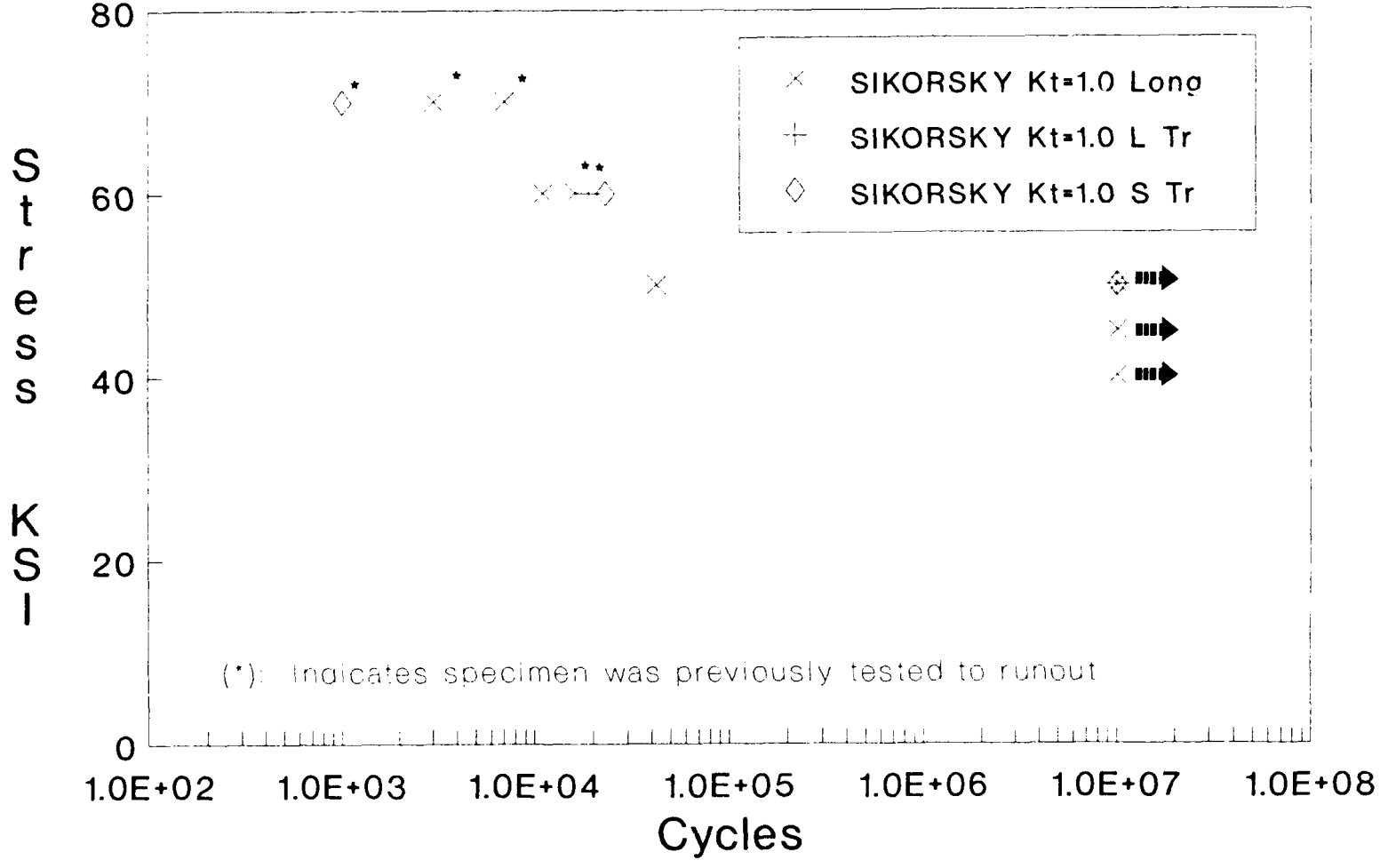

Figure C2 Fatigue Results for IN905XL Forging (R=0.1, Kt=1.0). Sikorsky.

TABLE G30

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES	
SIKORSKY	LONG	70.0	3,000	#
		70.0	7,000	!
		60.0	16,000	&
		60.0	11,000	
		50.0	42,000	
		50.0	10,000,000	*
		45.0	10,000,000	*
		40.0	10,000,000	*

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 40 KSI
(!): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 50 KSI
(&): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 45 KSI

TABLE G31

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	L TRANS	60.0	19,000 #
		50.0	10,000,000 *

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 50 KSI

TABLE G32

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	S TRANS	70.0	1,000 #
		60.0	23,000
		50.0	10,000,000 *

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 50 KSI

Novamet IN905XL Forging

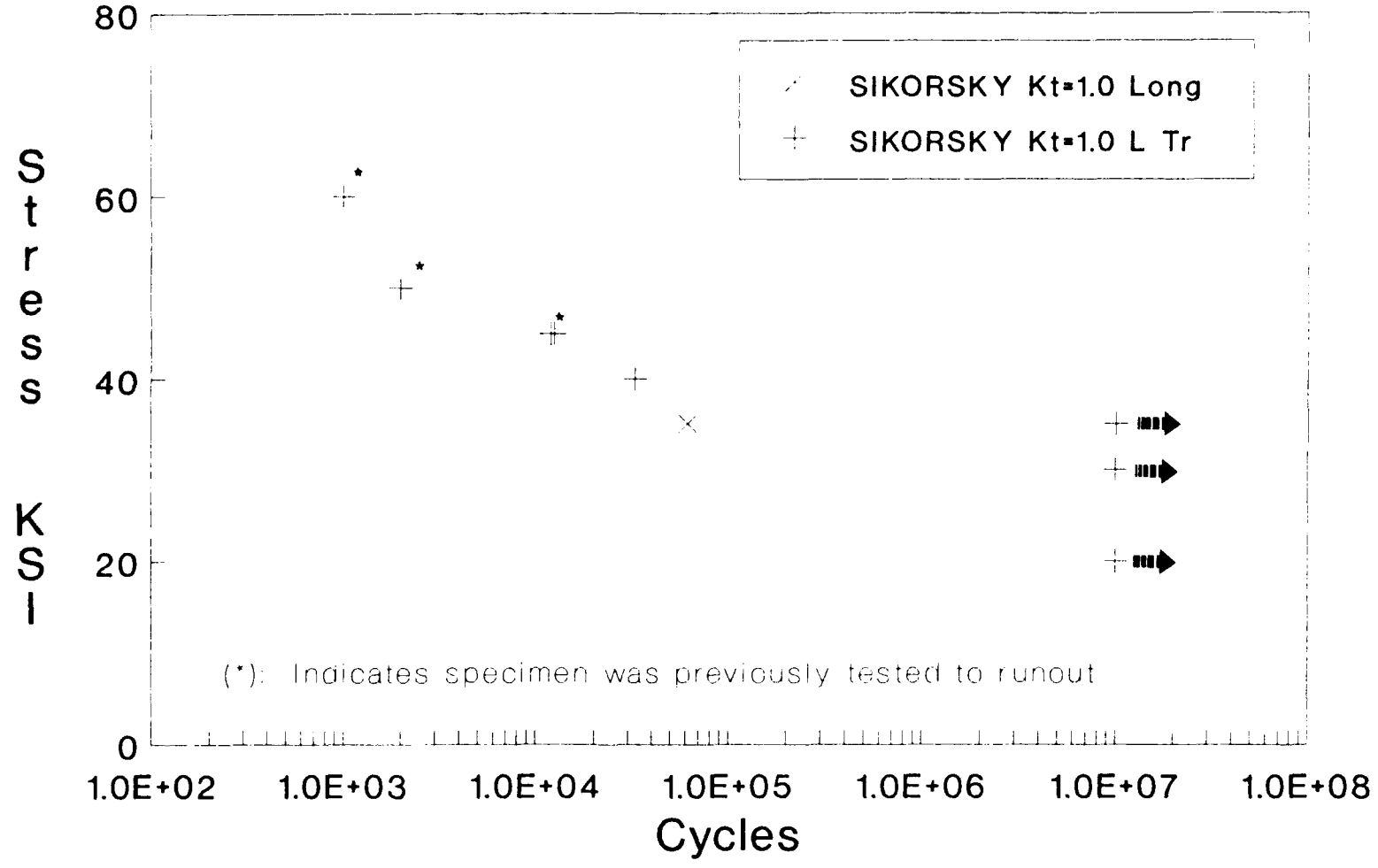

Figure 63 Fatigue Results for IN905XL Forging (R=-1.0, Kt=1.0). Sikorsky.

TABLE G33

FATIGUE RESULTS WITH R=-1.0 AND Kt=1.0 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	LONG	35.0	61,200

TABLE G34

FATIGUE RESULTS WITH R=-1.0 AND Kt=1.0 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	L TRANS	60.0	1,000 #
		50.0	2,000 !
		45.0	12,500
		45.0	12,000 &
		40.0	32,500
		35.0	10,000,000 *
		30.0	10,000,000 *
		20.0	10,000,000 *

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 30 KSI
(!): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 20 KSI
(&): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 35 KSI

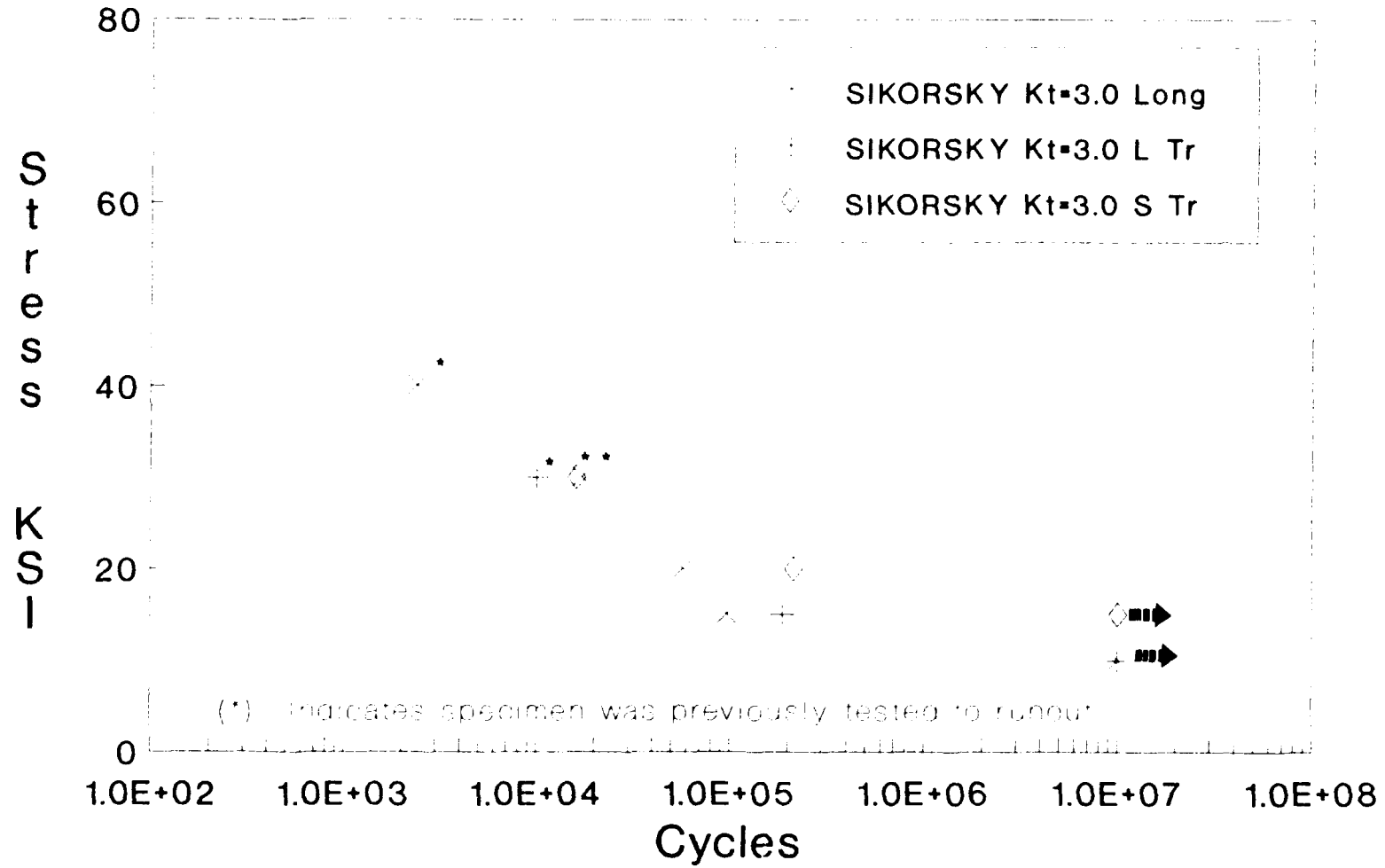

Figure G4 Fatigue Results for IN905XL Forging (R=0.1, Kt=3.0). Sikorsky.

TABLE G35

FATIGUE RESULTS WITH R=0.1 AND Kt=3.07 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	LONG	40.0	2,400 #
		30.0	17,000 #
		20.0	57,000
		15.0	96,000
		10.0	10,000,000 *
		10.0	10,000,000 *

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 10 KSI

TABLE G36

FATIGUE RESULTS WITH R=0.1 AND Kt=3.07 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	L TRANS	30.0	10,000 #
		15.0	187,400
		10.0	10,000,000 *

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 10 KSI

TABLE G37

FATIGUE RESULTS WITH R=0.1 AND Kt=3.07 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	S TRANS	30.0	16,000 #
		20.0	213,400
		15.0	10,000,000 *

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 15 KSI

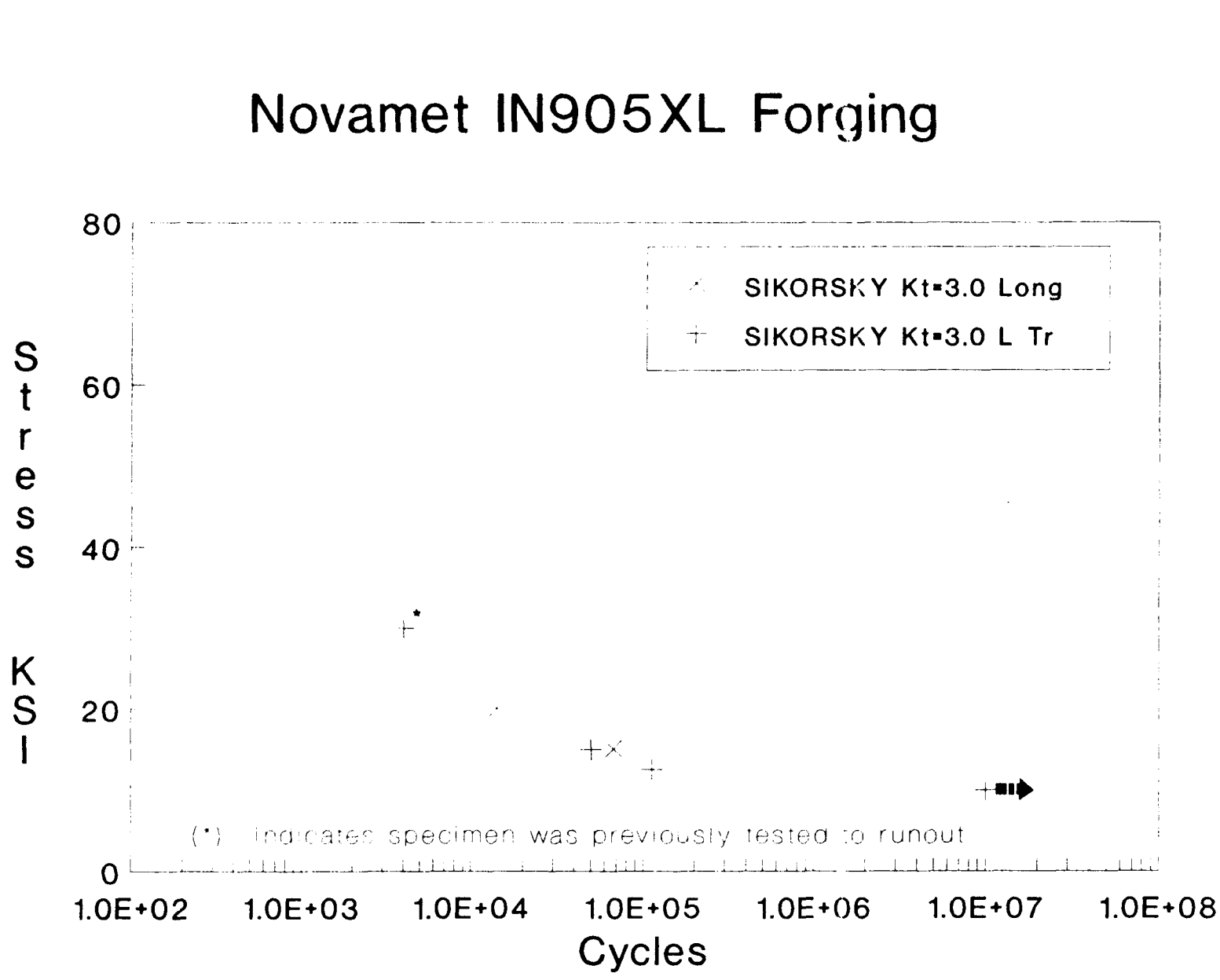

Figure G5 Fatigue Results for IN905XL Forging (R=-1.0, Kt=3.0). Sikorsky.

TABLE G38

FATIGUE RESULTS WITH R=-1.0 AND Kt=3.07 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	LONG	20.0	14,000
		15.0	67,000

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 15 KSI

TABLE G39

FATIGUE RESULTS WITH R=-1.0 AND Kt=3.07 FOR

IN905XL FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES
SIKORSKY	L TRANS	30.0	4,000 #
		15.0	50,000
		12.5	112,400
		10.0	10,000,000 *

(*): INDICATES A RUNOUT TEST
(#): INDICATES THAT SPECIMEN WAS PREVIOUSLY TESTED TO RUNOUT @ 10 KSI

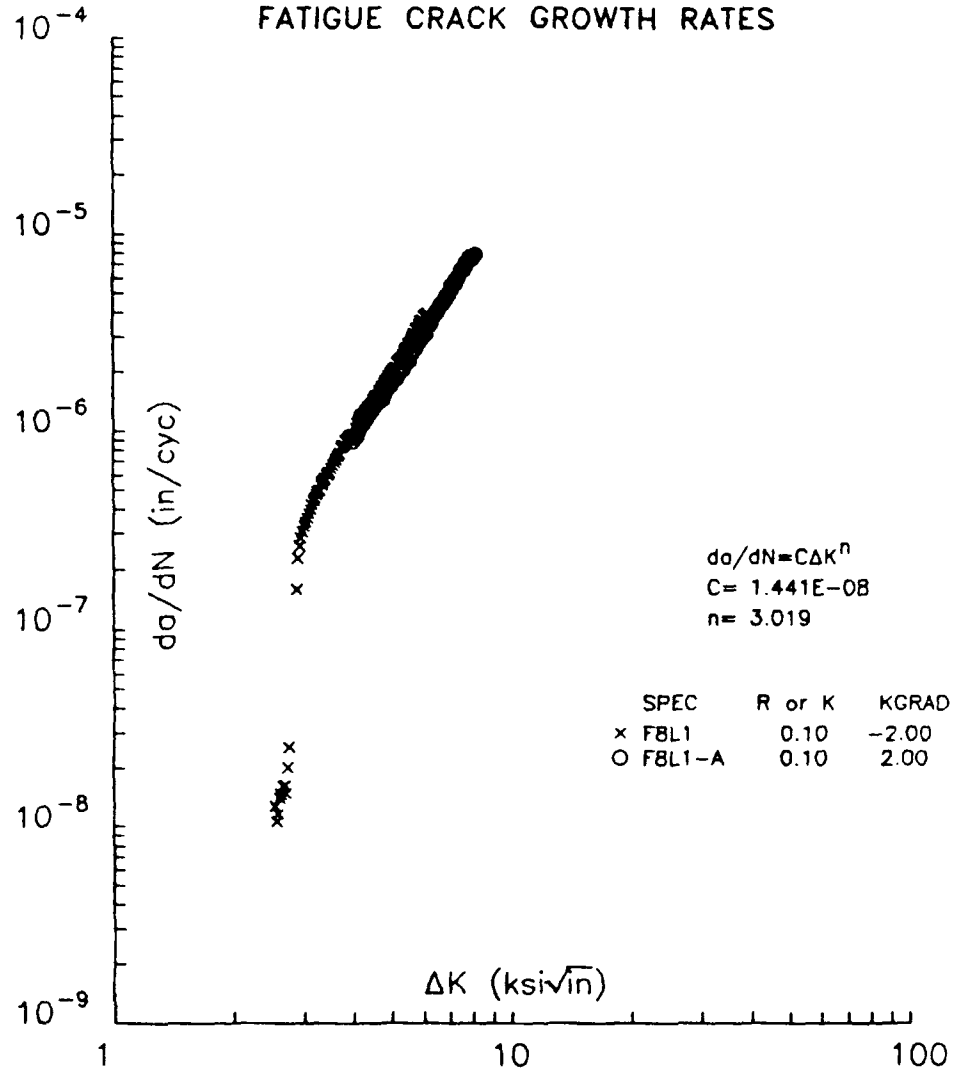

Figure G6 Fatigue Crack Growth Rate Data for IN905XL Forging (L-T Orientation, KGRAD -2.00 and 2.00). Northrop.

TABLE G40

Fatigue Crack Growth Data Associated With
Figure G6 (Specimen FBL1)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8L1	Geometry	C(T)
Contract #	95874	Orientation	L-T
Material	IN905XL FG	Yield (ksi)	55.5
Temperature (F)	72	Modulus	10.8
Environment	95% H.A.		

Specimen Dimensions (in)

Thickness	0.248	Notch depth	0.267
Width	1.497	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	500.0	Stress ratio (R)	0.10
Final a (in)	0.305	Kmax	7.12

Test Parameters

Initial a (in)	0.300	Initial K	7.20
K-gradient	-2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes
KRP 1 2

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
17.92	0.296	0.307	0.010	0.981
30.10	0.518	0.517	-.001	0.979
48.79	0.701	0.696	-.004	0.978
58.12	0.761	0.750	-.011	0.978
238.74	1.114	1.115	0.002	0.975
282.16	1.142	1.145	0.003	0.975

Comments

Date of test: 01-18-1988

TABLE G40 (Continued)

Specimen Id. F8L1

Pmax (lbs)	E8B/P	a (in)	N (KI)	Δa (in)	ΔN (KI)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	18.14	0.3019	3521						
480	18.32	0.3064	4604	0.0090	2266	3.952E-06	6.17	.176	5.65
472	18.50	0.3109	5787	0.0093	2418	3.863E-06	6.12	.176	5.60
464	18.70	0.3157	7021	0.0090	2364	3.807E-06	6.07	.175	5.56
455	18.88	0.3199	8152	0.0086	2363	3.643E-06	6.01	.176	5.50
448	19.06	0.3243	9384	0.0092	2569	3.569E-06	5.96	.175	5.46
440	19.27	0.3290	10720	0.0092	2668	3.433E-06	5.91	.176	5.41
432	19.46	0.3335	12052	0.0092	2766	3.321E-06	5.85	.176	5.36
425	19.67	0.3382	13486	0.0090	2767	3.247E-06	5.80	.175	5.32
417	19.86	0.3425	14819	0.0087	2815	3.105E-06	5.75	.176	5.26
410	20.06	0.3470	16301	0.0093	3108	2.996E-06	5.70	.176	5.22
403	20.28	0.3518	17928	0.0090	3078	2.917E-06	5.65	.176	5.17
396	20.47	0.3559	19378	0.0088	3076	2.864E-06	5.60	.176	5.13
389	20.69	0.3606	21003	0.0093	3345	2.776E-06	5.55	.175	5.09
383	20.91	0.3652	22723	0.0090	3376	2.663E-06	5.50	.176	5.04
376	21.12	0.3696	24379	0.0088	3383	2.604E-06	5.45	.176	4.99
370	21.34	0.3740	26105	0.0089	3526	2.532E-06	5.40	.176	4.95
364	21.56	0.3785	27906	0.0091	3742	2.431E-06	5.36	.175	4.91
358	21.79	0.3831	29847	0.0092	3882	2.372E-06	5.31	.175	4.87
352	22.02	0.3877	31788	0.0087	3809	2.296E-06	5.26	.176	4.82
346	22.24	0.3919	33656	0.0088	3927	2.249E-06	5.21	.184	4.73
340	22.48	0.3965	35715	0.0091	4121	2.213E-06	5.17	.188	4.66
334	22.71	0.4010	37777	0.0089	4216	2.109E-06	5.12	.195	4.58
329	22.95	0.4054	39930	0.0089	4375	2.040E-06	5.08	.196	4.53
323	23.19	0.4099	42153	0.0091	4571	1.996E-06	5.03	.203	4.46
318	23.45	0.4145	44501	0.0091	4661	1.947E-06	4.99	.206	4.40
312	23.69	0.4190	46814	0.0087	4627	1.887E-06	4.94	.206	4.36
307	23.94	0.4233	49128	0.0088	4814	1.828E-06	4.90	.213	4.29
302	24.19	0.4278	51628	0.0092	5088	1.803E-06	4.86	.210	4.26
297	24.46	0.4324	54216	0.0091	5175	1.751E-06	4.81	.211	4.22
292	24.72	0.4369	56803	0.0090	5354	1.686E-06	4.77	.217	4.15
287	24.99	0.4415	59570	0.0091	5490	1.655E-06	4.73	.216	4.12
283	25.26	0.4459	62292	0.0089	5550	1.605E-06	4.69	.218	4.07
278	25.53	0.4504	65120	0.0091	5879	1.540E-06	4.64	.220	4.02
273	25.82	0.4550	68171	0.0090	5988	1.510E-06	4.60	.224	3.97
269	26.09	0.4594	71108	0.0089	5989	1.494E-06	4.56	.231	3.90
264	26.38	0.4639	74160	0.0090	6213	1.454E-06	4.52	.232	3.86
260	26.67	0.4685	77321	0.0090	6434	1.404E-06	4.48	.233	3.82
256	26.96	0.4730	80594	0.0089	6544	1.357E-06	4.44	.235	3.77
251	27.25	0.4773	83865	0.0087	6544	1.334E-06	4.40	.239	3.72
247	27.54	0.4817	87138	0.0088	6766	1.305E-06	4.36	.242	3.68
243	27.84	0.4862	90631	0.0093	7255	1.279E-06	4.32	.246	3.62
239	28.17	0.4910	94393	0.0093	7420	1.249E-06	4.29	.248	3.58
235	28.48	0.4954	98051	0.0089	7315	1.211E-06	4.25	.254	3.52
231	28.79	0.4998	101708	0.0089	7444	1.197E-06	4.21	.252	3.50
227	29.11	0.5043	105495	0.0090	7713	1.172E-06	4.17	.258	3.44
224	29.44	0.5089	109421	0.0090	7990	1.131E-06	4.13	.264	3.38
220	29.77	0.5134	113485	0.0089	8075	1.100E-06	4.10	.267	3.34
216	30.10	0.5178	117496	0.0090	8715	1.027E-06	4.06	.272	3.28

TABLE C40 (Continued)

Specimen Id. F8L1

Pmax (lbs)	E4B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
213	30.44	0.5223	122201	0.0090	9420	9.573E-07	4.02	.272	3.26
209	30.78	0.5268	126916	0.0088	9240	9.535E-07	3.99	.270	3.24
206	31.12	0.5311	131441	0.0090	9386	9.617E-07	3.95	.274	3.19
202	31.49	0.5358	136302	0.0093	9888	9.423E-07	3.92	.276	3.15
199	31.86	0.5405	141328	0.0092	10047	9.159E-07	3.88	.281	3.10
196	32.22	0.5450	146349	0.0090	10044	8.929E-07	3.85	.284	3.06
192	32.59	0.5494	151372	0.0087	10223	8.506E-07	3.81	.289	3.01
189	32.94	0.5537	156572	0.0091	10779	8.421E-07	3.78	.292	2.97
186	33.35	0.5585	162151	0.0094	11412	8.246E-07	3.74	.295	2.93
183	33.74	0.5631	167984	0.0088	11455	7.716E-07	3.71	.300	2.89
180	34.11	0.5673	173606	0.0087	11656	7.437E-07	3.68	.305	2.84
177	34.50	0.5718	179640	0.0090	12535	7.213E-07	3.65	.306	2.81
174	34.91	0.5764	186141	0.0091	13078	6.951E-07	3.61	.314	2.76
171	35.31	0.5809	192717	0.0090	13416	6.717E-07	3.58	.314	2.73
168	35.73	0.5854	199557	0.0090	13944	6.451E-07	3.55	.320	2.68
165	36.15	0.5899	206661	0.0090	14469	6.213E-07	3.52	.329	2.62
163	36.58	0.5944	214026	0.0090	14725	6.144E-07	3.49	.324	2.62
160	37.01	0.5989	221386	0.0089	14977	5.941E-07	3.45	.327	2.58
157	37.44	0.6033	229003	0.0089	15501	5.739E-07	3.42	.320	2.59
155	37.88	0.6078	236887	0.0090	16029	5.617E-07	3.39	.321	2.56
152	38.33	0.6123	245023	0.0091	16535	5.488E-07	3.36	.325	2.52
149	38.80	0.6169	253442	0.0091	17158	5.301E-07	3.33	.341	2.44
147	39.27	0.6214	262181	0.0090	17798	5.034E-07	3.30	.344	2.41
144	39.74	0.6259	271239	0.0091	18443	4.911E-07	3.27	.348	2.37
142	40.23	0.6304	280623	0.0091	19084	4.746E-07	3.24	.353	2.33
140	40.71	0.6349	290323	0.0090	19716	4.557E-07	3.21	.355	2.30
137	41.21	0.6394	300339	0.0091	20457	4.428E-07	3.19	.361	2.26
135	41.72	0.6440	310780	0.0092	21774	4.210E-07	3.16	.360	2.24
132	42.24	0.6486	322113	0.0092	23086	3.980E-07	3.13	.373	2.18
130	42.77	0.6532	333866	0.0089	23479	3.802E-07	3.10	.368	2.18
128	43.28	0.6575	345592	0.0089	24670	3.591E-07	3.07	.387	2.09
126	43.82	0.6620	358535	0.0090	26307	3.419E-07	3.04	.396	2.04
124	44.36	0.6665	371899	0.0089	27349	3.272E-07	3.02	.401	2.01
121	44.91	0.6710	385884	0.0090	28957	3.091E-07	2.99	.395	2.01
119	45.47	0.6755	400856	0.0090	31437	2.862E-07	2.96	.404	1.96
117	46.05	0.6800	41732	0.0090	34774	2.600E-07	2.94	.411	1.92
115	46.63	0.6845	435631	0.0090	39425	2.281E-07	2.91	.424	1.86
113	47.22	0.6890	456746	0.0094	59339	1.592E-07	2.88	.437	1.80
	47.88	0.6940	494969						
	49.77	0.7076	1233705						
103	50.17	0.7104	1382902	0.0087	338966	2.552E-08	2.76	.493	1.55
102	51.02	0.7162	1572671	0.0098	485317	2.013E-08	2.74	.455	1.66
100	51.60	0.7202	1868219	0.0084	565011	1.494E-08	2.71	.456	1.64
98	52.28	0.7247	2137682	0.0092	559899	1.647E-08	2.69	.453	1.63
96	53.00	0.7294	2420118	0.0098	608915	1.617E-08	2.66	.436	1.67
95	53.80	0.7345	2746597	0.0092	624273	1.478E-08	2.64	.454	1.60
93	54.46	0.7386	3052391	0.0088	622384	1.413E-08	2.61	.459	1.57
91	55.21	0.7433	3368982	0.0086	737235	1.164E-08	2.59	.474	1.51
90	55.85	0.7472	3789626	0.0087	818376	1.069E-08	2.57	.482	1.48

Specimen Id. F8L1 Page 3

Pmax (lbs)	E4B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
88	56.67	0.7521	4187357	0.0093	726097	1.280E-08	2.54	.477	1.48
	57.42	0.7565	4515723						

TABLE C41

Fatigue Crack Growth Data Associated with Figure C6 (Specimen F8L1-A)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8L1-A	Geometry	C(T)
Contract #	95874	Orientation	L-T
Material	IN905XL FG	Yield (ksi)	55.5
Temperature (F)	72	Modulus	10.8
Environment	95% H.A.		

Specimen Dimensions (in)

Thickness	0.248	Notch depth	0.267
Width	1.497	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	500.0	Stress ratio (R)	0.10
Final a (in)	0.305	Kmax	7.12

Test Parameters

Initial a (in)	0.765	Initial K	4.40
K-gradient	2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes

KRP 1 2

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
17.92	0.296	0.307	0.010	0.981
30.10	0.518	0.517	-.001	0.979
48.79	0.701	0.696	-.004	0.978
58.12	0.761	0.750	-.011	0.978
238.74	1.114	1.115	0.002	0.975
282.16	1.142	1.145	0.003	0.975

Comments

Date of Test: 01-18-1988

TABLE G41 (Continued)

Specimen Id. F8L1-A

Pmax (lbs)	E8B/P	a (in)	N (KI)	Δa (in)	ΔN (KI)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	59.30	0.7672	6571						
133	60.14	0.7718	11976	0.0093	10509	8.865E-07	4.91	.272	3.25
133	61.01	0.7765	17080	0.0091	9886	9.246E-07	4.05	.269	3.29
133	61.85	0.7809	21862	0.0088	9331	9.461E-07	4.08	.268	3.32
133	62.69	0.7853	26411	0.0088	8972	9.862E-07	4.12	.271	3.33
133	63.57	0.7898	30833	0.0089	8721	1.026E-06	4.16	.267	3.38
133	64.46	0.7943	35132	0.0091	8612	1.056E-06	4.19	.269	3.41
133	65.40	0.7989	39445	0.0092	8460	1.083E-06	4.23	.267	3.44
132	66.35	0.8034	43592	0.0090	8149	1.106E-06	4.27	.273	3.45
132	67.29	0.8079	47594	0.0092	8012	1.144E-06	4.31	.272	3.48
132	68.31	0.8126	51604	0.0093	7825	1.186E-06	4.35	.274	3.50
132	69.32	0.8172	55419	0.0092	7615	1.213E-06	4.39	.273	3.54
132	70.37	0.8218	59219	0.0092	7440	1.240E-06	4.43	.276	3.56
132	71.43	0.8264	62858	0.0090	7107	1.267E-06	4.47	.274	3.60
131	72.47	0.8308	66326	0.0090	6922	1.293E-06	4.51	.279	3.61
131	73.55	0.8353	69780	0.0091	6786	1.335E-06	4.55	.272	3.68
131	74.67	0.8399	73112	0.0090	6527	1.379E-06	4.59	.325	3.44
131	75.78	0.8443	76307	0.0089	6425	1.386E-06	4.63	.335	3.42
130	76.92	0.8488	79537	0.0091	6418	1.413E-06	4.67	.328	3.49
130	78.12	0.8534	82726	0.0091	6302	1.436E-06	4.71	.323	3.54
130	79.31	0.8578	85838	0.0090	6220	1.453E-06	4.75	.325	3.57
130	80.56	0.8624	88946	0.0091	6027	1.507E-06	4.80	.325	3.60
129	81.81	0.8669	91865	0.0092	5829	1.572E-06	4.84	.329	3.61
129	83.14	0.8716	94775	0.0094	5817	1.624E-06	4.88	.321	3.68
129	84.53	0.8764	97682	0.0092	5538	1.664E-06	4.93	.328	3.68
128	85.86	0.8808	100312	0.0086	5121	1.684E-06	4.97	.325	3.73
128	87.14	0.8850	102803	0.0085	4951	1.719E-06	5.02	.321	3.78
128	88.49	0.8893	105263	0.0090	5027	1.791E-06	5.06	.334	3.74
127	89.98	0.8940	107830	0.0096	5245	1.827E-06	5.11	.323	3.84
127	91.58	0.8989	110508	0.0095	5133	1.854E-06	5.15	.306	3.98
127	93.13	0.9035	112963	0.0091	4688	1.933E-06	5.20	.314	3.96
126	94.65	0.9080	115197	0.0087	4355	1.990E-06	5.25	.303	4.06
126	96.13	0.9122	117318	0.0085	4217	2.021E-06	5.29	.322	3.99
125	97.68	0.9165	119414	0.0090	4371	2.053E-06	5.34	.304	4.13
125	99.39	0.9212	121689	0.0094	4458	2.104E-06	5.39	.309	4.14
125	101.18	0.9259	123871	0.0094	4191	2.237E-06	5.44	.303	4.21
124	102.98	0.9305	125880	0.0087	3907	2.238E-06	5.48	.308	4.21
124	104.60	0.9346	127779	0.0086	3799	2.257E-06	5.53	.308	4.25
123	106.42	0.9391	129680	0.0091	3803	2.400E-06	5.58	.291	4.40
123	108.35	0.9437	131581	0.0092	3730	2.460E-06	5.63	.294	4.41
122	110.29	0.9483	133410	0.0091	3589	2.525E-06	5.68	.314	4.33
122	112.27	0.9528	135170	0.0091	3520	2.598E-06	5.73	.307	4.41
121	114.36	0.9574	136930	0.0092	3380	2.719E-06	5.79	.307	4.45
121	116.47	0.9620	138550	0.0089	3173	2.814E-06	5.84	.301	4.53
120	118.54	0.9664	140103	0.0091	3248	2.792E-06	5.89	.289	4.65
119	120.83	0.9711	141798	0.0096	3312	2.894E-06	5.94	.294	4.66
119	123.28	0.9759	143414	0.0093	3024	3.060E-06	6.00	.301	4.66
118	125.54	0.9803	144821	0.0086	2772	3.091E-06	6.05	.292	4.76
118	127.76	0.9845	146186	0.0088	2839	3.106E-06	6.11	.303	4.73

TABLE C41 (Continued)

Specimen Id. F8L1-A

Pmax (lbs)	E4B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
117	130.28	0.9891	147660	0.0093	2831	3.292E-06	6.16	.285	4.89
116	132.91	0.9938	149017	0.0090	2660	3.395E-06	6.21	.284	4.94
116	135.41	0.9982	150320	0.0090	2617	3.426E-06	6.27	.280	5.02
115	138.15	1.0028	151634	0.0089	2510	3.541E-06	6.32	.294	4.96
115	140.75	1.0071	152831	0.0088	2388	3.696E-06	6.38	.286	5.06
114	143.61	1.0116	154022	0.0092	2381	3.847E-06	6.44	.279	5.16
113	146.58	1.0162	155211	0.0092	2324	3.945E-06	6.50	.278	5.21
113	149.63	1.0208	156346	0.0089	2210	4.005E-06	6.55	.267	5.34
112	152.56	1.0251	157422	0.0091	2189	4.177E-06	6.62	.274	5.34
111	156.01	1.0299	158535	0.0097	2216	4.377E-06	6.67	.252	5.55
110	159.54	1.0348	159637	0.0093	2106	4.417E-06	6.74	.248	5.63
110	162.92	1.0392	160641	0.0088	1954	4.529E-06	6.80	.263	5.57
109	166.32	1.0436	161591	0.0086	1834	4.678E-06	6.86	.262	5.63
108	169.69	1.0478	162475	0.0085	1749	4.834E-06	6.92	.262	5.67
107	173.21	1.0521	163340	0.0090	1817	4.971E-06	6.98	.268	5.67
107	177.29	1.0568	164293	0.0095	1861	5.104E-06	7.04	.242	5.93
106	181.46	1.0616	165201	0.0089	1665	5.341E-06	7.10	.239	6.00
105	185.26	1.0657	165957	0.0085	1556	5.494E-06	7.17	.274	5.78
104	189.38	1.0701	166756	0.0090	1599	5.611E-06	7.23	.260	5.94
103	193.86	1.0747	167556	0.0089	1530	5.812E-06	7.29	.269	5.92
102	198.18	1.0790	168287	0.0090	1532	5.884E-06	7.36	.273	5.94
101	203.10	1.0837	169088	0.0098	1602	6.092E-06	7.43	.266	6.06
101	208.55	1.0888	169889	0.0099	1566	6.309E-06	7.50	.250	6.24
100	213.99	1.0936	170654	0.0097	1459	6.626E-06	7.57	.248	6.32
99	219.64	1.0984	171348	0.0087	1309	6.679E-06	7.63	.247	6.38
98	224.37	1.1023	171963	0.0083	1210	6.849E-06	7.70	.243	6.48
97	229.84	1.1067	172558	0.0089	1232	7.236E-06	7.77	.214	6.78
96	235.73	1.1113	173195	0.0094	1289	7.313E-06	7.84	.233	6.68
95	242.32	1.1161	173846	0.0095	1248	7.622E-06	7.91	.241	6.67
94	248.81	1.1208	174442	0.0089	1185	7.496E-06	7.98	.220	6.92
93	255.02	1.1250	175031	0.0093	1201	7.716E-06	8.06	.239	6.82
92	262.62	1.1300	175643	0.0089	1139	7.857E-06	8.12	.215	7.08
	268.83	1.1340	176170						

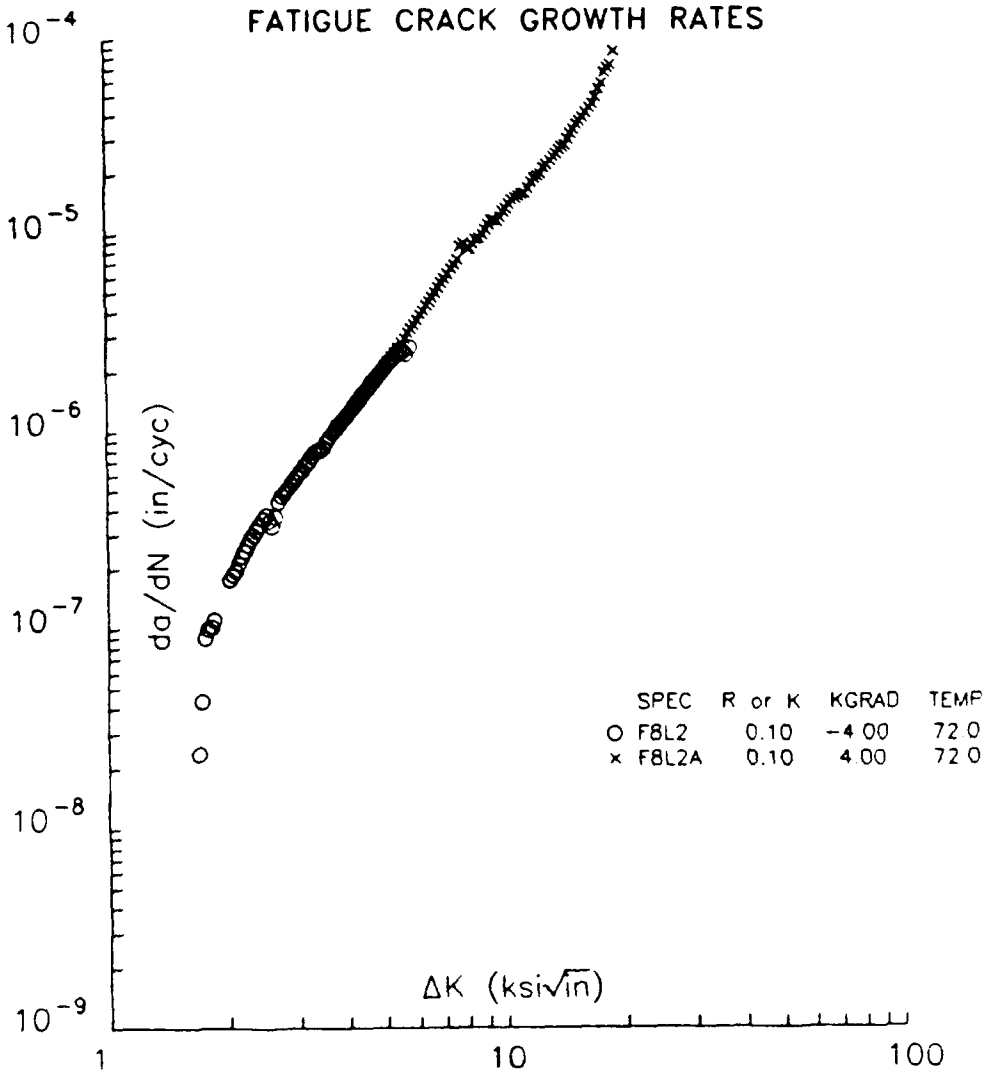

Figure 67 Fatigue Crack Growth Rate Data for IN905XL Forging (L-T Orientation, KGARAD -4.00 and 4.00). Northrop.

TABLE G42

Fatigue Crack Growth Data Associated with Figure G7 (Specimen F8L2)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8L2	Geometry	C(T)
Contract #	95874	Orientation	L-T
Material	IN905XL FRG	Yield (ksi)	55.7
Temperature (F)	72	Modulus	11.0
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.272
Width	1.495	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	284.0	Stress ratio (R)	0.10
Final a (in)	0.604	Kmax	6.83

Test Parameters

Initial a (in)	0.598	Initial K	7.00
K-gradient	-4.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes

KRP	1	0

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
36.94	0.584	0.582	-.002	0.945
108.35	0.939	0.941	0.002	0.961
274.20	1.135	1.138	0.003	0.971
352.86	1.175	1.174	-.001	0.973
395.73	1.192	1.190	-.002	0.974

Comments

Date of test: 04-11-1988

TABLE C42 (Continued)

Specimen Id. F8L2

Pmax (lbs)	E4B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)
	36.86	0.5833	155875				
275	37.36	0.5886	157655	0.0092	3388	2.715E-06	5.79
267	37.74	0.5925	159263	0.0086	3457	2.493E-06	5.68
261	38.20	0.5972	161111	0.0094	3620	2.596E-06	5.59
254	38.65	0.6019	162883	0.0093	3555	2.610E-06	5.49
248	39.12	0.6065	164666	0.0093	3719	2.511E-06	5.39
241	39.60	0.6112	166601	0.0093	3874	2.391E-06	5.30
235	40.06	0.6157	168540	0.0091	3959	2.301E-06	5.20
229	40.54	0.6203	170561	0.0093	4199	2.213E-06	5.11
223	41.04	0.6250	172739	0.0094	4434	2.121E-06	5.02
217	41.55	0.6297	174995	0.0094	4595	2.037E-06	4.93
212	42.06	0.6344	177334	0.0092	4734	1.952E-06	4.85
206	42.57	0.6390	179729	0.0093	4942	1.874E-06	4.76
201	43.11	0.6437	182276	0.0094	5188	1.808E-06	4.68
196	43.65	0.6483	184917	0.0093	5402	1.727E-06	4.59
191	44.19	0.6530	187678	0.0094	5712	1.646E-06	4.51
186	44.76	0.6577	190629	0.0094	5933	1.578E-06	4.43
181	45.31	0.6623	193610	0.0091	6090	1.499E-06	4.35
176	45.87	0.6669	196718	0.0091	6341	1.430E-06	4.28
172	46.44	0.6714	199952	0.0092	6740	1.364E-06	4.20
167	47.03	0.6761	203459	0.0094	7264	1.300E-06	4.13
163	47.65	0.6809	207216	0.0094	7519	1.247E-06	4.06
158	48.25	0.6854	210978	0.0093	7782	1.190E-06	3.99
154	48.87	0.6901	214998	0.0093	8149	1.140E-06	3.91
150	49.50	0.6947	219127	0.0091	8345	1.091E-06	3.84
146	50.12	0.6992	223342	0.0091	8738	1.042E-06	3.78
142	50.77	0.7038	227864	0.0093	9313	9.950E-07	3.71
139	51.44	0.7085	232655	0.0094	9877	9.512E-07	3.64
135	52.13	0.7132	237742	0.0095	10589	8.963E-07	3.58
131	52.83	0.7180	243244	0.0094	11174	8.371E-07	3.52
128	53.53	0.7226	248915	0.0092	11358	8.104E-07	3.45
124	54.23	0.7272	254602	0.0092	11369	8.083E-07	3.39
121	54.95	0.7318	260284	0.0093	11808	7.887E-07	3.33
118	55.70	0.7365	266410	0.0093	12443	7.510E-07	3.27
115	56.45	0.7411	272726	0.0092	12857	7.123E-07	3.22
111	57.20	0.7457	279267	0.0094	13852	6.753E-07	3.16
108	58.01	0.7505	286579	0.0094	14681	6.422E-07	3.10
106	58.81	0.7551	293947	0.0091	14749	6.159E-07	3.05
103	59.59	0.7596	301328	0.0090	15305	5.907E-07	3.00
100	60.40	0.7641	309252	0.0093	16428	5.635E-07	2.94
97	61.25	0.7688	317756	0.0094	17426	5.372E-07	2.89
95	62.12	0.7735	326678	0.0094	18253	5.136E-07	2.84
92	63.00	0.7782	336009	0.0094	19055	4.928E-07	2.79
89	63.90	0.7829	345733	0.0092	19534	4.718E-07	2.74
87	64.79	0.7874	355543	0.0091	20663	4.412E-07	2.69
85	65.71	0.7920	366395	0.0092	24889	3.710E-07	2.64
82	66.66	0.7966	380432	0.0094	27924	3.349E-07	2.60
80	67.64	0.8013	394319	0.0091	25733	3.536E-07	2.55
78	68.57	0.8057	406164	0.0093	24495	3.780E-07	2.51
76	69.62	0.8106	418814	0.0095	26206	3.640E-07	2.46
73	70.66	0.8153	432370	0.0093	27613	3.382E-07	2.42
71	71.71	0.8199	446426	0.0094	29586	3.188E-07	2.37
69	72.81	0.8247	461956	0.0094	31120	3.022E-07	2.33
67	73.91	0.8293	477546	0.0092	32120	2.860E-07	2.29
65	75.00	0.8339	494077	0.0091	33966	2.670E-07	2.25
64	76.11	0.8384	511512	0.0092	36986	2.496E-07	2.21
62	77.29	0.8431	531063	0.0095	40911	2.324E-07	2.17
60	78.53	0.8479	552422	0.0093	43291	2.139E-07	2.13
58	79.70	0.8524	574354	0.0090	46000	1.962E-07	2.10
57	80.92	0.8569	598422	0.0094	50212	1.873E-07	2.06
55	82.25	0.8618	624566	0.0090	51313	1.757E-07	2.02
	83.42	0.8660	649735				
	87.75	0.8807	719974				
47	88.99	0.8847	753678	0.0083	78213	1.107E-07	1.85
46	90.44	0.8894	798187	0.0091	88632	1.024E-07	1.82
45	91.87	0.8938	842350	0.0092	92073	1.001E-07	1.79
43	93.44	0.8986	890260	0.0094	104672	8.944E-08	1.76
42	94.99	0.9032	947022	0.0096	220906	4.367E-08	1.72
41	96.74	0.9082	1111165	0.0089	371906	2.390E-08	1.69
	98.10	0.9121	1318929				

TABLE G43

Fatigue Crack Growth Data Associated with Figure G7 (Specimen F8L2-A)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8L2A	Geometry	C(T)
Contract #	95874	Orientation	L-T
Material	IN905XL FRG	Yield (ksi)	0.0
Temperature (F)	72	Modulus	11.0
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.272
Width	1.495	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	284.0	Stress ratio (R)	0.10
Final a (in)	0.604	Kmax	6.83

Test Parameters

Initial a (in)	0.940	Initial K	4.00
K-gradient	4.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes

KRP 1 0

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
36.94	0.584	0.582	-.002	0.945
108.35	0.939	0.941	0.002	0.961
274.20	1.135	1.138	0.003	0.971
352.86	1.175	1.174	-.001	0.973
395.73	1.192	1.190	-.002	0.974

Comments

Date of test: 04-11-1988

TABLE C43 (Continued)

Specimen Id. F8L2A

Pmax (lbs)	E68/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)
	110.85	0.9447	5055				
81	112.88	0.9493	9364	0.0093	8599	1.087E-06	3.78
82	114.95	0.9540	13654	0.0093	8418	1.109E-06	3.85
82	117.09	0.9587	17782	0.0093	8113	1.152E-06	3.92
82	119.28	0.9634	21767	0.0094	7784	1.204E-06	3.99
83	121.55	0.9680	25566	0.0093	7410	1.252E-06	4.06
83	123.82	0.9726	29177	0.0092	7090	1.303E-06	4.14
83	126.20	0.9773	32657	0.0093	6793	1.363E-06	4.21
84	128.61	0.9819	35970	0.0093	6499	1.432E-06	4.29
84	131.15	0.9866	39156	0.0093	6183	1.506E-06	4.37
84	133.71	0.9912	42153	0.0093	5907	1.575E-06	4.45
85	136.39	0.9959	45063	0.0092	5574	1.647E-06	4.53
85	139.03	1.0004	47728	0.0092	5339	1.720E-06	4.61
85	141.88	1.0051	50402	0.0095	5257	1.799E-06	4.70
86	144.85	1.0098	52985	0.0093	4942	1.881E-06	4.78
86	147.77	1.0144	55344	0.0091	4604	1.975E-06	4.87
86	150.79	1.0189	57589	0.0093	4487	2.080E-06	4.96
86	154.06	1.0237	59831	0.0093	4265	2.179E-06	5.05
86	157.24	1.0282	61854	0.0090	3919	2.305E-06	5.15
87	160.52	1.0327	63750	0.0092	3802	2.428E-06	5.24
87	164.06	1.0375	65656	0.0092	3631	2.537E-06	5.33
87	167.55	1.0420	67381	0.0090	3346	2.692E-06	5.43
87	171.15	1.0465	69002	0.0092	3227	2.841E-06	5.53
87	174.99	1.0511	70608	0.0094	3141	2.989E-06	5.63
87	179.03	1.0559	72142	0.0093	2923	3.185E-06	5.73
87	183.07	1.0604	73531	0.0090	2697	3.351E-06	5.84
88	187.14	1.0649	74839	0.0092	2626	3.518E-06	5.95
88	191.65	1.0697	76157	0.0094	2538	3.723E-06	6.05
88	196.21	1.0743	77377	0.0092	2337	3.920E-06	6.17
88	200.76	1.0788	78494	0.0092	2218	4.139E-06	6.28
88	205.66	1.0835	79595	0.0093	2141	4.367E-06	6.39
88	210.73	1.0882	80635	0.0089	1954	4.572E-06	6.51
88	215.53	1.0925	81549	0.0088	1836	4.807E-06	6.63
88	220.83	1.0970	82471	0.0093	1825	5.099E-06	6.75
88	226.57	1.1018	83374	0.0093	1727	5.403E-06	6.87
88	232.32	1.1063	84198	0.0093	1631	5.730E-06	7.00
88	238.52	1.1111	85005	0.0095	1575	6.014E-06	7.13
87	244.91	1.1158	85772	0.0092	1453	6.316E-06	7.26
87	251.20	1.1203	86457	0.0090	1336	6.742E-06	7.39
87	257.85	1.1248	87109	0.0090	1270	7.070E-06	7.52
87	264.58	1.1293	87727	0.0092	1231	7.510E-06	7.66
87	272.21	1.1341	88340	0.0107	1241	8.644E-06	7.82
87	282.02	1.1400	88968	0.0095	1038	9.117E-06	7.95
86	288.17	1.1435	89378	0.0077	907	8.492E-06	8.11
86	295.62	1.1477	89875	0.0089	1060	8.441E-06	8.25
86	304.56	1.1525	90438	0.0098	1092	8.950E-06	8.40
86	314.31	1.1575	90968	0.0091	956	9.517E-06	8.55
85	322.70	1.1616	91394	0.0086	890	9.680E-06	8.71
85	332.26	1.1661	91857	0.0094	930	1.009E-05	8.87

TABLE G43 (Continued)

Specimen Id. F8L2A

Pmax (lbs)	$E_{dB/P}$	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)
85	343.10	1.1710	92324	0.0093	870	1.073E-05	9.02
84	353.46	1.1754	92727	0.0086	755	1.138E-05	9.19
84	363.53	1.1795	93079	0.0087	735	1.183E-05	9.35
83	375.06	1.1841	93462	0.0094	789	1.196E-05	9.52
83	388.07	1.1890	93867	0.0088	754	1.170E-05	9.68
82	399.05	1.1929	94215	0.0096	776	1.236E-05	9.88
82	415.77	1.1986	94644	0.0095	721	1.320E-05	10.04
81	427.73	1.2024	94936	0.0081	598	1.361E-05	10.24
81	441.63	1.2067	95241	0.0093	640	1.451E-05	10.42
80	458.76	1.2117	95576	0.0095	631	1.510E-05	10.60
80	475.04	1.2162	95872	0.0089	575	1.550E-05	10.80
79	491.69	1.2206	96151	0.0091	572	1.597E-05	11.00
78	510.67	1.2254	96444	0.0092	566	1.634E-05	11.19
78	529.66	1.2299	96717	0.0090	547	1.646E-05	11.40
77	549.75	1.2344	96991	0.0089	514	1.736E-05	11.60
76	570.50	1.2388	97231	0.0089	477	1.875E-05	11.81
75	593.02	1.2433	97468	0.0092	472	1.955E-05	12.03
75	617.76	1.2480	97703	0.0091	453	2.012E-05	12.24
74	642.45	1.2524	97922	0.0089	434	2.064E-05	12.47
73	669.23	1.2570	98136	0.0093	424	2.194E-05	12.69
72	699.25	1.2617	98345	0.0092	401	2.281E-05	12.92
71	728.57	1.2661	98537	0.0092	387	2.384E-05	13.17
70	763.20	1.2710	98733	0.0092	368	2.505E-05	13.40
69	796.41	1.2753	98905	0.0086	332	2.591E-05	13.64
68	830.77	1.2796	99065	0.0088	327	2.704E-05	13.88
67	870.49	1.2842	99233	0.0091	327	2.797E-05	14.13
66	912.36	1.2887	99391	0.0090	310	2.895E-05	14.38
65	956.35	1.2932	99543	0.0091	296	3.066E-05	14.64
64	%1005.41	1.2978	99687	0.0093	286	3.254E-05	14.91
63	%1058.95	1.3025	99829	0.0093	272	3.411E-05	15.18
61	%1115.30	1.3070	99959	0.0094	258	3.632E-05	15.47
60	%1179.04	1.3118	100087	0.0091	242	3.775E-05	15.74
59	%1241.47	1.3162	100200	0.0088	224	3.922E-05	16.03
58	%1310.45	1.3206	100311	0.0091	218	4.156E-05	16.32
56	%1388.40	1.3252	100419	0.0091	206	4.420E-05	16.60
55	%1470.10	1.3297	100516	0.0090	194	4.656E-05	16.91
54	%1560.75	1.3343	100612	0.0096	191	5.058E-05	17.23
52	%1671.91	1.3393	100707	0.0098	178	5.495E-05	17.54
51	%1785.06	1.3440	100791	0.0090	153	5.926E-05	17.87
49	%1890.62	1.3484	100859	0.0088	131	6.700E-05	18.20
48	%2028.59	1.3528	100922	0.0089	125	7.124E-05	18.51
46	%2171.32	1.3573	100985	0.0092	125	7.426E-05	18.85
45	%2340.17	1.3621	101046	0.0098	112	8.726E-05	19.20
	%2539.35	1.3671	101097				

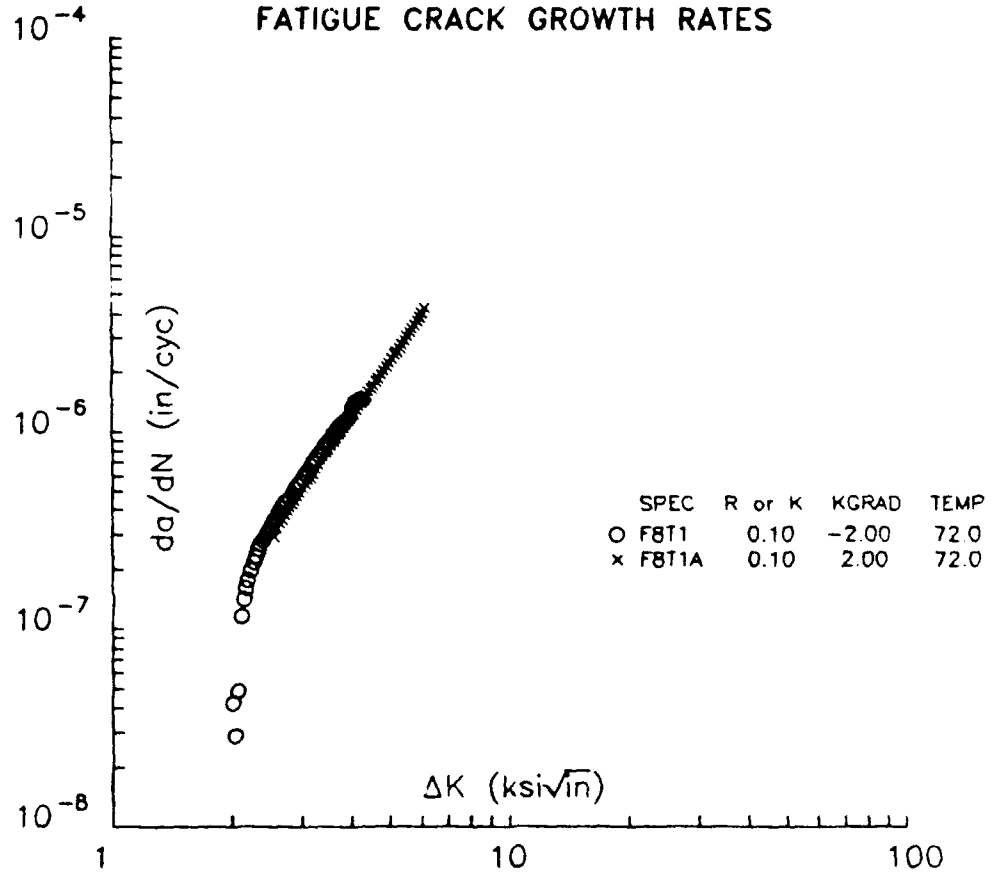

Figure 68 Fatigue Crack Growth Rate Data for IN905XL Forging (T-L Orientation, KGRAD -2.00 and 2.00). Northrop.

TABLE G44

Fatigue Crack Growth Data Associated
with Figure G8 (Specimen F8T1)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8T1	Geometry	C(T)
Contract #	95874	Orientation	T-L
Material	IN905 FG	Yield (ksi)	54.6
Temperature (F)	72	Modulus	10.8
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.262
Width	1.497	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	345.0	Stress ratio (R)	0.10
Final a (in)	0.318	Kmax	5.00

Test Parameters

Initial a (in)	0.260	Initial K	5.50
K-gradient	-2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes

KRP 1 2

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
18.47	0.322	0.330	0.008	1.006
20.32	0.363	0.350	-.013	1.004
51.86	0.727	0.731	0.004	0.993
73.32	0.838	0.842	0.003	0.990
382.83	1.189	1.188	-.001	0.979

Comments

Date of test: 01-13-1988

TABLE C44 (Continued)

Specimen Id. F8T1

Pmax (lbs)	E6B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	18.75	0.3283	6769						
318	19.07	0.3358	11909	0.0149	10180	1.468E-06	4.29	.176	3.93
309	19.40	0.3432	16948	0.0148	10099	1.466E-06	4.23	.176	3.87
300	19.73	0.3506	22008	0.0150	10463	1.430E-06	4.16	.176	3.81
291	20.07	0.3582	27412	0.0151	10694	1.414E-06	4.10	.176	3.75
283	20.43	0.3657	32702	0.0146	10866	1.347E-06	4.04	.176	3.69
275	20.77	0.3728	38277	0.0145	12023	1.204E-06	3.97	.176	3.64
267	21.13	0.3802	44725	0.0148	12894	1.149E-06	3.91	.176	3.58
260	21.50	0.3876	51171	0.0146	12888	1.133E-06	3.86	.175	3.54
253	21.86	0.3948	57612	0.0146	13315	1.096E-06	3.80	.175	3.48
246	22.25	0.4022	64485	0.0147	14021	1.052E-06	3.74	.175	3.43
239	22.64	0.4096	71633	0.0148	14675	1.010E-06	3.68	.175	3.38
232	23.04	0.4171	79160	0.0149	15326	9.708E-07	3.63	.175	3.33
226	23.45	0.4245	86959	0.0148	15857	9.316E-07	3.57	.175	3.28
219	23.87	0.4318	95017	0.0150	16664	8.975E-07	3.52	.175	3.23
213	24.31	0.4394	103623	0.0149	17230	8.640E-07	3.47	.175	3.18
207	24.74	0.4467	112247	0.0146	17578	8.283E-07	3.41	.175	3.13
202	25.18	0.4540	121201	0.0147	18571	7.923E-07	3.36	.175	3.08
196	25.64	0.4614	130817	0.0149	19558	7.609E-07	3.31	.175	3.04
191	26.11	0.4689	140759	0.0145	19877	7.299E-07	3.26	.175	2.99
186	26.57	0.4759	150695	0.0144	20546	6.994E-07	3.22	.175	2.95
181	27.05	0.4832	161305	0.0148	22023	6.723E-07	3.17	.174	2.91
176	27.56	0.4907	172718	0.0150	23371	6.434E-07	3.12	.174	2.86
171	28.08	0.4983	184676	0.0150	24326	6.165E-07	3.07	.174	2.82
166	28.60	0.5057	197044	0.0149	25135	5.910E-07	3.03	.174	2.78
161	29.14	0.5131	209811	0.0147	26053	5.646E-07	2.98	.174	2.74
157	29.68	0.5204	223097	0.0148	27210	5.426E-07	2.94	.174	2.69
153	30.24	0.5279	237021	0.0147	28357	5.192E-07	2.89	.174	2.65
149	30.80	0.5352	251454	0.0147	29884	4.905E-07	2.85	.174	2.61
145	31.38	0.5425	266904	0.0148	32078	4.607E-07	2.81	.174	2.58
141	31.98	0.5500	283532	0.0149	33399	4.459E-07	2.76	.174	2.54
137	32.60	0.5574	300304	0.0150	34136	4.387E-07	2.72	.174	2.50
133	33.24	0.5649	317668	0.0147	35381	4.167E-07	2.68	.174	2.46
129	33.87	0.5722	335685	0.0146	37305	3.923E-07	2.64	.174	2.42
126	34.52	0.5796	354973	0.0148	39966	3.708E-07	2.60	.173	2.39
122	35.20	0.5870	375650	0.0149	42260	3.523E-07	2.56	.173	2.35
119	35.89	0.5944	397233	0.0149	44733	3.329E-07	2.52	.173	2.32
115	36.60	0.6019	420383	0.0148	47087	3.146E-07	2.49	.173	2.28
112	37.33	0.6093	444321	0.0146	48696	3.007E-07	2.45	.173	2.25
109	38.06	0.6165	469080	0.0146	51563	2.834E-07	2.41	.173	2.22
106	38.81	0.6239	495884	0.0147	54801	2.689E-07	2.38	.173	2.18
103	39.59	0.6313	523880	0.0150	59011	2.537E-07	2.34	.173	2.15
100	40.42	0.6388	554894	0.0151	64252	2.344E-07	2.30	.173	2.12
97	41.25	0.6463	588132	0.0149	68168	2.179E-07	2.27	.173	2.09
95	42.09	0.6537	623062	0.0147	73604	1.992E-07	2.24	.173	2.05
92	42.94	0.6610	661736	0.0146	82042	1.783E-07	2.20	.172	2.03
89	43.82	0.6683	705104	0.0148	91658	1.615E-07	2.17	.173	1.99
87	44.74	0.6758	753394	0.0150	104514	1.432E-07	2.14	.197	1.91
84	45.70	0.6833	809617	0.0151	129009	1.167E-07	2.10	.200	1.87
82	46.68	0.6908	882403	0.0161	327470	4.908E-08	2.07	.205	1.83
79	47.83	0.6994	1137087	0.0147	509867	2.879E-08	2.04	.215	1.78
77	48.68	0.7055	1392269	0.0142	335111	4.241E-08	2.01	.216	1.75
	49.82	0.7136	1472199						

TABLE G45

Fatigue Crack Growth Data Associated with Figure G8 (Specimen F8T1-A)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8T1A	Geometry	C(T)
Contract #	95874	Orientation	T-L
Material	IN905 FG	Yield (ksi)	54.6
Temperature (F)	72	Modulus	10.8
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.262
Width	1.497	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	345.0	Stress ratio (R)	0.10
Final a (in)	0.318	Kmax	5.00

Test Parameters

Initial a (in)	0.725	Initial K	2.80
K-gradient	2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes		
KRP	1	2

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
18.47	0.322	0.330	0.008	1.006
20.32	0.363	0.350	-.013	1.004
51.86	0.727	0.731	0.004	0.993
73.32	0.838	0.842	0.003	0.990
382.83	1.189	1.188	-.001	0.979

Comments

Date of test: 01-13-1988

TABLE G45 (Continued)

Specimen Id. FBT1A

Pmax (lbs)	EdB/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	52.19	0.7295	6148						
93	52.97	0.7345	24913	0.0126	42697	2.949E-07	2.57	.180	2.35
93	54.17	0.7421	48845	0.0151	46117	3.277E-07	2.61	.173	2.40
93	55.40	0.7496	71030	0.0149	43366	3.445E-07	2.65	.173	2.43
93	56.65	0.7570	92212	0.0148	41420	3.577E-07	2.69	.173	2.47
93	57.94	0.7645	112450	0.0150	39682	3.768E-07	2.73	.173	2.51
93	59.29	0.7720	131893	0.0150	37739	3.965E-07	2.77	.173	2.54
93	60.67	0.7794	150189	0.0150	36062	4.151E-07	2.81	.172	2.58
92	62.11	0.7870	167955	0.0151	34879	4.323E-07	2.85	.172	2.62
92	63.59	0.7945	185068	0.0150	33146	4.515E-07	2.89	.172	2.66
92	65.11	0.8019	201101	0.0151	31799	4.746E-07	2.94	.172	2.70
92	66.72	0.8096	216867	0.0153	30924	4.954E-07	2.98	.173	2.74
92	68.39	0.8172	232025	0.0151	29311	5.162E-07	3.03	.173	2.78
92	70.07	0.8247	246178	0.0148	27376	5.409E-07	3.07	.173	2.82
91	71.79	0.8321	259401	0.0147	25832	5.676E-07	3.12	.173	2.87
91	73.55	0.8394	272010	0.0148	25267	5.849E-07	3.16	.172	2.91
91	75.41	0.8468	284668	0.0151	24733	6.101E-07	3.21	.172	2.95
91	77.39	0.8545	296743	0.0153	23591	6.484E-07	3.26	.173	3.00
90	79.45	0.8621	308259	0.0150	21937	6.824E-07	3.31	.173	3.04
90	81.48	0.8694	318679	0.0145	20137	7.196E-07	3.36	.173	3.09
90	83.55	0.8766	328396	0.0149	19755	7.554E-07	3.41	.173	3.13
89	85.87	0.8844	338434	0.0151	19251	7.861E-07	3.46	.174	3.17
89	88.17	0.8918	347647	0.0148	17999	8.198E-07	3.51	.173	3.23
88	90.55	0.8991	356433	0.0150	17582	8.548E-07	3.56	.173	3.27
88	93.13	0.9068	365229	0.0153	17171	8.910E-07	3.62	.174	3.32
88	95.80	0.9144	373603	0.0153	16360	9.333E-07	3.67	.173	3.37
87	98.58	0.9221	381589	0.0150	15463	9.715E-07	3.73	.174	3.42
87	101.39	0.9294	389066	0.0147	14530	1.008E-06	3.78	.174	3.47
86	104.26	0.9367	396120	0.0145	13768	1.051E-06	3.84	.174	3.52
85	107.23	0.9439	402834	0.0147	13409	1.097E-06	3.89	.175	3.57
85	110.44	0.9514	409528	0.0153	13389	1.141E-06	3.95	.175	3.62
84	113.93	0.9592	416223	0.0155	13055	1.184E-06	4.01	.175	3.68
84	117.53	0.9669	422583	0.0148	12078	1.228E-06	4.07	.175	3.73
83	121.04	0.9740	428301	0.0146	11375	1.279E-06	4.13	.176	3.78
82	124.83	0.9814	433959	0.0152	11321	1.339E-06	4.19	.175	3.84
82	129.00	0.9892	439622	0.0151	10786	1.398E-06	4.25	.175	3.90
81	133.10	0.9965	444745	0.0148	10129	1.457E-06	4.32	.174	3.96
80	137.49	1.0039	449751	0.0149	9720	1.530E-06	4.38	.175	4.02
79	142.07	1.0114	454465	0.0148	9236	1.602E-06	4.45	.175	4.08
79	146.85	1.0187	458986	0.0150	9051	1.662E-06	4.51	.175	4.14
78	152.08	1.0264	463516	0.0152	8846	1.724E-06	4.58	.175	4.20
77	157.51	1.0340	467832	0.0151	8407	1.792E-06	4.65	.175	4.26
76	163.17	1.0415	471923	0.0148	7951	1.867E-06	4.72	.175	4.32
75	169.02	1.0488	475783	0.0151	7698	1.956E-06	4.79	.175	4.39
74	175.48	1.0565	479621	0.0154	7503	2.056E-06	4.86	.177	4.44
73	182.33	1.0643	483286	0.0150	6981	2.153E-06	4.93	.175	4.52
72	189.18	1.0716	486602	0.0144	6420	2.243E-06	5.01	.176	4.58
71	196.19	1.0787	489705	0.0148	6311	2.347E-06	5.08	.175	4.66
70	204.28	1.0864	492913	0.0154	6263	2.466E-06	5.16	.177	4.71
69	212.86	1.0941	495968	0.0150	5836	2.564E-06	5.23	.178	4.78
68	221.40	1.1013	498749	0.0149	5555	2.674E-06	5.31	.179	4.84
67	230.93	1.1089	501523	0.0152	5423	2.794E-06	5.39	.182	4.90
66	240.98	1.1165	504172	0.0150	5133	2.930E-06	5.47	.178	4.99
65	251.62	1.1240	506656	0.0150	4828	3.098E-06	5.55	.181	5.05
64	262.91	1.1314	509001	0.0149	4586	3.254E-06	5.63	.180	5.13
63	274.96	1.1389	511241	0.0153	4500	3.397E-06	5.72	.183	5.19
62	288.50	1.1467	513501	0.0156	4392	3.542E-06	5.80	.183	5.27
60	302.84	1.1545	515633	0.0150	4043	3.706E-06	5.89	.186	5.33
59	317.28	1.1617	517544	0.0144	3721	3.878E-06	5.98	.182	5.43
58	332.58	1.1689	519354	0.0148	3629	4.065E-06	6.07	.182	5.51
57	349.93	1.1765	521173	0.0152	3533	4.296E-06	6.15	.185	5.58
	368.72	1.1841	522887						

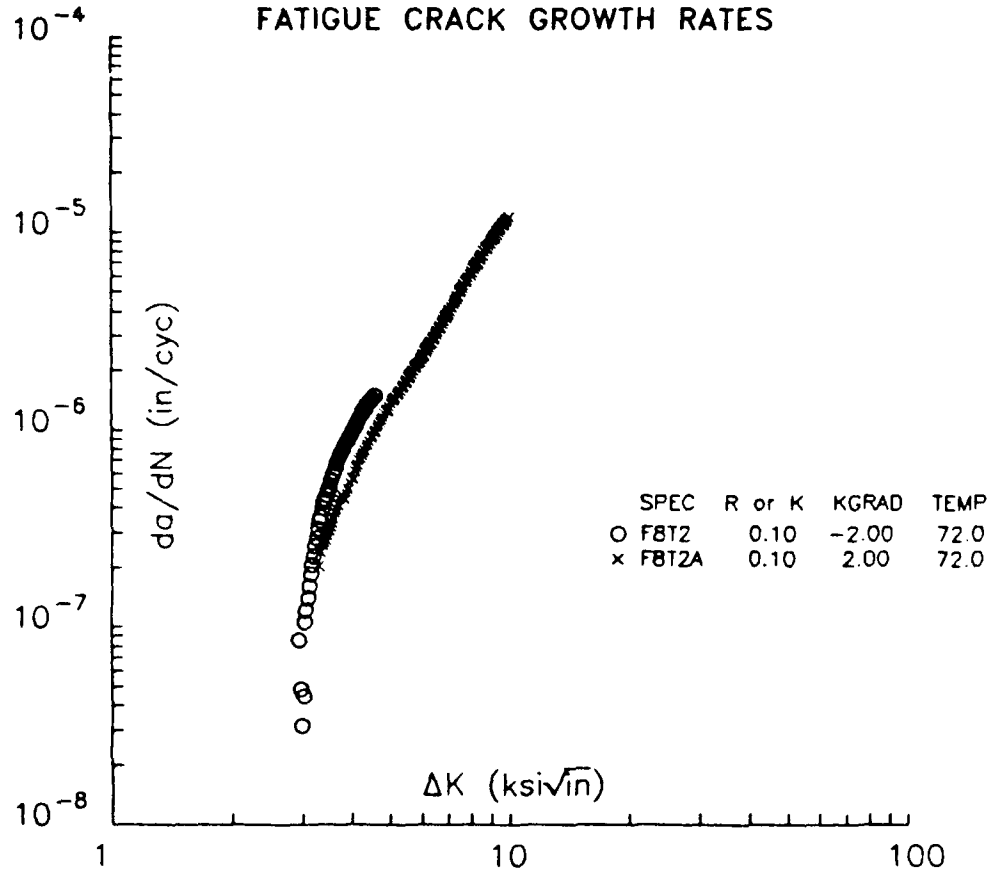

Figure G9 Fatigue Crack Growth Rate Data for IN905XL Forging (T-L Orientation, KGRAD -4.00 and 4.00). Northrop.

TABLE G46

Fatigue Crack Growth Data Associated
with Figure G9 (Specimen F8T2)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8T2	Geometry	C(T)
Contract #	95874	Orientation	T-L
Material	IN 905XL	Yield (ksi)	54.3
Temperature (F)	72	Modulus	11.5
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.265
Width	1.493	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	515.0	Stress ratio (R)	0.10
Final a (in)	0.284	Kmax	7.00

Test Parameters

Initial a (in)	0.265	Initial K	5.50
K-gradient	-2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes
KRP 1 4

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
17.13	0.283	0.280	-.003	0.999
25.98	0.478	0.475	-.003	1.032
30.45	0.547	0.553	0.006	1.044
31.32	0.558	0.563	0.005	1.045
31.68	0.563	0.569	0.006	1.046
38.18	0.639	0.628	-.011	1.059

Comments

Date of test: 02-19-1988

TABLE C46 (Continued)

Specimen Id. F8T2

Pmax (lbs)	E&B/P	a (in)	N (XI)	Δa (in)	ΔN (XI)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	17.54	0.2950	5581						
367	17.72	0.3001	8983	0.0098	6581	1.493E-06	4.63	.176	4.24
360	17.89	0.3048	12161	0.0097	6504	1.489E-06	4.59	.176	4.20
353	18.07	0.3097	15486	0.0099	6861	1.448E-06	4.55	.176	4.17
347	18.26	0.3148	19022	0.0100	7021	1.417E-06	4.51	.176	4.13
341	18.44	0.3197	22507	0.0097	7014	1.389E-06	4.48	.176	4.10
335	18.63	0.3245	26036	0.0097	7105	1.361E-06	4.44	.176	4.06
329	18.81	0.3294	29611	0.0097	7314	1.331E-06	4.40	.176	4.03
323	19.01	0.3342	33351	0.0096	7476	1.291E-06	4.37	.176	4.00
318	19.19	0.3390	37087	0.0097	7693	1.262E-06	4.33	.176	3.96
312	19.39	0.3440	41043	0.0098	7973	1.234E-06	4.29	.176	3.93
307	19.59	0.3489	45060	0.0096	8027	1.196E-06	4.26	.176	3.90
302	19.79	0.3536	49070	0.0096	8297	1.160E-06	4.22	.176	3.86
296	19.99	0.3585	53357	0.0098	8655	1.129E-06	4.19	.175	3.84
291	20.20	0.3633	57725	0.0095	8756	1.084E-06	4.15	.176	3.80
286	20.40	0.3680	62113	0.0095	9103	1.044E-06	4.12	.176	3.77
282	20.61	0.3728	66828	0.0098	9600	1.016E-06	4.08	.175	3.74
277	20.83	0.3777	71713	0.0096	9770	9.869E-07	4.05	.175	3.71
272	21.04	0.3825	76598	0.0095	9949	9.515E-07	4.01	.176	3.68
267	21.26	0.3872	81661	0.0096	10475	9.190E-07	3.98	.176	3.64
263	21.48	0.3921	87074	0.0098	11005	8.890E-07	3.95	.175	3.62
258	21.71	0.3970	92666	0.0097	11197	8.646E-07	3.91	.175	3.59
254	21.94	0.4018	98270	0.0095	11204	8.435E-07	3.88	.175	3.56
250	22.16	0.4064	103870	0.0094	11627	8.097E-07	3.85	.175	3.53
246	22.39	0.4112	109898	0.0097	12479	7.756E-07	3.82	.175	3.50
42	22.63	0.4161	116350	0.0097	12909	7.519E-07	3.79	.175	3.47
38	22.87	0.4209	122806	0.0095	12912	7.364E-07	3.75	.175	3.44
34	23.11	0.4256	129262	0.0095	13339	7.085E-07	3.72	.175	3.41
30	23.35	0.4304	136145	0.0097	14317	6.766E-07	3.69	.175	3.38
26	23.61	0.4353	143579	0.0097	15025	6.425E-07	3.66	.175	3.35
22	23.86	0.4400	151170	0.0095	15474	6.109E-07	3.63	.174	3.33
218	24.11	0.4448	159053	0.0095	16223	5.864E-07	3.60	.174	3.30
215	24.37	0.4495	167393	0.0096	17299	5.530E-07	3.57	.175	3.27
211	24.63	0.4543	176352	0.0097	18598	5.201E-07	3.54	.174	3.25
208	24.90	0.4592	185991	0.0097	19599	4.931E-07	3.51	.176	3.21
204	25.17	0.4640	195951	0.0095	20271	4.692E-07	3.48	.187	3.14
201	25.44	0.4687	206262	0.0096	21570	4.448E-07	3.45	.192	3.10
197	25.72	0.4736	217521	0.0097	22503	4.309E-07	3.42	.195	3.06
194	26.00	0.4784	228765	0.0093	23300	4.011E-07	3.39	.199	3.02
191	26.27	0.4829	240821	0.0094	25905	3.627E-07	3.36	.202	2.98
188	26.57	0.4878	254670	0.0097	28343	3.438E-07	3.33	.203	2.95
185	26.86	0.4927	269164	0.0095	30023	3.162E-07	3.31	.205	2.92
182	27.15	0.4973	284693	0.0095	33550	2.830E-07	3.28	.213	2.87
179	27.46	0.5022	302714	0.0096	37492	2.570E-07	3.25	.223	2.80
176	27.76	0.5069	322185	0.0094	40904	2.293E-07	3.22	.232	2.75
173	28.06	0.5115	343618	0.0095	46032	2.061E-07	3.19	.237	2.71
170	28.38	0.5164	368217	0.0096	51712	1.857E-07	3.17	.242	2.67
167	28.69	0.5211	395329	0.0094	57459	1.628E-07	3.14	.245	2.63
164	29.00	0.5258	425676	0.0094	66707	1.413E-07	3.12	.248	2.60
162	29.33	0.5306	462036	0.0096	78583	1.222E-07	3.09	.252	2.57
159	29.66	0.5354	504259	0.0097	90937	1.064E-07	3.06	.253	2.54
157	30.01	0.5403	552973	0.0085	189447	4.498E-08	3.04	.258	2.51
154	30.27	0.5439	693706	0.0092	291800	3.163E-08	3.01	.253	2.50
151	30.67	0.5495	844774	0.0105	215135	4.903E-08	2.99	.264	2.44
149	31.03	0.5544	908841	0.0090	103884	8.667E-08	2.96	.273	2.39
	31.33	0.5585	948657						

TABLE G47
Fatigue Crack Growth Data Associated
with Figure G9 (Specimen F8T2-A)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8T2A	Geometry	C(T)
Contract #	95874	Orientation	T-L
Material	IN 905XL	Yield (ksi)	54.3
Temperature (F)	72	Modulus	11.5
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.265
Width	1.493	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	515.0	Stress ratio (R)	0.10
Final a (in)	0.284	Kmax	7.00

Test Parameters

Initial a (in)	0.540	Initial K	3.50
K-gradient	2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes
KRP 1 4

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
17.13	0.283	0.280	-.003	0.999
25.98	0.478	0.475	-.003	1.032
30.45	0.547	0.553	0.006	1.044
31.32	0.558	0.563	0.005	1.045
31.68	0.563	0.569	0.006	1.046
38.18	0.639	0.628	-.011	1.059

Comments

Date of test: 02-19-1988

TABLE C47 (Continued)

Specimen Id. F8T2A

Pmax (lbs)	E8B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	31.82	0.5649	12212						
163	32.17	0.5695	36730	0.0094	45959	2.050E-07	3.33	.242	2.80
163	32.55	0.5744	58171	0.0095	39701	2.394E-07	3.36	.244	2.82
163	32.92	0.5790	76430	0.0095	36246	2.609E-07	3.39	.244	2.85
163	33.31	0.5838	94416	0.0096	35550	2.700E-07	3.42	.241	2.89
164	33.70	0.5886	111980	0.0095	34104	2.774E-07	3.45	.238	2.93
164	34.08	0.5933	128520	0.0094	32320	2.921E-07	3.49	.237	2.96
164	34.49	0.5981	144300	0.0096	31186	3.093E-07	3.52	.236	2.99
164	34.90	0.6029	159706	0.0096	29959	3.205E-07	3.56	.236	3.02
164	35.31	0.6077	174259	0.0095	28290	3.356E-07	3.59	.235	3.05
164	35.73	0.6124	187996	0.0094	26524	3.563E-07	3.62	.235	3.08
165	36.15	0.6171	200782	0.0093	24569	3.783E-07	3.66	.233	3.12
165	36.57	0.6217	212565	0.0093	23550	3.956E-07	3.69	.232	3.15
165	37.01	0.6264	224332	0.0095	23013	4.147E-07	3.73	.231	3.18
165	37.46	0.6313	235578	0.0097	21982	4.402E-07	3.76	.231	3.22
165	37.92	0.6361	246314	0.0096	20526	4.685E-07	3.80	.230	3.25
165	38.39	0.6409	256105	0.0087	19295	4.525E-07	3.84	.232	3.27
166	38.81	0.6448	265609	0.0085	19412	4.395E-07	3.87	.230	3.31
166	39.29	0.6494	275516	0.0090	18951	4.745E-07	3.91	.228	3.35
166	39.77	0.6538	284560	0.0089	17646	5.016E-07	3.94	.226	3.39
166	40.25	0.6582	293162	0.0090	16765	5.361E-07	3.98	.226	3.42
166	40.76	0.6628	301325	0.0087	15464	5.614E-07	4.01	.225	3.46
166	41.22	0.6669	308626	0.0082	14506	5.680E-07	4.05	.223	3.49
166	41.70	0.6711	315831	0.0089	14408	6.190E-07	4.09	.221	3.53
166	42.25	0.6759	323034	0.0091	14065	6.452E-07	4.12	.218	3.58
167	42.76	0.6801	329896	0.0088	13384	6.611E-07	4.16	.218	3.61
167	43.31	0.6847	336418	0.0089	12638	7.005E-07	4.20	.215	3.66
167	43.83	0.6890	342533	0.0087	12155	7.151E-07	4.24	.213	3.70
167	44.38	0.6934	348574	0.0088	11806	7.434E-07	4.27	.211	3.75
167	44.93	0.6978	354339	0.0086	11254	7.660E-07	4.31	.209	3.79
167	45.48	0.7020	359828	0.0087	10980	7.892E-07	4.35	.207	3.83
167	46.05	0.7064	365320	0.0090	10987	8.160E-07	4.39	.204	3.88
167	46.66	0.7110	370815	0.0090	10719	8.440E-07	4.43	.203	3.92
167	47.27	0.7155	376039	0.0089	10112	8.799E-07	4.47	.201	3.97
167	47.87	0.7199	380926	0.0087	9503	9.150E-07	4.51	.200	4.01
167	48.47	0.7242	385542	0.0085	9018	9.426E-07	4.55	.199	4.05
167	49.07	0.7284	389945	0.0086	8806	9.713E-07	4.59	.196	4.10
167	49.70	0.7327	394348	0.0088	8812	1.000E-06	4.63	.195	4.14
167	50.35	0.7372	398756	0.0091	8818	1.032E-06	4.67	.193	4.19
167	51.05	0.7418	403165	0.0092	8598	1.065E-06	4.72	.191	4.24
167	51.74	0.7463	407355	0.0087	7968	1.095E-06	4.76	.190	4.28
167	52.39	0.7505	411133	0.0085	7544	1.126E-06	4.80	.189	4.33
167	53.07	0.7548	414898	0.0087	7527	1.162E-06	4.85	.187	4.38
167	53.78	0.7593	418660	0.0089	7344	1.211E-06	4.89	.187	4.42
167	54.51	0.7637	422242	0.0087	6981	1.253E-06	4.93	.187	4.46
167	55.22	0.7680	425641	0.0086	6729	1.275E-06	4.98	.186	4.50
167	55.95	0.7723	428971	0.0087	6616	1.310E-06	5.02	.186	4.55
167	56.71	0.7767	432257	0.0087	6427	1.359E-06	5.07	.184	4.59
167	57.47	0.7811	435398	0.0088	6279	1.403E-06	5.12	.184	4.64

TABLE G47 (Continued)

Specimen Id. F8T2A

Pmax (lbs)	E48/P	a (in)	N (KI)	Δa (in)	ΔN (KI)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
167	58.27	0.7855	438536	0.0090	6277	1.429E-06	5.16	.184	4.68
167	59.10	0.7900	441675	0.0090	6135	1.468E-06	5.21	.183	4.73
167	59.94	0.7945	444671	0.0089	5851	1.513E-06	5.26	.183	4.77
167	60.76	0.7989	447526	0.0086	5566	1.544E-06	5.30	.182	4.82
166	61.59	0.8031	450237	0.0086	5380	1.595E-06	5.35	.181	4.87
166	62.44	0.8075	452906	0.0087	5323	1.643E-06	5.40	.181	4.92
166	63.33	0.8119	455560	0.0088	5193	1.686E-06	5.45	.180	4.96
166	64.22	0.8162	458098	0.0088	5076	1.731E-06	5.50	.179	5.01
166	65.15	0.8206	460636	0.0089	4963	1.788E-06	5.55	.179	5.06
166	66.10	0.8251	463062	0.0087	4736	1.837E-06	5.60	.179	5.11
165	67.03	0.8293	465372	0.0087	4622	1.884E-06	5.65	.178	5.16
165	68.01	0.8338	467683	0.0087	4506	1.932E-06	5.70	.177	5.21
165	68.98	0.8381	469877	0.0086	4339	1.994E-06	5.75	.176	5.27
165	69.99	0.8424	472022	0.0088	4273	2.058E-06	5.80	.177	5.31
165	71.04	0.8469	474151	0.0088	4164	2.113E-06	5.86	.177	5.36
164	72.10	0.8512	476186	0.0089	4071	2.177E-06	5.91	.177	5.40
164	73.20	0.8557	478222	0.0089	3981	2.228E-06	5.96	.177	5.45
164	74.30	0.8601	480167	0.0087	3798	2.295E-06	6.02	.177	5.50
163	75.42	0.8644	482020	0.0087	3705	2.361E-06	6.07	.177	5.55
163	76.58	0.8689	483872	0.0088	3613	2.424E-06	6.13	.177	5.60
163	77.74	0.8732	485632	0.0086	3417	2.503E-06	6.18	.177	5.65
162	78.90	0.8774	487289	0.0085	3294	2.579E-06	6.24	.177	5.70
162	80.10	0.8817	488926	0.0087	3272	2.645E-06	6.29	.177	5.75
162	81.35	0.8861	490561	0.0089	3273	2.729E-06	6.35	.177	5.81
161	82.68	0.8906	492199	0.0090	3200	2.812E-06	6.41	.177	5.86
161	84.02	0.8951	493762	0.0088	3051	2.891E-06	6.47	.177	5.91
161	85.36	0.8994	495250	0.0086	2902	2.978E-06	6.53	.177	5.97
160	86.70	0.9037	496663	0.0085	2750	3.077E-06	6.58	.177	6.02
160	88.04	0.9079	498000	0.0086	2672	3.202E-06	6.64	.177	6.07
159	89.47	0.9123	499336	0.0088	2671	3.299E-06	6.70	.177	6.13
159	90.97	0.9167	500671	0.0088	2609	3.378E-06	6.76	.178	6.18
158	92.47	0.9211	501945	0.0087	2487	3.491E-06	6.82	.177	6.24
158	93.99	0.9254	503158	0.0088	2429	3.622E-06	6.89	.176	6.31
157	95.61	0.9299	504373	0.0088	2368	3.737E-06	6.95	.177	6.35
157	97.22	0.9342	505526	0.0087	2272	3.828E-06	7.01	.177	6.41
156	98.86	0.9386	506645	0.0087	2200	3.950E-06	7.08	.176	6.48
156	100.56	0.9429	507726	0.0086	2117	4.085E-06	7.14	.177	6.53
155	102.26	0.9472	508762	0.0087	2070	4.219E-06	7.20	.177	6.59
155	104.08	0.9517	509796	0.0088	2022	4.368E-06	7.27	.177	6.65
154	105.91	0.9560	510784	0.0087	1929	4.496E-06	7.33	.177	6.71
153	107.75	0.9603	511726	0.0087	1884	4.631E-06	7.40	.177	6.77
153	109.71	0.9648	512667	0.0088	1836	4.800E-06	7.47	.176	6.84
152	111.69	0.9692	513562	0.0086	1725	5.011E-06	7.53	.177	6.89
152	113.67	0.9734	514393	0.0088	1702	5.148E-06	7.60	.176	6.96
151	115.81	0.9779	515264	0.0090	1706	5.249E-06	7.67	.177	7.02
150	117.99	0.9824	516099	0.0086	1594	5.421E-06	7.74	.177	7.08
150	120.10	0.9866	516858	0.0086	1518	5.635E-06	7.81	.176	7.15
149	122.35	0.9909	517617	0.0088	1518	5.793E-06	7.88	.176	7.22
148	124.70	0.9953	518375	0.0088	1479	5.938E-06	7.95	.177	7.27
147	127.08	0.9997	519096	0.0086	1397	6.150E-06	8.02	.177	7.34

TABLE G47 (Continued)

Specimen Id. F8T2A

Pmax (lbs)	E8B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
147	129.45	1.0039	519772	0.0085	1343	6.360E-06	8.10	.176	7.41
146	131.94	1.0083	520439	0.0087	1335	6.540E-06	8.17	.177	7.47
145	134.57	1.0127	521107	0.0090	1336	6.750E-06	8.24	.177	7.54
144	137.38	1.0173	521775	0.0091	1302	6.967E-06	8.32	.177	7.61
143	140.19	1.0217	522409	0.0088	1225	7.151E-06	8.40	.176	7.69
142	142.97	1.0260	523000	0.0086	1167	7.351E-06	8.47	.176	7.76
142	145.84	1.0303	523576	0.0087	1154	7.559E-06	8.55	.176	7.83
141	148.89	1.0347	524153	0.0087	1125	7.752E-06	8.62	.176	7.90
140	151.93	1.0390	524701	0.0086	1069	8.059E-06	8.70	.176	7.97
139	155.09	1.0434	525222	0.0086	1030	8.324E-06	8.78	.176	8.04
138	158.29	1.0476	525731	0.0086	1019	8.449E-06	8.86	.176	8.11
137	161.68	1.0520	526241	0.0088	1020	8.677E-06	8.94	.176	8.18
136	165.28	1.0565	526751	0.0088	996	8.881E-06	9.02	.176	8.26
135	168.88	1.0608	527237	0.0087	947	9.160E-06	9.10	.176	8.33
134	172.57	1.0651	527697	0.0085	899	9.406E-06	9.18	.176	8.40
133	176.22	1.0693	528135	0.0086	893	9.624E-06	9.26	.177	8.47
132	180.28	1.0737	528590	0.0090	907	9.894E-06	9.34	.176	8.56
131	184.54	1.0782	529042	0.0088	866	1.019E-05	9.43	.176	8.63
130	188.74	1.0825	529456	0.0086	826	1.041E-05	9.51	.176	8.71
129	193.07	1.0868	529869	0.0087	808	1.072E-05	9.60	.176	8.79
128	197.62	1.0912	530264	0.0085	771	1.100E-05	9.68	.177	8.85
127	202.05	1.0953	530639	0.0086	770	1.115E-05	9.77	.175	8.96
126	207.05	1.0998	531033	0.0090	785	1.143E-05	9.86	.176	9.02
125	212.26	1.1043	531425	0.0088	755	1.171E-05	9.95	.176	9.11
124	217.47	1.1086	531789	0.0085	712	1.196E-05	10.04	.175	9.20
	222.66	1.1128	532137						

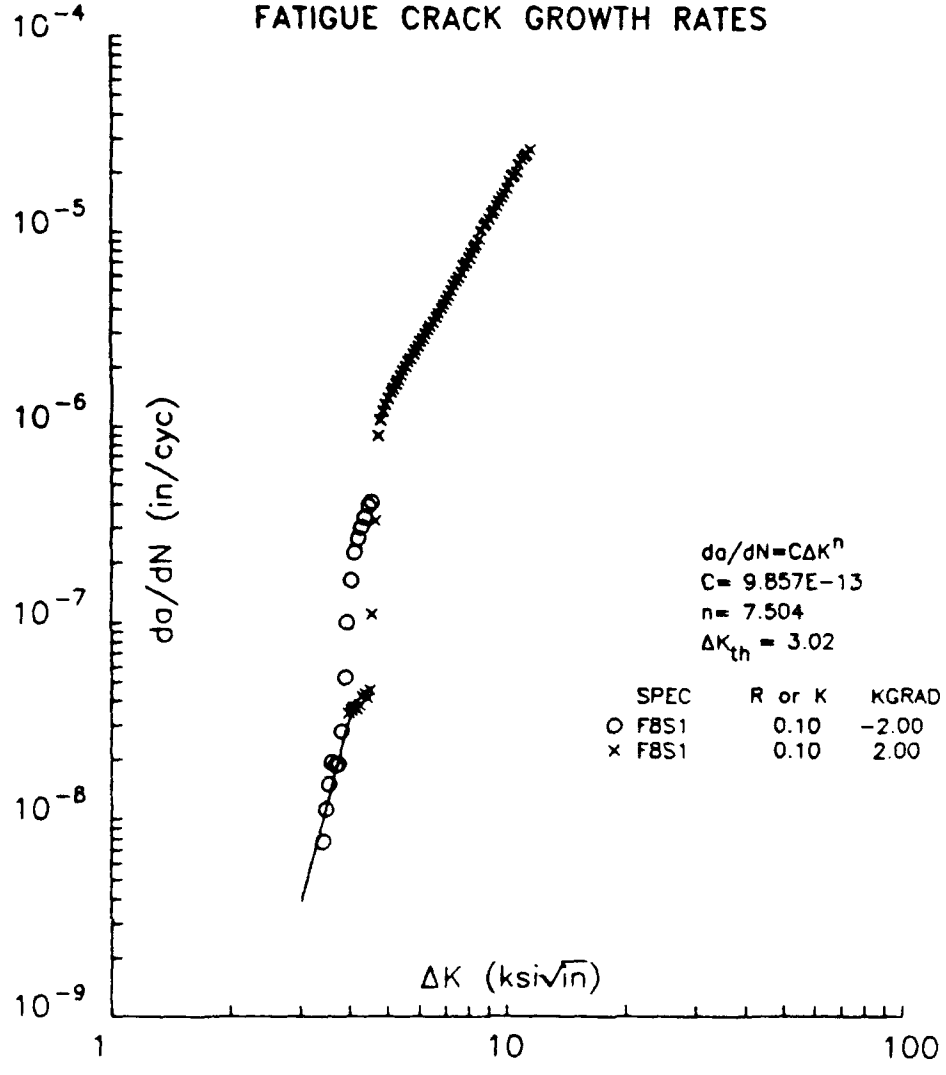

Figure G10 Fatigue Crack Growth Rate Data for IN905XL Forging (S-L Orientation, KGRAD -2.00 and 2.00). Northrop.

TABLE G48

Fatigue Crack Growth Data Associated
with Figure G10 (Specimen F8S1)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8S1	Geometry	C(T)
Contract #	95874	Orientation	S-L
Material	IN905XL FG	Yield (ksi)	51.4
Temperature (F)	72	Modulus	11.1
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.248	Notch depth	0.276
Width	1.496	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	497.0	Stress ratio (R)	0.10
Final a (in)	0.299	Kmax	7.00

Test Parameters

Initial a (in)	0.276	Initial K	5.50
K-gradient	-2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes

KRP 1 4

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
17.68	0.306	0.299	-.007	1.015
20.43	0.349	0.356	0.006	0.968
22.54	0.378	0.390	0.012	0.937
24.68	0.405	0.392	-.012	0.910

Comments

Date of test: 02-03-1988

TABLE G48 (Continued)

Specimen Id. F8S1

Pmax (lbs)	E8B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	18.12	0.3132	22658						
346	18.43	0.3183	35516	0.0106	25759	4.100E-07	4.55	.292	3.58
336	18.76	0.3237	48417	0.0103	26316	3.917E-07	4.47	.301	3.47
326	19.07	0.3286	61832	0.0099	29236	3.398E-07	4.38	.307	3.37
316	19.39	0.3337	77652	0.0102	33672	3.037E-07	4.29	.431	2.71
307	19.73	0.3389	95505	0.0102	38262	2.671E-07	4.21	.445	2.60
298	20.06	0.3439	115914	0.0105	45854	2.287E-07	4.12	.459	2.48
290	20.43	0.3493	141359	0.0104	63382	1.641E-07	4.05	.478	2.35
282	20.78	0.3543	179296	0.0099	98487	1.006E-07	3.97	.497	2.22
274	21.13	0.3592	239846	0.0101	190577	5.324E-08	3.89	.515	2.10
266	21.51	0.3645	369872	0.0100	359722	2.785E-08	3.82	.532	1.99
259	21.86	0.3693	599567	0.0097	508236	1.907E-08	3.75	.675	1.35
252	22.23	0.3741	878108	0.0102	537689	1.891E-08	3.68	.697	1.24
245	22.63	0.3794	1137256	0.0104	529416	1.955E-08	3.61	.716	1.14
238	23.03	0.3845	1407525	0.0102	671119	1.514E-08	3.54	.735	1.04
231	23.44	0.3896	1808376	0.0100	885680	1.133E-08	3.48	.753	0.95
225	23.84	0.3945	2293205	0.0100	1290984	7.747E-09	3.41	.768	0.88
	24.26	0.3996	3099360						

TABLE G49

Fatigue Crack Growth Data Associated
with Figure G10 (Specimen F8S1-A)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8S1A	Geometry	C(T)
Contract #	95874	Orientation	S-L
Material	IN905XL FG	Yield (ksi)	51.4
Temperature (F)	72	Modulus	11.1
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.248	Notch depth	0.276
Width	1.496	Gage length	1.000
Height	0.900	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	497.0	Stress ratio (R)	0.10
Final a (in)	0.299	Kmax	7.00

Test Parameters

Initial a (in)	0.390	Initial K	4.00
K gradient	2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669516
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes

KRP 1 4

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
17.68	0.306	0.299	-.007	1.015
20.43	0.349	0.356	0.006	0.968
22.54	0.378	0.390	0.012	0.937
24.68	0.405	0.392	-.012	0.910

Comments

Date of test: 02-03-1988

TABLE G49 (Continued)

Specimen Id. F8S1A

Pmax (lbs)	E68/P	a (in)	N (K1)	Δa (in)	ΔN (K1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	26.11	0.4285	76023						
245	26.50	0.4346	247977	0.0139	397085	3.502E-08	3.99	.738	1.16
245	26.99	0.4424	473108	0.0156	432854	3.596E-08	4.04	.737	1.18
246	27.50	0.4502	680831	0.0155	415838	3.730E-08	4.10	.731	1.23
246	28.01	0.4579	888946	0.0154	419556	3.665E-08	4.17	.725	1.27
247	28.53	0.4656	1100387	0.0156	406365	3.833E-08	4.23	.718	1.33
247	29.08	0.4735	1295310	0.0154	363072	4.253E-08	4.30	.710	1.39
248	29.62	0.4810	1463459	0.0158	358983	4.408E-08	4.37	.705	1.43
248	30.22	0.4893	1654294	0.0153	369281	4.153E-08	4.43	.696	1.50
249	30.75	0.4964	1832740	0.0128	282293	4.550E-08	4.50	.687	1.57
249	31.19	0.5021	1936587	0.0168	152581	1.102E-07	4.58	.680	1.63
250	32.05	0.5132	1985321	0.0193	58908	3.281E-07	4.64	.666	1.72
250	32.71	0.5215	1995495	0.0157	17389	9.031E-07	4.73	.655	1.81
251	33.33	0.5289	2002710	0.0151	13768	1.096E-06	4.80	.645	1.90
251	33.97	0.5365	2009263	0.0150	12334	1.216E-06	4.87	.635	1.97
252	34.60	0.5439	2015044	0.0149	11315	1.317E-06	4.95	.627	2.05
252	35.27	0.5514	2020578	0.0150	10665	1.410E-06	5.02	.618	2.13
253	35.94	0.5589	2025709	0.0149	9847	1.512E-06	5.09	.608	2.22
253	36.63	0.5663	2030425	0.0150	9385	1.595E-06	5.17	.600	2.30
254	37.35	0.5739	2035094	0.0151	9112	1.657E-06	5.25	.593	2.37
254	38.08	0.5814	2039537	0.0152	8711	1.747E-06	5.32	.584	2.46
254	38.84	0.5891	2043805	0.0158	8547	1.854E-06	5.41	.575	2.55
255	39.67	0.5973	2048083	0.0159	8162	1.951E-06	5.49	.566	2.65
255	40.49	0.6050	2051967	0.0152	7385	2.052E-06	5.57	.557	2.74
255	41.28	0.6124	2055469	0.0148	6850	2.161E-06	5.66	.550	2.83
256	42.10	0.6198	2058817	0.0152	6720	2.264E-06	5.74	.543	2.91
256	42.98	0.6276	2062189	0.0157	6590	2.384E-06	5.83	.534	3.02
256	43.90	0.6355	2065408	0.0153	6114	2.495E-06	5.91	.525	3.12
256	44.77	0.6429	2068303	0.0151	5770	2.624E-06	6.00	.517	3.22
257	45.72	0.6507	2071177	0.0155	5626	2.763E-06	6.09	.509	3.32
257	46.70	0.6584	2073928	0.0151	5226	2.889E-06	6.18	.502	3.42
257	47.65	0.6658	2076403	0.0150	4938	3.042E-06	6.27	.495	3.52
257	48.67	0.6735	2078866	0.0157	4933	3.192E-06	6.37	.488	3.62
257	49.77	0.6815	2081336	0.0161	4833	3.325E-06	6.46	.480	3.73
257	50.89	0.6895	2083699	0.0158	4507	3.507E-06	6.56	.470	3.86
257	52.02	0.6973	2085843	0.0152	4087	3.712E-06	6.66	.464	3.97
257	53.12	0.7047	2087787	0.0148	3800	3.987E-06	6.76	.458	4.07
257	54.25	0.7121	2089643	0.0152	3713	4.104E-06	6.86	.451	4.18
257	55.49	0.7199	2091500	0.0157	3619	4.329E-06	6.96	.445	4.29
257	56.76	0.7278	2093262	0.0154	3394	4.536E-06	7.06	.437	4.42
257	58.03	0.7353	2094893	0.0154	3211	4.796E-06	7.17	.429	4.55
256	59.38	0.7432	2096473	0.0157	3086	5.094E-06	7.28	.418	4.70
256	60.78	0.7511	2097929	0.0156	2869	5.424E-06	7.38	.414	4.81
256	62.20	0.7587	2099342	0.0154	2697	5.721E-06	7.50	.409	4.92
255	63.66	0.7665	2100676	0.0155	2604	5.959E-06	7.61	.404	5.04
255	65.19	0.7743	2101943	0.0155	2429	6.363E-06	7.72	.397	5.17
254	66.74	0.7819	2103105	0.0155	2261	6.839E-06	7.83	.391	5.30
254	68.37	0.7897	2104208	0.0156	2190	7.141E-06	7.95	.381	5.47
253	70.06	0.7976	2105294	0.0163	2154	7.546E-06	8.07	.375	5.60

TABLE C49 (Continued)

Specimen Id. F8S1A

Pmax (lbs)	EδB/P	a (in)	N (Xl)	Δa (in)	ΔN (Xl)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
253	71.95	0.8060	2106362	0.0159	1985	8.035E-06	8.19	.367	5.77
252	73.70	0.8135	2107279	0.0149	1767	8.435E-06	8.32	.362	5.90
251	75.46	0.8209	2108130	0.0153	1730	8.826E-06	8.44	.358	6.02
250	77.43	0.8288	2109009	0.0160	1714	9.353E-06	8.57	.353	6.16
250	79.52	0.8369	2109843	0.0160	1557	1.029E-05	8.70	.347	6.31
249	81.63	0.8448	2110566	0.0153	1388	1.099E-05	8.82	.337	6.50
248	83.67	0.8522	2111231	0.0149	1325	1.121E-05	8.95	.331	6.66
247	85.82	0.8597	2111891	0.0155	1321	1.176E-05	9.09	.324	6.82
246	88.21	0.8677	2112551	0.0161	1288	1.253E-05	9.22	.319	6.98
245	90.72	0.8758	2113179	0.0157	1198	1.311E-05	9.36	.314	7.14
243	93.18	0.8834	2113750	0.0154	1121	1.376E-05	9.50	.310	7.28
242	95.80	0.8912	2114300	0.0155	1058	1.460E-05	9.64	.306	7.43
241	98.46	0.8989	2114808	0.0154	996	1.544E-05	9.79	.301	7.60
239	101.27	0.9066	2115296	0.0156	977	1.601E-05	9.93	.296	7.77
238	104.26	0.9145	2115785	0.0158	932	1.697E-05	10.08	.286	8.00
236	107.38	0.9224	2116228	0.0156	842	1.848E-05	10.23	.281	8.17
235	110.52	0.9301	2116627	0.0151	768	1.965E-05	10.38	.273	8.38
233	113.72	0.9375	2116996	0.0154	777	1.984E-05	10.54	.266	8.59
231	117.28	0.9455	2117404	0.0161	786	2.053E-05	10.69	.263	8.76
230	121.12	0.9537	2117782	0.0152	677	2.245E-05	10.85	.261	8.91
228	124.55	0.9607	2118080	0.0153	644	2.382E-05	11.02	.258	9.09
226	128.81	0.9690	2118426	0.0174	710	2.459E-05	11.19	.249	9.33
224	133.74	0.9781	2118790	0.0168	663	2.528E-05	11.36	.241	9.58
222	138.07	0.9857	2119089	0.0145	542	2.668E-05	11.53	.236	9.79
	142.13	0.9926	2119332						

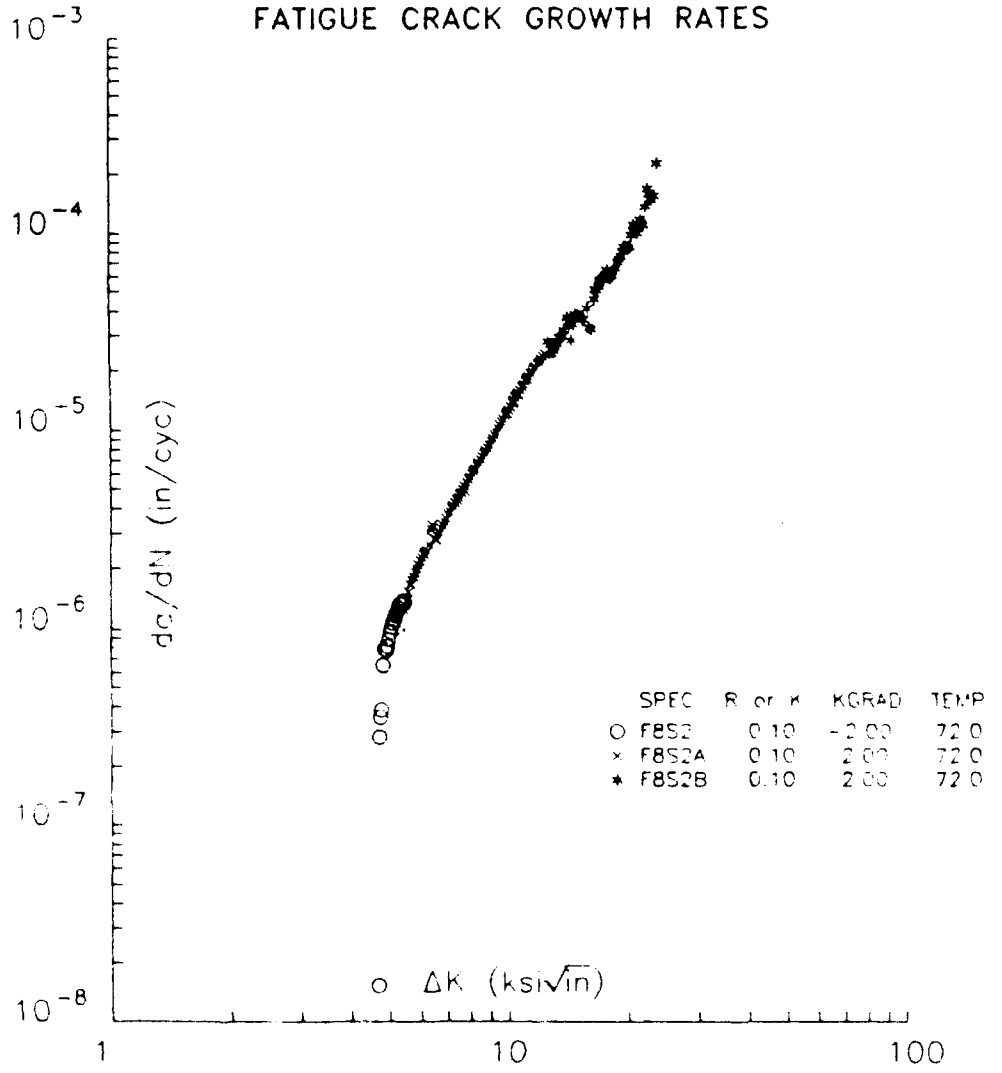

Figure C11 Fatigue Crack Growth Rate Data for IN905XL Forging (S-L Orientation, KGRAD -2.00, 2.00 and 2.00). Northrop.

TABLE G50

Fatigue Crack Growth Data Associated with Figure G11 (Specimen F8S2)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8S2	Geometry	C(T)
Contract #	95874	Orientation	S-L
Material	IN905XL FG.	Yield (ksi)	51.0
Temperature (F)	72	Modulus	10.1
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.249	Notch depth	0.268
Width	1.498	Gage length	1.000
Height	9.000	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	252.0	Stress ratio (R)	0.10
Final a (in)	0.514	Kmax	5.19

Test Parameters

Initial a (in)	0.513	Initial K	6.50
K-gradient	-2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.884000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes

KRP 1 4

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
30.19	0.515	0.536	0.021	0.969
37.06	0.608	0.610	0.002	0.999
39.18	0.632	0.644	0.012	1.007
40.02	0.641	0.650	0.009	1.010
50.08	0.732	0.730	-.002	1.040
65.10	0.827	0.817	-.010	1.073
145.25	1.051	1.031	-.020	1.153
243.18	1.151	1.127	-.024	1.192
%1232.18	1.339	1.349	0.010	1.26%

Comments

Date of test: 04-19-1988

TABLE C50 (Continued)

Specimen Id. F8S2

Pmax (lbs)	E8B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	Δkeff (ksi√in)
	30.34	0.5173	15261						
292	30.70	0.5228	19511	0.0105	7941	1.326E-06	5.49	.673	1.99
287	31.03	0.5278	23201	0.0102	7478	1.363E-06	5.45	.679	1.95
282	31.38	0.5330	26989	0.0102	7568	1.353E-06	5.41	.686	1.89
278	31.73	0.5381	30769	0.0103	7699	1.335E-06	5.37	.691	1.84
273	32.09	0.5433	34688	0.0105	7970	1.312E-06	5.33	.697	1.79
269	32.46	0.5485	38739	0.0103	8205	1.255E-06	5.29	.702	1.75
264	32.82	0.5536	42894	0.0106	8750	1.207E-06	5.24	.707	1.71
260	33.22	0.5591	47489	0.0109	9341	1.164E-06	5.20	.715	1.65
255	33.61	0.5645	52235	0.0105	9474	1.111E-06	5.16	.723	1.59
251	34.00	0.5696	56963	0.0103	9600	1.069E-06	5.12	.729	1.54
247	34.39	0.5747	61835	0.0102	10063	1.016E-06	5.08	.736	1.49
243	34.78	0.5798	67026	0.0102	10707	9.569E-07	5.04	.742	1.44
239	35.19	0.5850	72542	0.0101	11475	8.798E-07	5.01	.749	1.40
235	35.58	0.5899	78501	0.0101	12515	8.108E-07	4.97	.754	1.36
231	36.00	0.5951	85056	0.0103	13402	7.673E-07	4.93	.760	1.31
225	36.42	0.6002	91902	0.0164	20886	7.844E-07	4.87	.766	1.27
221	37.37	0.6115	105942	0.0153	23733	6.461E-07	4.83	.782	1.17
215	37.72	0.6156	115635	0.0093	24463	3.818E-07	4.77	.787	1.13
212	38.19	0.6208	130405	0.0105	29878	3.526E-07	4.74	.793	1.09
208	38.65	0.6261	145513	0.0107	38273	2.798E-07	4.70	.800	1.05
206	39.15	0.6316	168679	0.0065	422247	1.539E-08	4.68	.803	1.03
	39.24	0.6326	567760						

TABLE G51

Fatigue Crack Growth Data Associated
with Figure G11 (Specimen F8S2-A)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8S2A	Geometry	C(T)
Contract #	95874	Orientation	S-L
Material	IN905XL FG.	Yield (ksi)	51.0
Temperature (F)	72	Modulus	10.1
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.249	Notch depth	0.268
Width	1.498	Gage length	1.000
Height	9.000	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	252.0	Stress ratio (R)	0.10
Final a (in)	0.514	Kmax	5.19

Test Parameters

Initial a (in)	0.629	Initial K	5.80
K-gradient	2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes
KRP 1 4

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
30.19	0.515	0.536	0.021	0.969
37.06	0.608	0.610	0.002	0.999
39.18	0.632	0.644	0.012	1.007
40.02	0.641	0.650	0.009	1.010
50.08	0.732	0.730	-.002	1.040
65.10	0.827	0.817	-.010	1.073
145.25	1.051	1.031	-.020	1.153
243.18	1.151	1.127	-.024	1.192
%1232.18	1.339	1.349	0.010	1.269

Comments

Date of test: 04-19-1988

TABLE G51 (Continued)

Specimen Id. F8S2A

Pmax (lbs)	E&B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
	40.39	0.6448	42828						
231	40.91	0.6502	48853	0.0105	10657	9.899E-07	5.44	.702	1.80
231	41.42	0.6554	53484	0.0102	8454	1.210E-06	5.50	.693	1.87
231	41.92	0.6604	57307	0.0098	7150	1.373E-06	5.55	.686	1.94
231	42.41	0.6652	60634	0.0099	6548	1.518E-06	5.61	.679	2.00
232	42.94	0.6703	63855	0.0103	6287	1.639E-06	5.66	.672	2.06
232	43.48	0.6755	66921	0.0102	5985	1.711E-06	5.72	.662	2.15
232	44.02	0.6806	69840	0.0100	5553	1.798E-06	5.78	.657	2.21
232	44.56	0.6855	72474	0.0100	5288	1.888E-06	5.84	.650	2.27
232	45.12	0.6906	75128	0.0102	5187	1.967E-06	5.90	.644	2.33
232	45.70	0.6957	77661	0.0099	4822	2.063E-06	5.96	.638	2.40
232	46.25	0.7005	79950	0.0099	4577	2.158E-06	6.02	.630	2.47
232	46.84	0.7056	82238	0.0101	4474	2.252E-06	6.08	.626	2.53
232	47.44	0.7106	84424	0.0100	4273	2.335E-06	6.14	.616	2.62
232	48.04	0.7155	86511	0.0100	4183	2.397E-06	6.20	.612	2.68
233	48.67	0.7206	88607	0.0101	4106	2.448E-06	6.27	.605	2.75
233	49.29	0.7256	90617	0.0098	3759	2.599E-06	6.33	.600	2.81
233	49.90	0.7304	92366	0.0107	3390	3.159E-06	6.40	.595	2.88
233	50.68	0.7363	94007	0.0102	3095	3.284E-06	6.46	.588	2.96
233	51.24	0.7405	95462	0.0089	3176	2.813E-06	6.53	.580	3.04
233	51.88	0.7452	97183	0.0097	3483	2.786E-06	6.59	.574	3.12
233	52.57	0.7502	98945	0.0100	3453	2.898E-06	6.66	.567	3.20
233	53.27	0.7552	100635	0.0101	3340	3.013E-06	6.73	.562	3.28
233	53.99	0.7603	102285	0.0102	3243	3.141E-06	6.80	.557	3.34
233	54.74	0.7654	103878	0.0101	3082	3.268E-06	6.87	.551	3.42
232	55.48	0.7704	105366	0.0097	2853	3.401E-06	6.94	.546	3.50
232	56.20	0.7751	106731	0.0095	2676	3.556E-06	7.01	.541	3.57
232	56.94	0.7799	108042	0.0097	2625	3.687E-06	7.08	.534	3.63
232	57.72	0.7848	109356	0.0100	2634	3.796E-06	7.15	.527	3.70
232	58.54	0.7899	110677	0.0102	2581	3.940E-06	7.22	.520	3.85
232	59.38	0.7950	111936	0.0101	2469	4.074E-06	7.30	.515	3.94
232	60.21	0.8000	113146	0.0099	2364	4.200E-06	7.37	.511	4.01
232	61.06	0.8049	114301	0.0098	2240	4.364E-06	7.45	.507	4.08
231	61.91	0.8097	115386	0.0094	2100	4.481E-06	7.52	.502	4.17
231	62.73	0.8143	116401	0.0094	2034	4.607E-06	7.60	.498	4.24
231	63.60	0.8191	117420	0.0097	2043	4.754E-06	7.68	.492	4.33
231	64.52	0.8240	118444	0.0102	2069	4.931E-06	7.76	.484	4.45
231	65.52	0.8293	119489	0.0100	1945	5.120E-06	7.84	.478	4.54
230	66.43	0.8340	120388	0.0094	1762	5.351E-06	7.92	.472	4.64
230	67.38	0.8387	121251	0.0095	1712	5.538E-06	8.00	.467	4.73
230	68.34	0.8435	122100	0.0097	1699	5.692E-06	8.08	.464	4.81
229	69.36	0.8484	122950	0.0098	1654	5.910E-06	8.16	.459	4.91
229	70.39	0.8532	123755	0.0094	1552	6.089E-06	8.24	.456	4.99
229	71.39	0.8579	124501	0.0094	1500	6.299E-06	8.33	.452	5.08
228	72.46	0.8627	125254	0.0096	1473	6.548E-06	8.41	.445	5.19
228	73.55	0.8675	125975	0.0094	1390	6.791E-06	8.50	.440	5.29
228	74.62	0.8721	126644	0.0093	1372	7.047E-06	8.59	.432	5.40
227	75.80	0.8772	127347	0.0098	1352	7.249E-06	8.67	.426	5.53
227	76.97	0.8819	127996	0.0096	1269	7.537E-06	8.76	.420	5.65

TABLE C51 (Continued)

Specimen Id. F852A

Pmax (lbs)	E88/P	a (in)	N (Xl)	Δa (in)	ΔN (Xl)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	ΔKeff (ksi√in)
226	78.17	0.8867	128616	0.0095	1207	7.847E-06	8.85	.415	5.75
226	79.35	0.8914	129203	0.0093	1148	8.056E-06	8.94	.411	5.85
225	80.54	0.8960	129764	0.0094	1129	8.364E-06	9.03	.408	5.94
225	81.84	0.9008	130332	0.0095	1090	8.756E-06	9.12	.406	6.02
224	83.12	0.9055	130854	0.0093	1020	9.105E-06	9.22	.403	6.11
224	84.40	0.9101	131352	0.0092	981	9.367E-06	9.31	.397	6.23
223	85.71	0.9147	131835	0.0092	956	9.658E-06	9.40	.393	6.34
223	87.07	0.9194	132306	0.0096	951	1.006E-05	9.50	.386	6.49
222	88.55	0.9243	132786	0.0099	932	1.059E-05	9.60	.379	6.63
222	90.08	0.9292	133240	0.0095	867	1.096E-05	9.70	.374	6.75
221	91.51	0.9338	133654	0.0090	799	1.121E-05	9.80	.368	6.88
220	92.94	0.9382	134039	0.0094	802	1.170E-05	9.90	.365	6.98
220	94.59	0.9432	134456	0.0095	789	1.210E-05	10.00	.363	7.08
219	96.14	0.9477	134827	0.0090	728	1.242E-05	10.10	.359	7.19
218	97.71	0.9522	135183	0.0092	710	1.302E-05	10.20	.356	7.31
217	99.42	0.9570	135537	0.0092	678	1.362E-05	10.30	.354	7.40
217	101.06	0.9615	135861	0.0090	646	1.391E-05	10.41	.347	7.56
216	102.76	0.9660	136183	0.0092	643	1.439E-05	10.51	.340	7.71
215	104.59	0.9707	136504	0.0093	626	1.487E-05	10.62	.334	7.85
214	106.41	0.9753	136809	0.0090	595	1.513E-05	10.73	.328	8.01
213	108.22	0.9797	137098	0.0094	596	1.574E-05	10.84	.322	8.16
213	110.30	0.9846	137405	0.0100	610	1.636E-05	10.95	.319	8.28
212	112.47	0.9897	137708	0.0097	576	1.683E-05	11.07	.315	8.42
211	114.55	0.9943	137981	0.0088	502	1.752E-05	11.18	.315	8.51
210	116.44	0.9985	138211	0.0085	472	1.798E-05	11.29	.312	8.64
209	118.48	1.0028	138452	0.0095	513	1.854E-05	11.41	.312	8.73
208	120.98	1.0080	138724	0.0096	504	1.909E-05	11.52	.309	8.87
207	123.20	1.0124	138956	0.0090	461	1.953E-05	11.65	.300	9.06
206	125.53	1.0170	139185	0.0094	461	2.033E-05	11.77	.300	9.15
205	128.08	1.0218	139417	0.0091	444	2.055E-05	11.89	.292	9.35
204	130.41	1.0261	139628	0.0091	429	2.125E-05	12.01	.282	9.58
203	133.12	1.0309	139846	0.0089	407	2.177E-05	12.13	.282	9.67
202	135.44	1.0350	140035	0.0091	402	2.254E-05	12.26	.271	9.93
200	138.44	1.0400	140248	0.0090	383	2.343E-05	12.37	.271	10.01
199	140.85	1.0439	140418	0.0090	371	2.414E-05	12.51	.266	10.20
	144.02	1.0490	140619						

TABLE G52

Fatigue Crack Growth Data Associated
with Figure G11 (Specimen F8S2-B)

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	F8S2B	Geometry	C(T)
Contract #	95874	Orientation	S-L
Material	IN905XL FG.	Yield (ksi)	51.0
Temperature (F)	72	Modulus	10.1
Environment	HUMID AIR		

Specimen Dimensions (in)

Thickness	0.249	Notch depth	0.268
Width	1.498	Gage length	1.000
Height	9.000	Alpha ratio	1.250

Precrack Parameters

Pmax (lbs)	252.0	Stress ratio (R)	0.10
Final a (in)	0.514	Kmax	5.19

Test Parameters

Initial a (in)	1.020	Initial K	12.50
K-gradient	2.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff
0.886000	1.000980
4.640000	-4.669510
-13.320000	18.460100
14.720000	-236.824997
-5.600000	1214.880000
0.000000	-2143.570100

Analysis Codes
KRP 1 4

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
30.19	0.515	0.536	0.021	0.9[illegible]
37.06	0.608	0.610	0.002	0.999
39.18	0.632	0.644	0.012	1.007
40.02	0.641	0.650	0.009	1.010
50.08	0.732	0.730	-.002	1.040
65.10	0.827	0.817	-.010	1.073
145.25	1.051	1.031	-.020	1.153
243.18	1.151	1.127	-.024	1.192
%1232.18	1.339	1.349	0.010	1.269

Comments

Date of test: 04-19-1988

TABLE G52 (Continued)

Specimen Id. F8S2B

Pmax (lbs)	E&B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)	CCL	Δkeff (ksi√in)
	147.70	1.0546	140775						
192	151.93	1.0608	141019	0.0110	390	2.808E-05	12.77	.266	10.41
191	155.32	1.0655	141166	0.0105	385	2.716E-05	12.94	.259	10.65
190	159.51	1.0712	141404	0.0092	382	2.401E-05	13.06	.259	10.75
188	162.17	1.0747	141548	0.0082	326	2.509E-05	13.22	.259	10.88
187	165.87	1.0794	141730	0.0097	363	2.661E-05	13.34	.239	11.29
186	169.91	1.0844	141911	0.0091	334	2.722E-05	13.48	.239	11.40
184	173.39	1.0885	142064	0.0082	279	2.927E-05	13.62	.239	11.52
183	176.90	1.0925	142190	0.0086	292	2.941E-05	13.75	.239	11.63
182	180.99	1.0971	142356	0.0089	298	2.986E-05	13.88	.221	12.02
180	185.03	1.1014	142488	0.0090	283	3.172E-05	14.03	.221	12.14
178	189.48	1.1061	142639	0.0116	311	3.723E-05	14.20	.215	12.39
177	196.49	1.1130	142799	0.0124	372	3.343E-05	14.37	.215	12.53
175	202.31	1.1185	143011	0.0100	355	2.827E-05	14.56	.215	12.70
173	207.35	1.1230	143154	0.0096	280	3.422E-05	14.73	.202	13.06
171	213.14	1.1281	143291	0.0097	254	3.829E-05	14.89	.202	13.20
169	218.76	1.1328	143408	0.0128	338	3.789E-05	15.11	.202	13.40
167	229.05	1.1409	143629	0.0123	327	3.766E-05	15.27	.202	13.54
164	234.67	1.1451	143735	0.0130	355	3.646E-05	15.56	.175	14.06
162	247.07	1.1539	143984	0.0131	363	3.617E-05	15.71	.175	14.41
160	253.66	1.1582	144098	0.0094	227	4.144E-05	15.97	.175	14.64
157	261.54	1.1633	144211	0.0131	397	3.301E-05	16.19	.174	14.85
155	275.00	1.1713	144495	0.0128	396	3.221E-05	16.38	.174	15.03
153	283.34	1.1760	144608	0.0091	201	4.553E-05	16.62	.176	15.21
151	291.59	1.1805	144696	0.0081	159	5.115E-05	16.78	.176	15.36
149	296.68	1.1841	144767	0.0081	160	5.051E-05	16.95	.176	15.52
148	307.51	1.1885	144856	0.0096	180	5.341E-05	17.12	.176	15.68
146	318.54	1.1938	144947	0.0069	156	5.689E-05	17.28	.176	15.82
144	324.60	1.1974	145012	0.0081	140	5.749E-05	17.48	.176	16.00
142	336.76	1.2018	145097	0.0082	144	5.737E-05	17.63	.176	16.14
14	345.70	1.2056	145155	0.0064	137	6.122E-05	17.81	.174	16.30
134	357.40	1.2102	145224	0.0069	133	6.900E-05	17.97	.174	16.50
132	368.25	1.2143	145288	0.0060	150	6.007E-05	18.17	.174	16.69
131	381.87	1.2192	145374	0.0137	233	5.907E-05	18.44	.174	16.92
130	406.30	1.2280	145521	0.0134	221	6.053E-05	18.64	.175	17.09
129	422.99	1.2326	145595	0.0081	123	6.571E-05	18.92	.175	17.34
126	434.93	1.2361	145644	0.0077	108	7.164E-05	19.11	.175	17.52
124	449.88	1.2403	145703	0.0087	118	7.419E-05	19.29	.175	17.68
122	466.85	1.2448	145762	0.0083	116	7.613E-05	19.48	.175	17.85
120	483.95	1.2492	145819	0.0084	104	8.060E-05	19.68	.174	18.04
118	500.83	1.2532	145865	0.0081	95	8.615E-05	19.88	.174	18.24
116	518.82	1.2573	145914	0.0086	102	8.438E-05	20.07	.174	18.42
114	539.67	1.2618	145967	0.0091	107	8.522E-05	20.28	.174	18.61
112	562.48	1.2664	146021	0.0093	108	8.619E-05	20.50	.174	18.81
110	586.95	1.2711	146075	0.0091	92	9.883E-05	20.72	.172	19.06
108	611.62	1.2755	146113	0.0080	73	1.104E-04	20.92	.172	19.25
105	632.80	1.2791	146148	0.0078	77	1.022E-04	21.13	.172	19.44
103	654.23	1.2833	146189	0.0085	84	1.013E-04	21.33	.172	19.62
101	681.82	1.2877	146232	0.0084	78	1.071E-04	21.54	.172	19.82
99	716.66	1.2917	146267	0.0069	72	1.171E-04	21.76	.172	20.02
97	749.58	1.2961	146304	0.0086	75	1.136E-04	21.97	.172	20.22
95	783.31	1.3003	146343	0.0084	76	1.099E-04	22.20	.172	20.42
92	818.97	1.3045	146380	0.0107	79	1.363E-04	22.47	.175	20.69
89	880.63	1.3110	146422	0.0108	64	1.682E-04	22.69	.175	20.80
87	923.37	1.3152	146444	0.0077	49	1.597E-04	22.98	.175	21.07
85	962.29	1.3188	146470	0.0073	49	1.481E-04	23.20	.175	21.27
83	$1005.19	1.3225	146493	0.0079	51	1.548E-04	23.42	.175	21.47
80	$1058.17	1.3267	146521	0.0085	55	1.554E-04	23.64	.175	21.67
77	$1114.92	1.3310	146548	0.0120	53	2.280E-04	23.95	.175	21.95
	$1232.18	1.3387	146574						

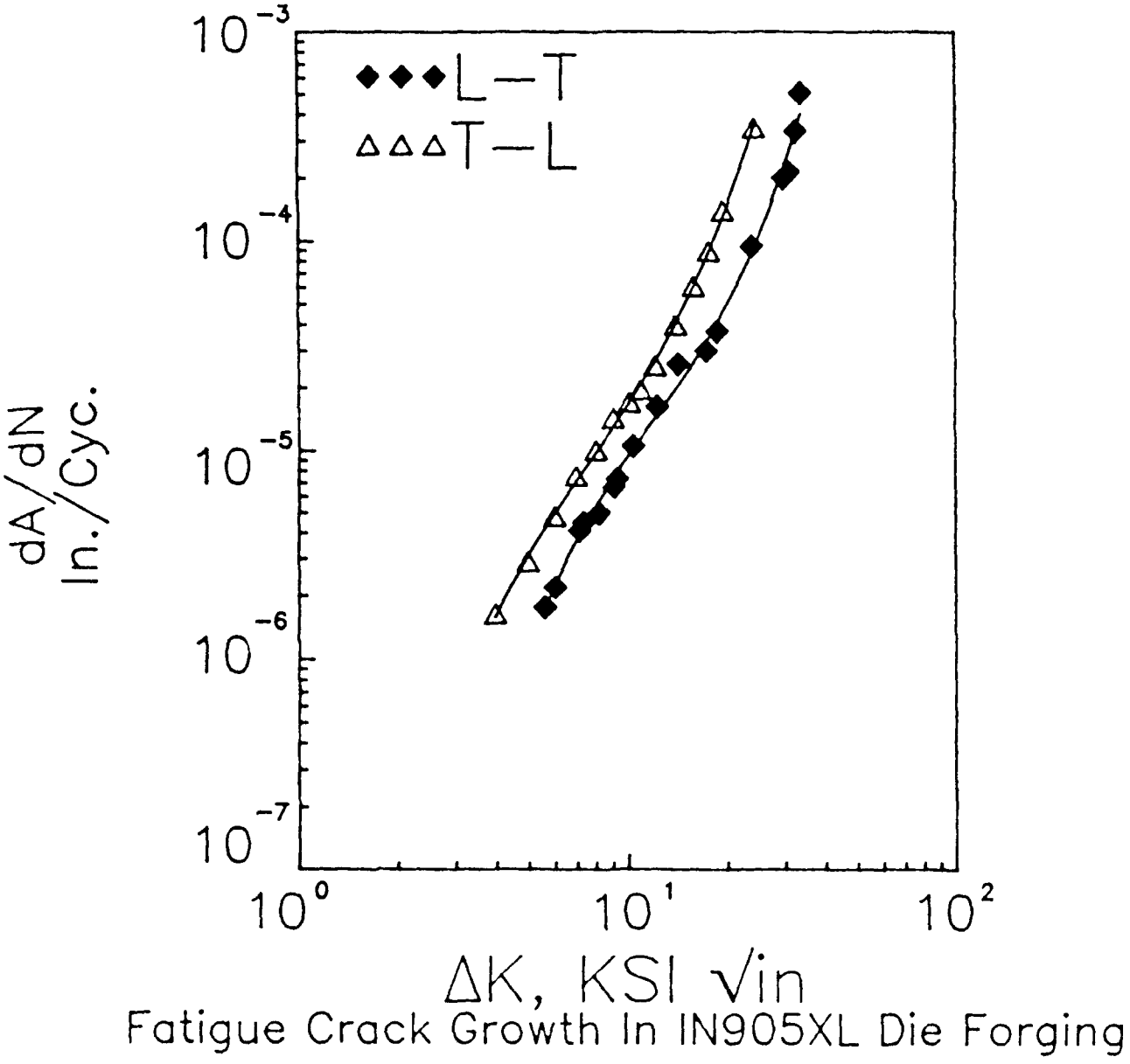

Figure C12 Fatigue Crack Growth Rate Data for Solutiontreated and aged IN905XL Forging (L-T and T-L Orientation, R=0.1, Lab Air and a third order regression fit to each data set). General Dynamics TX.

TABLE G53
Fatigue Crack Growth Data Associated
with Figure G12 (L-T Orientation)

COMPACT TENSION AT H/W=0.486 — GENERAL DYNAMICS
18 — FORT WORTH DIVISION
IN905XL L-T ORIENTATION — SEPT 23,1987
LAB AIR,RT

180 CPM
R= 0.1 B= 0.4437 W= 2.5525

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRI)
5	9076	0.851				647	5.81
6	10491	0.858				651	5.84
7	11905	0.853				648	5.83
8	14735	0.859				649	5.87
9	17358	0.864				649	5.90
		0.855	1.75E-06	0.978	0.000	5	5.85
9	17358	0.864				649	5.90
10	21216	0.870				649	5.93
11	25543	0.879				649	5.96
12	28427	0.883				648	5.01
13	30444	0.892				649	6.03
14	33918	0.899				649	6.07
15	37150	0.905				649	6.10
		0.885	2.18E-05	0.997	0.000	7	6.00
16	0	0.930				730	7.01
17	2000	0.938				731	7.07
18	3578	0.945				731	7.11
19	4897	0.951				731	7.14
20	6499	0.956				731	7.19
21	7895	0.961				731	7.21
		0.947	4.08E-06	0.996	0.019	6	7.13
22	10703	0.975				731	7.33
23	12113	0.979				730	7.34
24	14579	0.991				730	7.43
		0.981	4.46E-06	0.987	0.030	8	7.36
25	0	0.985				901	9.05
26	1000	0.991				901	9.09
27	2000	0.997				900	9.01
28	3349	0.996				900	9.13
29	4739	1.001				901	9.18
30	6533	1.011				901	9.24
31	7903	1.019				900	9.30
32	9145	1.025				900	9.34
33	10738	1.034				900	9.40
		1.004	4.95E-06	0.990	0.039	9	9.13
34	0	1.030				952	9.31
35	800	1.031				952	9.33
36	2400	1.044				952	9.43
37	3953	1.051				952	9.49
		1.039	8.64E-06	0.981	0.091	4	9.09

TABLE G53 (Continued)

COMPACT TENSION AT H/W=0.486 GENERAL DYNAMICS
18 FORT WORTH DIVISION
IN905XL L-T ORIENTATION SEPT 23,1987
LAB AIR,RT

180 CPM
R= 0.1 B= 0.4437 W= 2.5525

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRT)
37	3353	1.051				862	9.19
38	4320	1.059				863	9.26
39	5257	1.064				862	9.29
40	6775	1.075				864	9.40
41	7791	1.084				863	9.47
		1.067	7.29E-06	0.997	0.081	5	9.32
42	0	1.090				922	10.16
43	400	1.093				921	10.19
44	1185	1.101				921	10.26
45	1857	1.107				922	10.32
46	2576	1.115				922	10.39
47	3152	1.120				922	10.44
48	3789	1.129				921	10.53
49	4242	1.133				922	10.56
50	5018	1.142				922	10.64
		1.114	1.05E-05	0.998	0.143	9	10.39
51	0	1.130				1051	12.01
52	300	1.134				1052	12.05
53	802	1.142				1050	12.16
54	1152	1.146				1051	12.20
55	1509	1.150				1052	12.30
56	1958	1.161				1050	12.36
57	2385	1.168				1051	12.42
58	2731	1.174				1051	12.47
59	3221	1.182				1052	12.55
		1.155	1.61E-05	1.000	0.235	8	12.27
60	0	1.170				1172	13.61
61	200	1.173				1172	13.64
62	402	1.180				1171	13.71
63	641	1.187				1171	13.78
64	1000	1.198				1171	13.89
65	1202	1.204				1171	13.95
66	1498	1.213				1171	14.04
67	1743	1.220				1171	14.11
		1.192	2.99E-05	0.998	0.171	7	13.83

TABLE G53 (Continued)

COMPACT TENSION AT H/W=0.486
18
IN905XL L-T ORIENTATION
LAB AIR,RT

GENERAL DYNAMICS
FORT WORTH DIVISION
SEPT 23,1987

180 CPM
R= 0.1 B= 0.4437 W= 2.5525

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRI)
68	0	1.215				1364	16.83
69	125	1.225				1364	16.99
70	206	1.227				1364	17.03
71	368	1.234				1364	17.14
72	515	1.237				1365	17.21
73	792	1.246				1364	17.34
74	1007	1.252				1364	17.44
75	1231	1.258				1364	17.55
76	1456	1.263				1365	17.64
77	1737	1.270				1364	17.75
		1.243	3.00E-05	0.991	0.591	10	17.29
80	0	1.260				1434	18.48
81	100	1.267				1433	18.60
82	188	1.269				1434	18.65
83	364	1.275				1434	18.75
84	579	1.283				1433	18.89
		1.271	2.71E-05	0.988	0.590	5	18.67
92	0	1.320				1686	23.00
93	80	1.328				1685	23.36
94	142	1.333				1685	23.40
95	219	1.339				1687	23.56
96	304	1.349				1685	23.81
97	357	1.354				1686	23.94
98	429	1.361				1685	24.11
99	494	1.366				1685	24.25
100	573	1.373				1685	24.44
		1.347	9.39E-05	0.999	2.396	9	23.76
101	0	1.390				1988	29.38
102	20	1.395				1988	29.56
103	46	1.402				1989	29.74
104	80	1.405				1988	29.95
105	113	1.413				1988	30.17
106	147	1.420				1987	30.43
		1.404	1.99E-04	0.999	4.734	6	29.87
106	147	1.420				1987	30.43
107	177	1.426				1988	30.65
108	210	1.433				1988	30.93
109	240	1.439				1989	31.18
110	270	1.445				1987	31.41
111	299	1.452				1988	31.69
		1.485	2.13E-04	1.000	5.219	5	31.05

TABLE G53 (Continued)

COMPACT TENSION AT H/W=0.486
18
IN905XL L-T ORIENTATION
LAB AIR,RT

GENERAL DYNAMICS
FORT WORTH DIVISION
SEPT 23,1987

180 CPM
R= 0.1 B= 0.4437 W= 2.5525

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRI)
112	0	1.455				2003	32.04
113	12	1.457				2004	32.15
114	36	1.465				2003	32.48
115	54	1.472				2003	32.76
116	72	1.479				2003	33.05
		1.466	3.34E-04	0.997	9.012	5	32.49
116	72	1.479				2003	33.05
117	90	1.485				2003	33.32
118	07	1.493				2003	33.67
119	22	1.500				2003	34.03
120	34	1.511				2003	34.51
		1.493	5.08E-04	0.987	17.539	5	33.72
121	0	1.490				1660	27.80
122	10	1.487				1660	27.71
123	20	1.488				1660	27.72
124	40	1.490				1658	27.77
125	80	1.492				1658	27.86
126	160	1.499				1659	28.11
127	240	1.506				1659	28.42
		1.493	7.59E-05	0.980	1.997	7	27.91
127	240	1.506				1659	28.42
128	305	1.513				1659	28.69
129	368	1.522				1658	29.02
130	416	1.529				1658	29.27
131	466	1.536				1659	29.64
132	504	1.543				1659	29.95
		1.525	1.39E-04	0.994	3.234	6	29.17
132	504	1.543				1659	29.95
133	536	1.551				1659	30.29
134	565	1.557				1659	30.58
135	590	1.565				1659	30.96
		1.554	2.39E-04	0.998	4.280	4	30.49

TABLE G54

Fatigue Crack Growth Data Associated
with Figure G12 (T-L Orientation)

COMPACT TENSION AT H/W=0.486 — GENERAL DYNAMICS
19 — FORT WORTH DIVISION
IN905XL T-L ORIENTATION — OCT 27,1987
LAB AIR,RT

360 CPM
R= 0.1 B= 0.4435 W= 2.566

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRI)
8	5967	0.850				440	3.92
9	8011	0.855				439	3.93
10	10429	0.856				439	3.94
11	15265	0.865				440	3.97
12	18734	0.870				439	3.98
13	23503	0.877				439	4.00
14	27786	0.887				439	4.04
		0.866	1.62E-06	0.994	0.000	7	3.97
15	0	0.886				530	4.87
16	1200	0.888				530	4.88
17	3600	0.895				531	4.91
18	5731	0.902				529	4.93
19	7854	0.906				532	4.97
20	10694	0.915				531	5.00
21	12813	0.922				530	5.02
22	14708	0.925				530	5.04
23	18498	0.938				530	5.09
24	20428	0.946				531	5.13
		0.912	2.88E-06	0.999	0.003	10	4.98
25	0	0.941				611	5.88
26	800	0.940				610	5.87
27	1600	0.943				611	5.89
28	3043	0.950				610	5.92
29	4348	0.956				611	5.96
30	5900	0.964				612	6.01
31	7192	0.969				611	6.03
32	8601	0.977				611	6.07
33	9792	0.983				611	6.10
34	11132	0.991				611	6.14
35	12193	0.997				611	6.17
		0.965	4.76E-06	0.996	0.016	11	6.00

TABLE G54 (Continued)

COMPACT TENSION AT H/W=0.486
19
IN905XL T-L ORIENTATION
LAB AIR,RT

360 CPM
R= 0.1 B= 0.4435 W= 2.566

GENERAL DYNAMICS
FORT WORTH DIVISION
OCT 27,1987

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRI)
36	0	0.991				680	6.84
37	500	0.990				680	6.82
38	1000	0.993				680	6.85
39	1862	0.999				681	6.89
40	2871	1.005				680	6.92
41	3846	1.014				681	6.98
42	4602	1.021				681	7.02
43	5253	1.025				680	7.04
44	6307	1.035				680	7.10
45	6966	1.039				680	7.13
46	8130	1.048				681	7.19
		1.015	7.49E-06	0.996	0.039	11	6.98
47	0	1.056				740	7.86
48	400	1.055				740	7.85
49	800	1.060				740	7.89
50	1311	1.064				741	7.92
51	2119	1.072				739	7.97
52	2784	1.078				740	8.02
53	3408	1.086				740	8.07
54	3948	1.093				740	8.12
55	4455	1.096				740	8.15
56	5450	1.108				740	8.23
		1.077	9.99E-06	0.995	0.078	10	8.01
57	0	1.101				802	8.86
58	300	1.094				802	8.80
59	600	1.100				802	8.86
60	905	1.103				801	8.88
61	1490	1.113				802	8.96
62	1903	1.119				803	9.01
63	2334	1.124				803	9.06
64	2831	1.133				802	9.12
65	3204	1.138				802	9.16
66	3638	1.145				802	9.22
67	4044	1.151				801	9.26
68	4456	1.158				802	9.31
69	4894	1.163				801	9.35
		1.126	1.42E-05	0.993	0.154	13	9.07

TABLE G54 (Continued)

COMPACT TENSION AT H/W=0.486
19
IN905XL T-L ORIENTATION
LAB AIR,RT

GENERAL DYNAMICS
FORT WORTH DIVISION
OCT 27,1987

360 CPM
R= 0.1 B= 0.4435 W= 2.566

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRI)
70	0	1.161				853	9.94
71	150	1.161				852	9.94
72	450	1.167				852	9.98
73	798	1.171				852	10.03
74	1321	1.181				852	10.12
75	1648	1.186				852	10.16
76	2077	1.193				850	10.20
77	2493	1.203				854	10.33
78	2767	1.206				854	10.37
79	3285	1.215				851	10.43
		1.184	1.69E-05	0.998	0.187	10	10.15
80	0	1.206				882	10.71
81	150	1.205				882	10.70
82	300	1.206				883	10.72
83	600	1.213				882	10.77
84	895	1.218				882	10.83
85	1264	1.226				882	10.90
86	1575	1.232				881	10.97
87	1875	1.238				882	11.03
88	2186	1.244				882	11.09
89	2534	1.251				881	11.16
90	2856	1.259				882	11.25
91	3115	1.263				882	11.31
		1.230	1.94E-05	0.997	0.283	12	10.95
92	0	1.266				923	11.86
93	100	1.267				923	11.87
94	300	1.271				923	11.93
95	584	1.279				924	12.02
96	821	1.285				924	12.09
97	1094	1.292				924	12.17
98	1345	1.298				923	12.24
99	1582	1.305				923	12.32
100	1828	1.311				923	12.41
		1.286	2.53E-05	0.999	0.337	9	12.10

TABLE G54 (Continued)

COMPACT TENSION AT H/W=0.486
19
IN905XL T-L ORIENTATION
LAB AIR,RT

GENERAL DYNAMICS
FORT WORTH DIVISION
OCT 27,1987

360 CPM
R= 0.1 B= 0.4435 W= 2.566

NO.	TOTAL CYCLES	CRACK LENGTH (IN)	DA/DN (IN/CYC)	CORR. COEFF	STD.ERR OF EST.	MAX LOAD (LBS)	DEL-K (KSI-SQRI)
101	0	1.311				1014	13.62
102	100	1.319				1013	13.72
103	183	1.322				1013	13.77
104	333	1.327				1013	13.83
105	547	1.335				1013	13.95
106	718	1.342				1013	14.06
107	867	1.348				1012	14.13
108	043	1.354				1013	14.24
109	211	1.361				1014	14.36
		1.335	3.96E-05	0.998	0.465	9	13.97
110	0	1.356				1093	15.40
111	75	1.363				1093	15.51
112	149	1.368				1091	15.58
113	235	1.373				1092	15.68
114	339	1.378				1093	15.78
115	470	1.386				1093	15.90
116	589	1.393				1093	16.03
117	696	1.400				1092	16.16
118	792	1.406				1092	16.27
119	895	1.412				1092	16.38
		1.383	6.05E-05	0.999	0.775	10	15.87
120	0	1.396				1155	17.01
121	50	1.403				1154	17.13
122	97	1.406				1153	17.18
123	188	1.413				1155	17.35
124	270	1.421				1154	17.49
125	342	1.427				1154	17.60
126	409	1.435				1154	17.79
127	470	1.438				1154	17.86
128	574	1.448				1154	18.07
129	646	1.454				1155	18.24
130	712	1.461				1154	18.37
		1.427	8.90E-05	0.999	1.428	11	17.65

TABLE G54 (Continued)

131	0	1.441				1204	18.71
132	25	1.443				1202	18.74
133	75	1.451				1202	18.89
134	120	1.456				1202	19.03
135	171	1.462				1203	19.20
136	223	1.471				1203	19.42
137	261	1.476				1203	19.53
138	311	1.484				1203	19.73
139	353	1.489				1204	19.89
140	403	1.496				1204	20.07
141	452	1.503				1203	20.25
		1.470	1.39E-04	1.000	2.545	11	19.41
142	0	1.491				1405	23.27
143	20	1.497				1406	23.45
144	43	1.505				1405	23.72
145	60	1.512				1402	23.89
146	77	1.517				1405	24.10
147	97	1.524				1402	24.29
148	116	1.530				1401	24.46
149	137	1.537				1404	24.77
150	156	1.543				1404	25.01
151	174	1.552				1403	25.30
		1.521	3.44E-04	0.999	6.845	10	24.23

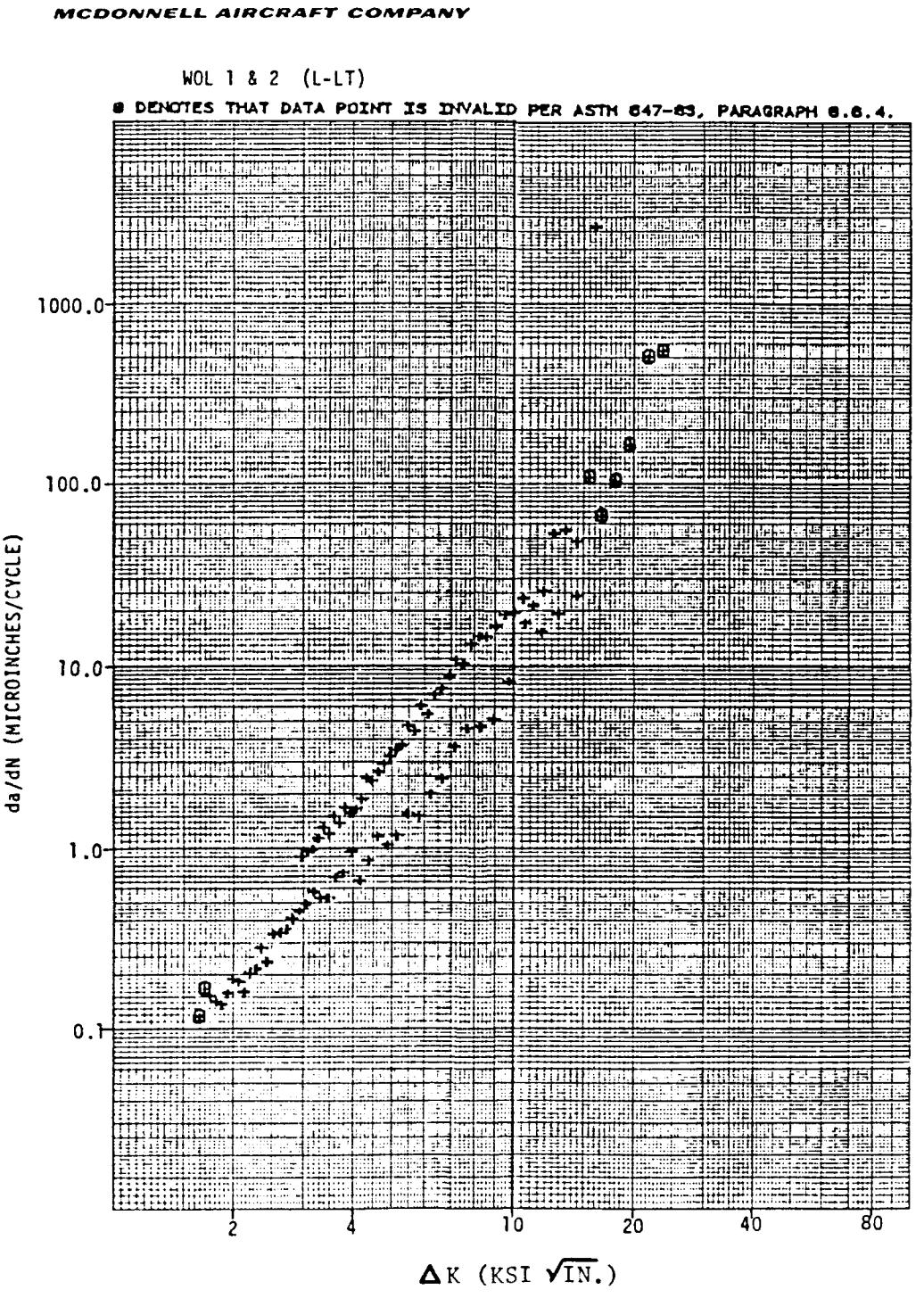

Figure G13 Fatigue Crack Growth Rate Data for IN905XL Forging (WOL Specimen, L-T Orientation, R=0.02, Lab Air). McDonnell Aircraft Mo.

TABLE G55

Fatigue Crack Growth Data Associated
with Figure G13 (Specimen WOL1)

MATERIAL DESCRIPTION: IN905XL DIE FORGING; AL-LI
TENSILE PROPERTIES: FTY = 63.8 KSI FTU = 75.0 KSI % ELONG. = 8.7 %RA = 18.0 E = 12.0X10E6 PSI
SPECIMEN ID: WOL 1 TYPE: WOL THICKNESS = .2506 WIDTH = 1.6004 ORIENT.: L-LT LOCATION: N/A
MAXIMUM TEST LOAD = 95 LBS. R = .02 ENVIR.: LAB AIR TEMP. = 75 HUMIDITY = 30
CYCLIC RATE: VARIED FROM 20 CPS TO 1 CPS IN ORDER TOMAINTAIN CONTROL OF THE CRACK GROWTH

CRACK LENGTH--A (INCH)			DELTA CYCLES	TOTAL CYCLES	DELTA K (KSIAIN^1/2)	AVERAGE DELTA K (KSIAIN^1/2)	DA/DN (INCH/CYCLE)
FRONT	BACK	AVERAGE					
0.437	0.483	0.460 A	0	0	1.60	----	----------
0.457	0.502	0.479 A	160,000	160,000	1.65	1.62	1.18750E-07
0.476	0.523	0.500 A	120,000	280,000	1.70	1.68	1.69167E-07
0.503	0.536	0.520	130,000	410,000	1.76	1.73	1.55385E-07
0.529	0.553	0.541	145,000	555,000	1.82	1.79	1.44138E-07
0.551	0.570	0.561	145,000	700,000	1.88	1.85	1.39310E-07
0.571	0.589	0.580	120,000	820,000	1.94	1.91	1.60000E-07
0.595	0.607	0.601	110,000	930,000	2.01	1.97	1.91818E-07
0.614	0.627	0.621	105,000	1,035,000	2.07	2.04	1.86667E-07
0.636	0.643	0.640	115,000	1,150,000	2.14	2.10	1.63478E-07
0.658	0.663	0.660	100,000	1,250,000	2.21	2.17	2.07000E-07
0.677	0.683	0.680	90,000	1,340,000	2.28	2.25	2.20000E-07
0.698	0.702	0.700	70,000	1,410,000	2.36	2.32	2.87143E-07
0.718	0.720	0.719	80,000	1,490,000	2.45	2.41	2.40000E-07
0.739	0.741	0.740	60,000	1,550,000	2.54	2.49	3.45000E-07
0.761	0.761	0.761	60,000	1,610,000	2.64	2.59	3.50000E-07
0.779	0.781	0.780	51,500	1,661,500	2.73	2.68	3.66990E-07
0.802	0.797	0.800	47,000	1,708,500	2.83	2.78	4.17021E-07
0.822	0.818	0.820	45,000	1,753,500	2.95	2.89	4.60000E-07
0.844	0.837	0.840	40,000	1,793,500	3.07	3.01	5.05000E-07
0.864	0.857	0.861	34,000	1,827,500	3.20	3.14	5.91176E-07
0.884	0.876	0.880	36,000	1,863,500	3.34	3.27	5.41667E-07
0.904	0.894	0.899	35,000	1,898,500	3.48	3.41	5.45714E-07
0.924	0.917	0.920	30,000	1,928,500	3.65	3.56	7.06667E-07
0.944	0.938	0.941	27,500	1,956,000	3.83	3.74	7.49091E-07
0.970	0.951	0.960	20,000	1,976,000	4.01	3.92	9.75000E-07
0.983	0.976	0.979	28,000	2,004,000	4.21	4.11	6.78571E-07
1.001	0.997	0.999	22,500	2,026,500	4.43	4.32	8.80000E-07
1.023	1.017	1.020	17,500	2,044,000	4.68	4.55	1.18857E-06
1.039	1.039	1.039	18,000	2,062,000	4.94	4.81	1.07222E-06
1.059	1.059	1.059	16,500	2,078,500	5.23	5.08	1.20606E-06
1.081	1.079	1.080	13,000	2,091,500	5.56	5.40	1.59231E-06
1.099	1.101	1.100	13,000	2,104,500	5.92	5.74	1.54615E-06
1.119	1.122	1.120	10,000	2,114,500	6.33	6.13	2.03000E-06
1.137	1.143	1.140	8,000	2,122,500	6.77	6.55	2.45000E-06
1.156	1.165	1.160	5,500	2,128,000	7.28	7.02	3.72727E-06
1.181	1.180	1.180	4,200	2,132,200	7.83	7.55	4.66667E-06
1.199	1.202	1.200	4,200	2,136,400	8.47	8.15	4.78571E-06
1.215	1.226	1.220	3,800	2,140,200	9.19	8.83	5.23684E-06
1.234	1.247	1.240	2,400	2,142,600	10.02	9.60	8.39583E-06
1.256	1.266	1.261	1,200	2,143,800	11.02	10.52	1.73750E-05
1.272	1.289	1.280	1,250	2,145,050	12.10	11.56	1.55200E-05
1.292	1.308	1.300	1,000	2,146,050	13.39	12.75	1.97000E-05
1.313	1.328	1.321	850	2,146,900	15.00	14.19	2.44706E-05
1.340	1.334	1.337	6	2,146,906	16.46	15.73	2.66667E-03

A DENOTES THAT DATA POINT IS INVALID PER ASTM STANDARD TEST METHOD E647-83, PARAGRAPH 8.6.4.

TABLE G56

Fatigue Crack Growth Data Associated
with Figure G13 (Specimen WOL 2)

MATERIAL DESCRIPTION: IN905XL DIE FORGING; AL-LI
TENSILE PROPERTIES: FTY = 63.8 KSI FTU = 75.0 KSI % ELONG. = 8.7 %RA = 18.0 E = 12.0X10E6 PSI
SPECIMEN ID: WOL 2 TYPE: WOL THICKNESS = .2494 WIDTH = 1.6421 ORIENT.: L-LT LOCATION: N/A
MAXIMUM TEST LOAD = 200 LBS. R = .02 ENVIR.: LAB AIR TEMP. = 75 HUMIDITY = 30
CYCLIC RATE: VARIED FROM 15 CPS TO 1 CPS IN ORDER TO MAINTAIN CONTROL OF THE CRACK GROWTH

CRACK LENGTH--A (INCH)			DELTA CYCLES	TOTAL CYCLES	DELTA K (KSIAIN^1/2)	AVERAGE DELTA K (KSIAIN^1/2)	DA/DN (INCH/CYCLE)
FRONT	BACK	AVERAGE					
0.381	0.382	0.381	0	0	2.88	----	----------
0.396	0.403	0.399	20,000	20,000	2.96	2.92	9.10000E-07
0.413	0.426	0.420	20,500	40,500	3.07	3.02	9.85366E-07
0.434	0.445	0.440	20,000	60,500	3.17	3.12	1.00500E-06
0.456	0.465	0.461	18,000	78,500	3.28	3.22	1.15556E-06
0.473	0.488	0.480	15,000	93,500	3.38	3.33	1.33667E-06
0.495	0.505	0.500	16,000	109,500	3.49	3.43	1.22500E-06
0.512	0.527	0.520	13,000	122,500	3.60	3.54	1.53077E-06
0.534	0.545	0.540	14,000	136,500	3.71	3.65	1.41429E-06
0.555	0.566	0.560	12,000	148,500	3.83	3.77	1.70833E-06
0.575	0.585	0.580	12,500	161,000	3.95	3.89	1.58400E-06
0.595	0.606	0.600	12,000	173,000	4.08	4.02	1.68333E-06
0.615	0.626	0.620	10,500	183,500	4.21	4.15	1.90476E-06
0.638	0.642	0.640	8,000	191,500	4.35	4.28	2.48750E-06
0.658	0.661	0.660	8,000	199,500	4.48	4.41	2.42500E-06
0.678	0.684	0.681	7,800	207,300	4.64	4.56	2.70513E-06
0.697	0.702	0.699	6,300	213,600	4.79	4.71	2.98413E-06
0.718	0.720	0.719	6,100	219,700	4.95	4.87	3.27869E-06
0.739	0.741	0.740	5,800	225,500	5.12	5.04	3.55172E-06
0.759	0.760	0.759	5,100	230,600	5.30	5.21	3.78431E-06
0.782	0.779	0.780	4,400	235,000	5.50	5.40	4.79545E-06
0.801	0.800	0.800	4,400	239,400	5.70	5.60	4.52273E-06
0.822	0.818	0.820	3,200	242,600	5.91	5.81	6.18750E-06
0.842	0.838	0.840	3,600	246,200	6.14	6.03	5.58333E-06
0.861	0.858	0.859	2,700	248,900	6.38	6.26	7.07407E-06
0.883	0.877	0.880	2,700	251,600	6.64	6.51	7.66667E-06
0.905	0.897	0.901	2,300	253,900	6.94	6.79	9.04348E-06
0.927	0.914	0.921	1,800	255,700	7.23	7.08	1.10000E-05
0.947	0.936	0.942	2,000	257,700	7.57	7.40	1.04500E-05
0.968	0.953	0.960	1,400	259,100	7.90	7.73	1.32857E-05
0.990	0.971	0.980	1,400	260,500	8.28	8.09	1.45000E-05
1.008	0.991	0.999	1,300	261,800	8.66	8.47	1.46154E-05
1.033	1.009	1.021	1,300	263,100	9.15	8.91	1.67692E-05
1.056	1.027	1.042	1,050	264,150	9.64	9.40	1.93333E-05
1.077	1.042	1.059	900	265,050	10.11	9.88	1.97778E-05
1.099	1.063	1.081	920	265,970	10.74	10.42	2.34783E-05
1.112	1.087	1.100	860	266,830	11.33	11.03	2.16279E-05
1.127	1.113	1.120	800	267,630	12.06	11.69	2.60000E-05
1.149	1.135	1.142	400	268,030	12.89	12.48	5.37500E-05
1.170	1.149	1.160	320	268,350	13.67	13.28	5.62500E-05
1.199	1.164	1.182	450	268,800	14.72	14.20	4.84444E-05
1.226	1.175	1.200 *	170	268,970	15.73	15.23	1.10000E-04
1.250	1.190	1.220 *	290	269,260	16.92	16.33	6.75862E-05
1.275	1.207	1.241 *	200	269,460	18.36	17.64	1.05000E-04
1.297	1.225	1.261 *	120	269,580	19.92	19.14	1.66667E-04
1.322	1.261	1.292 *	60	269,640	22.77	21.35	5.10000E-04
1.328	1.271	1.299 *	14	269,654	23.59	23.18	5.50000E-04

* DENOTES THAT DATA POINT IS INVALID PER ASTM STANDARD TEST METHOD E647-83, PARAGRAPH 8.6.4.

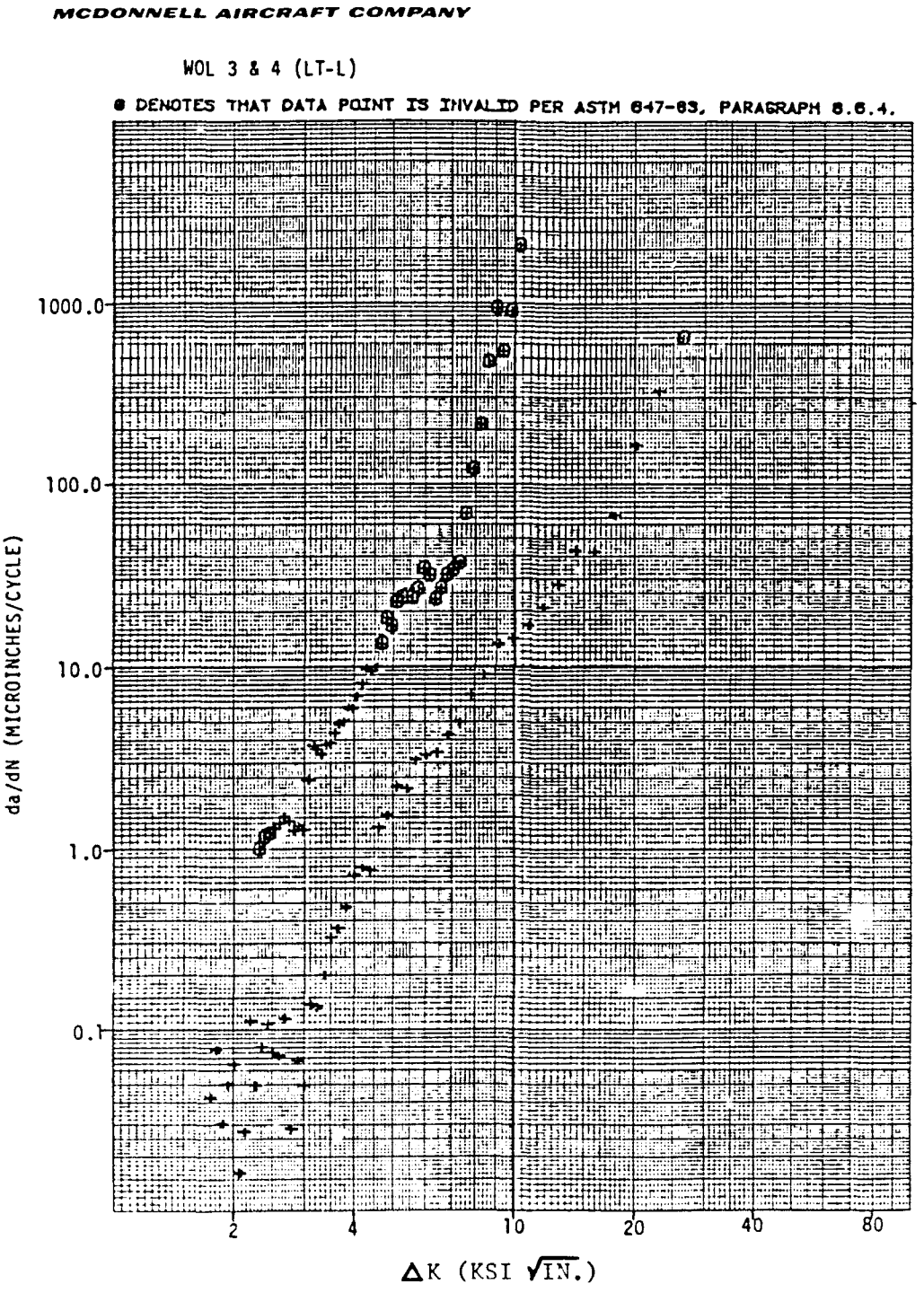

Figure G14 Fatigue Crack Growth Rate Data for IN905XL Forging (WOL Specimen, T-L Orientation, R=0.02 and Lab Air). McDonnell Aircraft Mo.

TABLE C57

Fatigue Crack Growth Data Associated
with Figure C14 (Specimen WOL 3)

MATERIAL DESCRIPTION: IN905XL DIE FORGING; AL-LI
TENSILE PROPERTIES: ETY = 64.0 KSI ETU = 74.5 KSI % ELONG. = 8.3 %RA = 16.6 E = 1[illegible].2X10E6 PSI
SPECIMEN ID: WOL 3 TYPE: WOL THICKNESS = .2508 WIDTH = 1.0 ORIENT.: LT-L LOCATION: MA
MAXIMUM TEST LOAD = 105 LBS. R = .02 ENVIR.: LAB AIR TEMP. = 75 HUMIDITY = 30
CYCLIC RATE: VARIED FROM 25 CPS TO 6 CPM IN ORDER TO MAINTAIN CONTROL OF THE CRACK GROWTH

CRACK LENGTH--A (INCH)			DELTA CYCLES	TOTAL CYCLES	DELTA K (KSIAIN^1/2)	AVERAGE DELTA K (KSIAIN^1/2)	DA/DN (INCH/CYCLE)
FRONT	BACK	AVERAGE					
0.444	0.435	0.440	0	0	1.71	----	----------
0.463	0.457	0.460	470,000	470,000	1.76	1.74	4.31915E-08
0.481	0.479	0.480	260,000	730,000	1.82	1.79	7.88462E-08
0.500	0.499	0.500	625,000	1,355,000	1.88	1.85	3.10400E-08
0.521	0.519	0.520	400,000	1,755,000	1.94	1.91	5.10000E-08
0.542	0.540	0.541	320,000	2,075,000	2.01	1.98	6.59375E-08
0.563	0.558	0.560	1,150,000	3,225,000	2.07	2.04	1.66957E-08
0.591	0.570	0.580	700,000	3,925,000	2.14	2.11	2.80000E-08
0.607	0.592	0.600	175,000	4,100,000	2.21	2.18	1.13143E-07
0.623	0.616	0.619	385,000	4,485,000	2.28	2.25	5.03896E-08
0.644	0.637	0.640	260,000	4,745,000	2.36	2.32	8.15385E-08
0.662	0.658	0.660	180,000	4,925,000	2.44	2.40	1.08889E-07
0.682	0.677	0.679	250,000	5,175,000	2.52	2.48	7.68000E-08
0.696	0.702	0.699	275,000	5,450,000	2.61	2.57	7.30909E-08
0.711	0.729	0.720	175,000	5,625,000	2.70	2.66	1.17143E-07
0.736	0.744	0.740	690,000	6,315,000	2.80	2.75	2.88406E-08
0.757	0.764	0.760	300,000	6,615,000	2.91	2.85	6.90000E-08
0.768	0.794	0.781	400,000	7,015,000	3.02	2.96	5.07500E-08
0.786	0.814	0.800	140,000	7,155,000	3.13	3.08	1.38571E-07
0.808	0.832	0.820	150,000	7,305,000	3.26	3.20	1.35333E-07
0.832	0.847	0.840	95,000	7,400,000	3.39	3.32	2.03158E-07
0.853	0.866	0.859	60,000	7,460,000	3.53	3.46	3.28333E-07
0.876	0.883	0.880	55,000	7,515,000	3.68	3.61	3.67273E-07
0.897	0.904	0.900	43,000	7,558,000	3.85	3.77	4.81395E-07
0.918	0.922	0.920	27,000	7,585,000	4.03	3.94	7.29630E-07
0.938	0.942	0.940	25,000	7,610,000	4.22	4.12	7.96000E-07
0.957	0.962	0.960	26,000	7,636,000	4.43	4.32	7.69231E-07
0.978	0.983	0.980	15,000	7,651,000	4.66	4.54	1.34000E-06
0.999	1.002	1.000	13,000	7,664,000	4.91	4.78	1.56154E-06
1.021	1.025	1.023	10,000	7,674,000	5.21	5.06	2.23000E-06
1.038	1.042	1.040	8,000	7,682,000	5.47	5.34	2.18750E-06
1.058	1.061	1.060	6,200	7,688,200	5.78	5.63	3.12903E-06
1.080	1.080	1.080	6,100	7,694,300	6.15	5.97	3.34426E-06
1.100	1.102	1.101	6,100	7,700,400	6.57	6.36	3.44262E-06
1.120	1.121	1.121	4,600	7,705,000	7.01	6.79	4.30435E-06
1.138	1.143	1.140	3,900	7,708,900	7.49	7.25	5.02564E-06
1.157	1.162	1.159	3,700	7,711,600	8.02	7.75	7.07407E-06
1.177	1.180	1.179	2,100	7,713,700	8.61	8.31	9.09524E-06
1.200	1.203	1.201	1,700	7,715,400	9.40	9.00	1.32941E-05
1.224	1.218	1.221	1,400	7,716,800	10.21	9.80	1.42500E-05
1.243	1.242	1.243	1,300	7,718,100	11.21	10.71	1.66154E-05
1.264	1.255	1.260	900	7,718,900	12.11	11.66	2.10625E-05
1.287	1.274	1.280	740	7,719,640	13.38	12.74	2.79730E-05
1.310	1.290	1.300	450	7,720,090	14.77	14.08	4.31111E-05
1.327	1.314	1.320	485	7,720,575	16.53	15.65	4.24742E-05
1.352	1.329	1.340	300	7,720,875	18.61	17.57	6.73333E-05
1.375	1.347	1.361	125	7,721,000	21.18	19.89	1.64000E-04
1.398	1.363	1.381	60	7,721,060	24.21	22.69	3.26667E-04
1.423	1.371	1.400***	30	7,721,090	27.97	26.09	6.46667E-04

* DENOTES THAT DATA POINT IS INVALID PER ASTM STANDARD TEST METHOD E647-83, PARAGRAPH 8.6.4.
** DENOTES THAT DATA POINT IS INVALID PER ASTM STANDARD TEST METHOD E647-83, PARAGRAPH 7.2.1.
*** DENOTES THAT DATA POINT IS INVALID PER ASTM STANDARD TEST METHOD E647-83, PARAGRAPHS 8.6.4 AND 7.2.1.

TABLE G58

Fatigue Crack Growth Data Associated
with Figure G14 (Specimen WOL 4)

MATERIAL DESCRIPTION: IN905XL DIE FORGING; AL-LI
TENSILE PROPERTIES: FTY = 64.0 KSI FTU = 74.5 KSI % ELONG. = 8.3 %RA = 16.6 E = 12.2X10E6 PSI
SPECIMEN ID: WOL 4 TYPE: WOL THICKNESS = .2484 WIDTH = 1.99? ORIENT.: LT-L LOCATION: NA
MAXIMUM TEST LOAD = 200 LBS. R = .02 ENVIR.: LAB AIR TEMP. = 75 HUMIDITY = 30
CYCLIC RATE: VARIED FROM 20 CPS TO 6 CPM IN ORDER TO MAINTAIN CONTROL OF THE CRACK GROWTH

CRACK LENGTH--A (INCH)			DELTA CYCLES	TOTAL CYCLES	DELTA K (KSIAIN^1/2)	AVERAGE DELTA K (KSIAIN^1/2)	DA/DN (INCH/CYCLE)
FRONT	BACK	AVERAGE					
0.389	0.334	0.362 *	0	0	2.25	----	----------
0.408	0.351	0.380 *	18,000	18,000	2.31	2.28	1.00556E-06
0.432	0.367	0.400 *	17,000	35,000	2.39	2.35	1.17647E-06
0.447	0.394	0.420 *	17,000	52,000	2.46	2.42	1.22353E-06
0.461	0.419	0.440	15,000	67,000	2.53	2.50	1.30667E-06
0.478	0.441	0.460	14,000	81,000	2.60	2.57	1.39286E-06
0.498	0.463	0.480	13,500	94,500	2.68	2.64	1.51852E-06
0.515	0.484	0.499	13,500	108,000	2.75	2.71	1.42963E-06
0.527	0.512	0.520	16,000	124,000	2.82	2.79	1.26875E-06
0.539	0.540	0.540	14,600	138,600	2.90	2.86	1.36301E-06
0.547	0.571	0.559	15,400	154,000	2.98	2.94	1.27922E-06
0.576	0.591	0.584	10,000	164,000	3.07	3.03	2.43000E-06
0.596	0.603	0.600	4,300	168,300	3.14	3.11	3.72093E-06
0.623	0.619	0.621	6,000	174,300	3.23	3.18	3.56667E-06
0.646	0.634	0.640	5,700	180,000	3.31	3.27	3.33333E-06
0.671	0.651	0.661	5,500	185,500	3.40	3.35	3.76364E-06
0.690	0.669	0.680	5,000	190,500	3.48	3.44	3.84000E-06
0.714	0.686	0.700	4,700	195,200	3.57	3.53	4.34043E-06
0.734	0.706	0.720	4,000	199,200	3.66	3.62	4.92500E-06
0.754	0.725	0.740	3,900	203,100	3.76	3.71	5.02564E-06
0.778	0.745	0.762	3,700	206,800	3.87	3.81	6.02703E-06
0.797	0.763	0.780	3,100	209,900	3.96	3.92	5.93548E-06
0.816	0.783	0.800	2,800	212,700	4.07	4.01	6.91071E-06
0.839	0.801	0.820	2,500	215,200	4.18	4.12	8.14000E-06
0.858	0.821	0.840	2,000	217,200	4.29	4.23	9.85000E-06
0.880	0.841	0.860	2,200	219,400	4.41	4.35	9.45455E-06
0.902	0.859	0.880	2,000	221,400	4.54	4.47	1.00000E-05
0.927	0.874	0.900 *	1,500	222,900	4.66	4.60	1.33333E-05
0.948	0.893	0.921 *	1,100	224,000	4.80	4.73	1.82727E-05
0.970	0.911	0.940 *	1,200	225,200	4.94	4.87	1.65833E-05
0.998	0.923	0.961 *	900	226,100	5.09	5.01	2.24444E-05
1.023	0.936	0.980 *	800	226,900	5.23	5.16	2.37500E-05
1.052	0.948	1.000 *	850	227,750	5.40	5.32	2.40000E-05
1.078	0.963	1.020 *	850	228,600	5.57	5.49	2.35882E-05
1.105	0.975	1.040 *	750	229,350	5.75	5.66	2.66333E-05
1.132	0.989	1.060 *	600	229,950	5.94	5.85	3.40833E-05
1.157	1.004	1.080 *	640	230,590	6.15	6.04	3.12500E-05
1.175	1.025	1.100 *	850	231,440	6.36	6.25	2.32941E-05
1.201	1.039	1.120 *	750	232,190	6.58	6.47	2.66667E-05
1.220	1.060	1.140 *	630	232,820	6.82	6.70	3.15079E-05
1.240	1.081	1.160 *	600	233,420	7.08	6.95	3.33333E-05
1.258	1.102	1.180 *	550	233,970	7.35	7.21	3.64545E-05
1.283	1.119	1.201 *	300	234,270	7.65	7.50	6.83333E-05
1.312	1.131	1.221 *	170	234,440	7.97	7.81	1.20294E-04
1.344	1.136	1.240 *	90	234,530	8.28	8.13	2.11111E-04
1.369	1.159	1.264 *	50	234,580	8.71	8.50	4.71000E-04
1.389	1.172	1.280 *	18	234,598	9.03	8.87	9.30556E-04
1.424	1.174	1.299 *	35	234,633	9.42	9.22	5.34286E-04
1.457	1.186	1.321 *	25	234,658	9.92	9.67	8.98000E-04
1.483	1.197	1.340 *	9	234,667	10.37	10.14	2.05556E-03

* DENOTES THAT DATA POINT IS INVALID PER ASTM STANDARD TEST METHOD E647-83, PARAGRAPH 8.6.4.

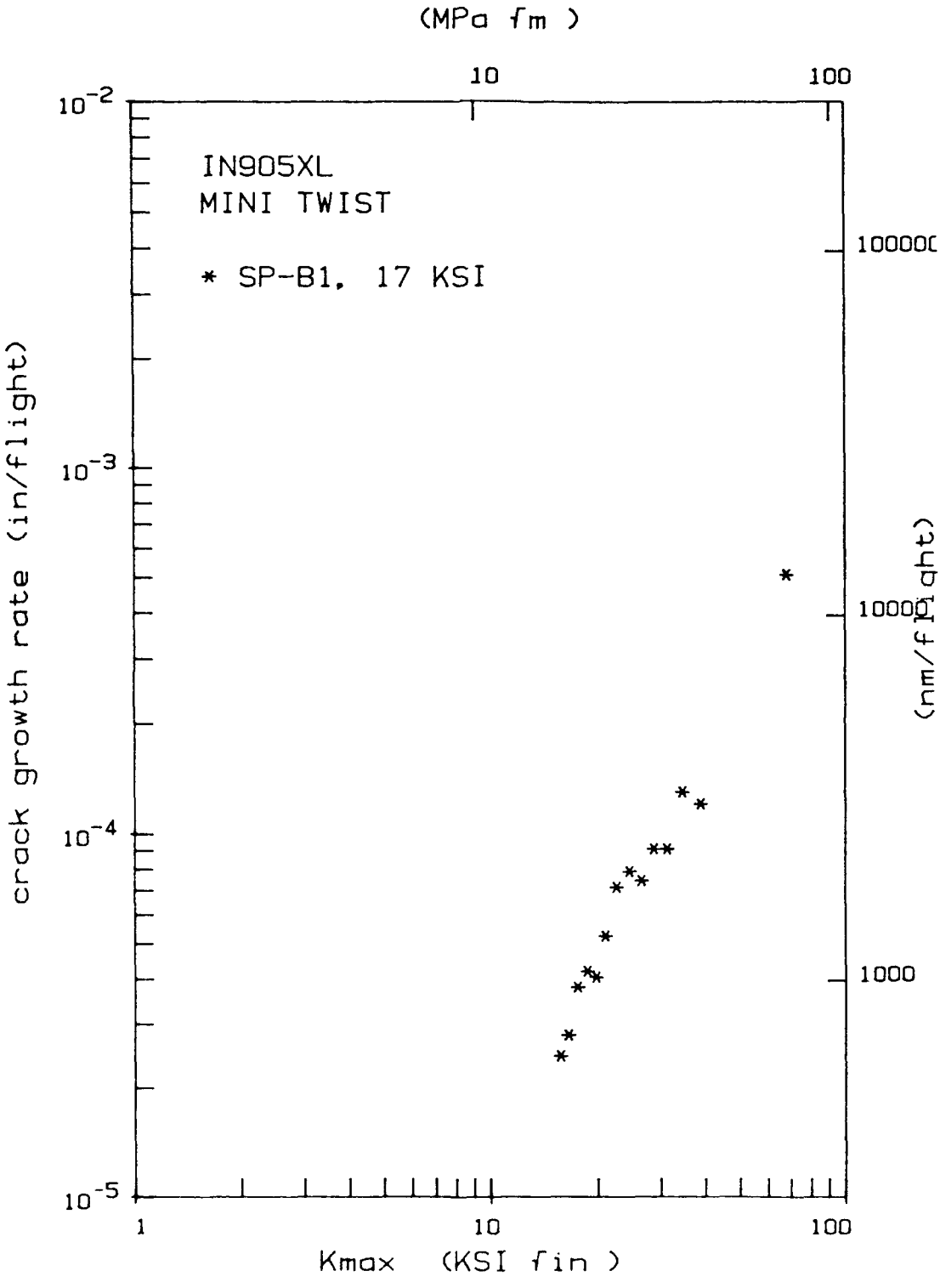

Figure G15 Mini-TWIST Spectrum Fatigue Crack Growth Rata Data. Air Force.

TABLE G59

Mini-TWIST Spectrum Fatigue Crack Growth Rate Data Associated with Figure G15.

MATERIAL : IN905XL
FORM : FORGING
ORIENTATION : LT
TEST CONDITION : LAB AIR
TYPE SPECTRUM : MINI TWIST

SPECIMEN ID : SP-B1
DATE : 4-1-88

WIDTH, W = 3.912 INCHES
THICK, B = 0.252 INCHES

MAX SPECTRUM STRESS = 16.9 KSI

POINT #	CRACK (2a) (INCHES)	TOTAL FLIGHTS	K-MAX KSI SQR(IN)	Da/dF 10^-6 IN/FLT
1	0.516	1		
			15.76	24.52
2	0.565	1000		
			16.55	28.00
3	0.621	2000		
			17.50	38.00
4	0.697	3000		
			18.62	42.00
5	0.781	4000		
			19.74	40.50
6	0.862	5000		
			20.97	52.50
7	0.967	6000		
			22.57	71.50
8	1.110	7000		
			24.51	79.00
9	1.268	8000		
			26.49	74.50
10	1.417	9000		
			28.69	91.00
11	1.599	10000		
			31.21	91.00
12	1.781	11000		
			34.52	130.50
13	2.042	12000		
			38.76	121.00
14	2.284	13000		
			68.08	510.11
15	4.000	14682		

APPENDIX H

AL905XL Precision Forging

INTRODUCTION

The AL905XL forging was received the second quarter of 1989. All the participants tested the material in the as received condition. Figure H1 shows the geometry of the AL905XL back-up fitting precision forging.

TESTING

Basic mechanical properties (tension, compression, bearing, etc.) were tested according to ASTM standards, unless otherwise specified.

Constant amplitude fatigue crack growth tests were conducted according to ASTM E647 standard. The growth rate a-N data that were generated by the participants (Northrop, McDonnell Aircraft Company and Air Force) were reduced using a seven-point incremental polynomial method. This involves fitting a second-order polynomial (parabola) to sets of seven successive data points. The data are also checked against size requirements per ASTM E647, Section 7.2. Northrop also performed two constant amplitude fatigue crack growth tests using a K-decreasing method.

Spectrum fatigue crack growth tests were performed by the Air Force using FALSTAFF (a severe fatigue environment) and Mini-TWIST (a moderately intense fatigue environment) spectrums.

Stress Corrosion tests were performed by Wyman Gordon and the results are shown in tabular form.

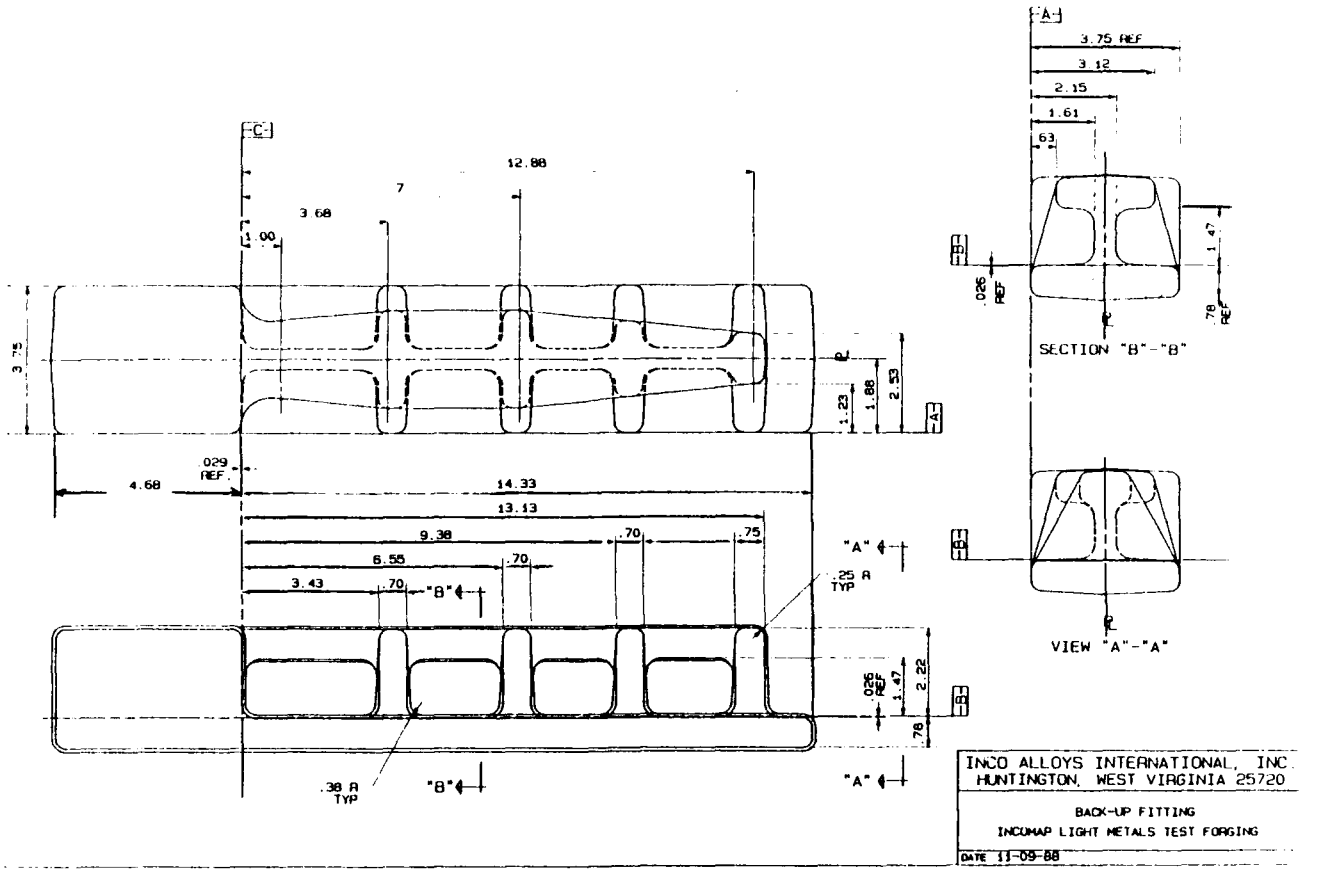

Figure H1 AL905XL Back-up Fitting Precision Forging.

TABLE H1

TENSILE RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	LONG	79.0	70.9		24.0	
			77.3	67.8		16.7	
			76.9	71.7	9.9	22.6	
LTV	RT	LONG	74.7	66.7	12.0		13.4
			74.5	67.5	7.7		13.2
			75.0	67.7	11.6		13.1
MCAIR	RT	LONG	75.0	66.0	11.0	22.1	11.3
			75.5	66.5	11.0	20.0	11.9
			75.0	65.5	11.0	17.8	10.6
WYMAN-GORDON	RT	LONG	75.2	67.8	9.0		
			73.6	62.8	12.0		
			73.2	64.2	11.0		
NASA-LANGLEY	RT	LONG	76.7	67.7	9.0		11.3
			76.1	67.9	9.0		11.3
			77.1	68.7	8.8		11.3
MCDONNELL	RT	LONG	73.5	65.7	13.0		
DOUGLAS			72.5	64.1	13.0		
HELICOPTER			73.3	62.1	12.0		
MARTIN	RT	LONG	75.3	64.3	12.0	18.3	11.6
MARIETTA			75.3	65.0	12.0	23.2	12.0
			72.9	61.2	12.0	24.1	11.6
NORTHROP	RT	LONG	76.1	66.8	10.2	27.8	12.1
			76.0	66.9	7.8	18.9	11.8
			76.1	67.1	8.6	18.3	11.7
		AVERAGE	75.2	66.4	10.6	21.1	11.9
	STANDARD DEVIATION		1.6	2.5	1.6	3.3	0.8

TABLE H2

TENSILE RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	L TRANS	72.0	60.4	8.7	20.8	
			72.5	62.4	8.7	16.6	
			71.1	58.1	8.3	16.7	
LTV	RT	L TRANS	71.8	61.2	8.0		13.1
			61.3	72.2	8.8		12.8
			71.4	58.9	8.4		12.9
MCAIR	RT	L TRANS	72.5	60.0	9.0	13.6	11.2
			72.5	60.0	9.0	16.5	11.2
			73.0	60.0	7.0	13.8	10.5
WYMAN-GORDON	RT	L TRANS	72.0	60.8	8.0		
			72.2	57.2	8.0		
			72.3	60.1	8.0		
NASA-LANGLEY	RT	L TRANS	73.5	60.5	7.5		11.2
			73.5	60.5	7.1		11.2
			73.1	59.2	8.8		11.2
MCDONNELL	RT	L TRANS	68.0	57.0	7.0		
DOUGLAS			67.3	53.7	7.0		
HELICOPTER			71.3	62.6	12.0		
MARTIN	RT	L TRANS	72.4	58.7	11.0	17.6	
MARIETTA			71.8	60.2	11.0	13.9	
			71.7	56.8	12.0	16.1	
NORTHROP	RT	L TRANS	72.9	58.5	8.6	18.3	11.5
			73.9	60.4	6.2	14.4	11.2
			74.4	61.3	9.4	14.4	11.7
		AVERAGE	71.6	60.0	8.6	16.1	11.6
	STANDARD DEVIATION		2.7	3.2	1.5	2.2	0.8

TABLE H3

TENSILE RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	S TRANS	72.6	58.6	6.4	12.3	
			72.5	59.4	5.3	13.8	
			72.4	59.5	3.9	7.8	
LTV	RT	S TRANS	69.1	56.4	3.1		13.3
			71.2	58.4	5.3		13.9
			69.4	56.0	3.1		14.3
MCAIR	RT	S TRANS	70.5	61.5	5.0	7.9	13.4
			71.5	58.5	7.0	12.4	10.8
			71.5	59.0	8.0	14.8	10.9
WYMAN-GORDON	RT	S TRANS	69.6	54.4	6.0		
			70.0	56.0	8.0		
			70.6	56.1	7.0		
NASA-LANGLEY	RT	S TRANS	70.4	56.3	4.9		11.2
			70.6	55.7	4.8		11.2
			70.8	55.3	4.8		11.1
MCDONNELL DOUGLAS HELICOPTER	RT	S TRANS	67.7	54.5	11.0		
			68.0	54.0	10.0		
			68.7	55.6	10.0		
MARTIN MARIETTA	RT	S TRANS	68.3	57.1	4.0	7.0	11.7
			70.2	54.7	5.0	5.5	11.5
			68.4	54.9	5.0	4.0	11.5
NORTHROP	RT	S TRANS	72.4	59.4	7.8	17.8	11.2
			71.1	57.6	7.8	9.7	11.5
			71.5	57.9	7.8	16.5	11.3
		AVERAGE	70.4	57.0	6.3	10.8	11.9
	STANDARD DEVIATION		1.5	2.0	2.2	4.5	1.2

TABLE H4

COMPRESSION RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
LTV	RT	LONG	72.5	11.8
			73.9	11.7
			73.3	12.2
MCAIR	RT	LONG	64.0	9.9
			66.0	10.3
			56.5	9.4
WYMAN-GORDON	RT	LONG	64.4	
			70.0	
			70.6	
NASA-LANGLEY	RT	LONG	70.5	11.5
			70.3	11.5
MARTIN MARIETTA	RT	LONG	70.4	
			72.0	
			70.4	
NORTHROP	RT	LONG	70.9	11.8
			70.4	11.7
			67.1	11.8
		AVERAGE	69.0	11.2
		STANDARD DEVIATION	4.3	0.9

TABLE H5

COMPRESSION RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
NASA-LANGLEY	RT	L TRANS	56.4	11.5
			55.3	11.4
			55.9	11.5
		AVERAGE	55.9	11.5
		STANDARD DEVIATION	0.6	0.1

TABLE H6

COMPRESSION RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
LTV	RT	S TRANS	58.5	11.8
			58.8	11.6
			60.5	12.2
MCAIR	RT	S TRANS	54.0	10.4
			53.5	9.6
			64.0	10.4
WYMAN-GORDON	RT	S TRANS	60.6	
			63.1	
			61.5	
MARTIN MARIETTA	RT	S TRANS	57.1	
			58.2	
			57.1	
NORTHROP	RT	S TRANS	56.9	11.7
			57.8	11.8
			58.1	11.8
		AVERAGE	58.6	11.3
		STANDARD DEVIATION	2.9	0.9

TABLE H7

AMSLER DOUBLE SHEAR RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
LTV	L - S	32.8
		33.1
		36.5
NASA-LANGLEY	L - S	42.3
		41.1
		41.6
MCDONNELL DOUGLAS HELICOPTER	L - S	41.4
		41.5
		41.7
NORTHROP	L - S	39.1
		41.2
		41.9
	AVERAGE	39.5

TABLE H8

PIN SHEAR RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	SHEAR STRENGTH (KSI)
MCAIR	L - S	42.2
		40.6
		42.0
WYMAN-GORDON	L - S	40.4
		50.0
		40.2
	AVERAGE	42.6
	STANDARD DEVIATION	3.7

TABLE H9

BEARING RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
LTV	LONG	1.5	100.7	88.7
			96.0	91.4
MCAIR	LONG	1.5	101.4	
			100.2	
WYMAN-GORDON	LONG	1.5	103.1	
			99.2	
NORTHROP	LONG	1.5	101.6	91.3
			98.5	89.1
		AVERAGE	100.1	90.1
		STANDARD DEVIATION	2.2	1.4

TABLE H10

BEARING RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
LTV	LONG	2.0	125.2	101.2
			122.3	100.5
MCAIR	LONG	2.0	129.8	127.8
			133.2	129.4
WYMAN-GORDON	LONG	2.0	127.6	
			122.5	
NORTHROP	LONG	2.0	134.9	107.1
			133.1	106.6
		AVERAGE	128.6	112.1
		STANDARD DEVIATION	5.0	13.1

TABLE H11

FRACTURE TOUGHNESS RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
AIR FORCE	L-T	27.1		VALID
		23.6		VALID
LTV	L-T	28.9		VALID
		27.7		VALID
MCAIR	L-T		27.1	INVALID(1)
		29.9		VALID
WYMAN-GORDON	L-T	29.5		VALID
		28.9		VALID
MCDONNELL	L-T		31.1	INVALID(2)
DOUGLAS			29.9	INVALID(2)
HELICOPTER				
MARTIN	L-T	31.2		VALID
MARIETTA		30.8		VALID
NORTHROP	L-T	29.1		VALID
			29.9	INVALID(2)
	AVERAGE	28.7	29.5	
	STANDARD DEVIATION	2.2	1.7	

(1): DIFF. BETWEEN SURFACE CRACK LENGTHS > 10% OF AVERAGE CRACK LENGTH
(2): Pmax/Pq EXCEEDED 1.10

TABLE H12

FRACTURE TOUGHNESS RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
AIR FORCE	T-L	22.3		VALID
		21.3		VALID
LTV	T-L	19.0		VALID
		19.1		VALID
MCAIR	T-L	25.7		VALID
		24.0		VALID
WYMAN-GORDON	T-L	22.2		VALID
		20.4		VALID
MCDONNELL DOUGLAS HELICOPTER	T-L		28.2	INVALID(1)
			29.0	INVALID(1)
MARTIN MARIETTA	T-L	23.1		VALID
NORTHROP	T-L	24.1		VALID
		25.4		VALID
	AVERAGE	22.4	28.6	
	STANDARD DEVIATION	2.3	0.6	

(1): Pmax/Pq EXCEEDED 1.10

TABLE H13

FRACTURE TOUGHNESS RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
AIR FORCE	S-L	21.2		VALID
LTV	S-L	20.5		VALID
		20.6		VALID
MCAIR	S-L		24.9	INVALID(1)
WYMAN-GORDON	S-L	21.8		VALID
		20.9		VALID
MARTIN	S-L	22.9		VALID
MARIETTA			23.6	INVALID(2)
	AVERAGE	21.3	24.3	
	STANDARD DEVIATION	0.9	0.9	

(1): DIFF. BETWEEN SURFACE CRACK LENGTHS > 10% OF AVERAGE CRACK LENGTH
(2): PRECRACK LENGTH TOO LONG, a/W=0.6

TABLE H14

FRACTURE TOUGHNESS RESULTS FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	KIC (KSI in^0.5)	Kq (KSI in^0.5)	COMMENT
AIR FORCE	S-T	26.1		VALID
		22.3		VALID
LTV	S-T		21.1	INVALID(1)
		24.6		VALID
MCAIR	S-T		27.2	INVALID(2)
			25.2	INVALID(2)
WYMAN-GORDON	S-T	22.6		VALID
		22.9		VALID
MCDONNELL DOUGLAS HELICOPTER	S-T		29.5	INVALID(3)
		26.2		VALID
MARTIN MARIETTA	S-T	24.2		VALID
		24.2		VALID
NORTHROP	S-T	26.2		VALID
		24.1		VALID
	AVERAGE	24.3	25.8	
	STANDARD DEVIATION	1.5	3.6	

(1): CRACK SYMMETRY OUTSIDE LIMITS
(2): DIFF. BETWEEN SURFACE CRACK LENGTHS > 10% OF AVERAGE CRACK LENGTH
(3): W,B > 2.5(Kq/YS)**2

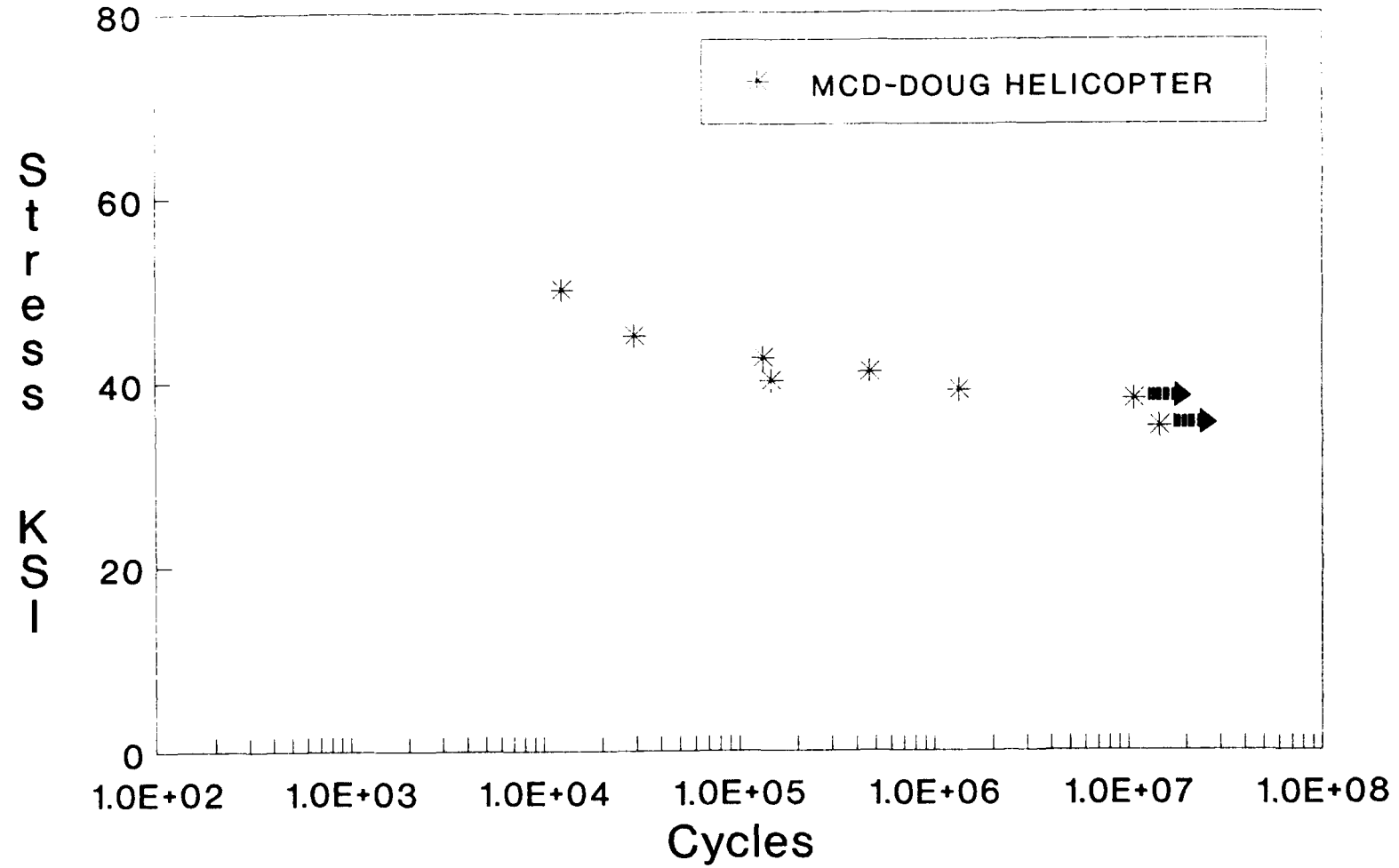

Figure H2 Fatigue Results for AL905XL Forging (Longitudinal Orientation, R=0.1, Kt=1.0). McDonnell Douglas Helicopter.

TABLE H15

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR

INCOMAP AL905XL DIE FORGING

COMPANY	ORIENTATION	STRESS (KSI)	CYCLES	
MCDONNELL	LONG	50.0	12,300	
DOUGLAS		45.0	29,200	
HELICOPTER		42.5	133,200	
		41.0	467,400	
		40.0	146,500	
		39.0	1,346,200	
		38.0	10,685,100	*
		35.0	14,455,400	*

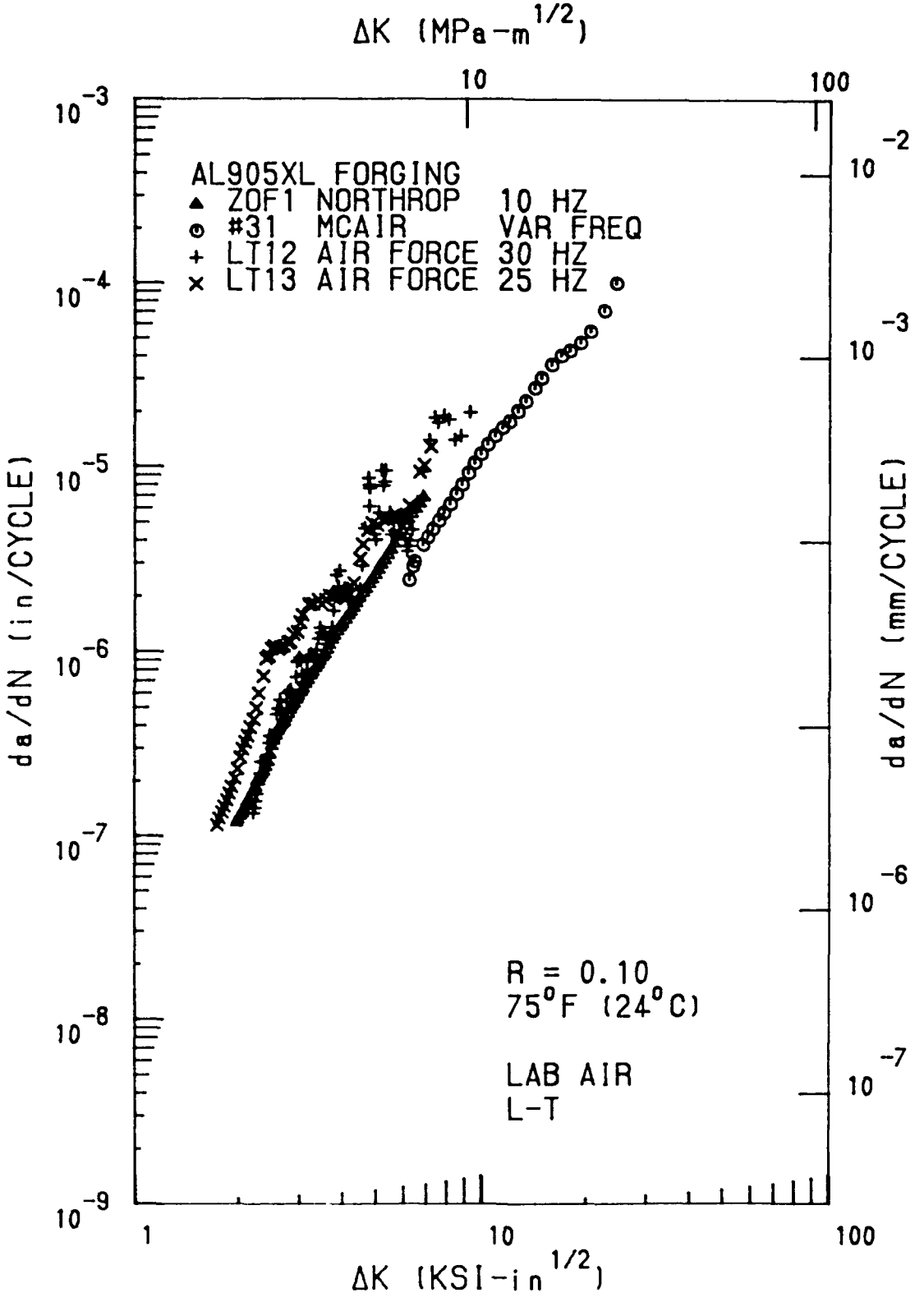

Figure H3 Fatigue Crack Growth Rate Data for AL905XL Forging (L-T Orientation). Northrop, MCAIR, and Air Force.

TABLE H16

Northrop Fatigue Crack Growth Rate Data Associated with Figure H3

Seven Point Incremental Polynomial Method per ASTM E647

04-29-1991

Specimen Number: ZOF1 Specimen Type: CT

B= 0.2500 in W= 1.5000 in An= 0.0000

Pmax= 113.0 lbs Pmin= 11.3 lbs

R= 0.10 Frequency= 10.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES (x 1000)	Ameas	Areg	MCC	Delta K	da/dN
1	58.89	0.4568				
2	135.99	0.4649				
3	206.82	0.4726				
4	273.01	0.4800	0.4801	0.999981	1.97	.1170E-06
5	336.70	0.4878	0.4877	0.999980	1.99	.1217E-06
6	398.31	0.4954	0.4953	0.999920	2.02	.1276E-06
7	457.88	0.5031	0.5031	0.999908	2.05	.1326E-06
8	515.01	0.5106	0.5108	0.999910	2.07	.1384E-06
9	567.30	0.5184	0.5181	0.999901	2.10	.1448E-06
10	614.66	0.5249	0.5251	0.999907	2.12	.1509E-06
11	661.03	0.5322	0.5323	0.999903	2.15	.1568E-06
12	712.92	0.5406	0.5404	0.999891	2.18	.1648E-06
13	760.81	0.5486	0.5486	0.999854	2.21	.1747E-06
14	802.84	0.5557	0.5560	0.999908	2.24	.1838E-06
15	842.90	0.5635	0.5634	0.999762	2.27	.1978E-06
16	878.54	0.5706	0.5707	0.999534	2.30	.2066E-06
17	913.82	0.5779	0.5782	0.999605	2.33	.2162E-06
18	942.54	0.5852	0.5845	0.999582	2.35	.2242E-06
19	979.72	0.5928	0.5930	0.999405	2.39	.2372E-06
20	1011.90	0.6005	0.6006	0.999294	2.42	.2528E-06
21	1042.44	0.6083	0.6083	0.999887	2.45	.2762E-06
22	1069.66	0.6160	0.6161	0.999772	2.49	.3072E-06
23	1092.68	0.6231	0.6233	0.999771	2.52	.3296E-06
24	1112.14	0.6300	0.6300	0.999763	2.55	.3505E-06
25	1132.90	0.6380	0.6376	0.9998[illegible]	2.5[illegible]	.3710E-06
26	1154.35	0.6456	0.6459	0.999889	2.62	.3478E-06
27	1173.34	0.6534	0.6533	0.999863	[illegible]	[illegible]
28	1190.65	0.6604	0.6603	[illegible]	2.70	[illegible]
29	1208.77	0.6679	0.6680	0.999799	2.73	[illegible]
30	[illegible]	[illegible]	0.6760	[illegible]	[illegible]	[illegible]
31	1243.53	0.6834	0.6837	0.9999[illegible]	[illegible]	.4334E-06
32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	1285.78	0.7056	0.7057	0.999930	2.94	.5503E-06
35	1300.36	0.7139	0.7137	0.999944	2.98	.5742E-06
36	1313.61	0.7213	0.7215	0.999939	3.03	.6013E-06
37	1325.54	0.7287	0.7287	0.999947	3.07	.6298E-06
38	1336.17	0.7356	0.7355	0.999918	3.11	.6641E-06
39	1347.37	0.7430	0.7431	0.999900	3.16	.6997E-06
40	1358.59	0.7510	0.7511	0.999910	3.22	.7374E-06
41	1368.22	0.7567	0.7584	0.999912	3.26	.7727E-06
42	1377.65	0.7657	0.7659	0.999916	3.32	.8093E-06
43	1387.07	0.7736	0.7736	0.999900	3.37	.8479E-06
44	1395.64	0.7810	0.7810	0.999972	3.42	.8836E-06
45	1403.79	0.7883	0.7883	0.999946	3.48	.9312E-06
46	1411.75	0.7959	0.7959	0.999821	3.54	.9594E-06
47	1419.29	0.8032	0.8032	0.999425	3.59	.1014E-05
48	1426.14	0.8106	0.8102	0.999206	3.65	.1082E-05
49	1433.64	0.8177	0.8185	0.999324	3.72	.1153E-05
50	1439.06	0.8250	0.8248	0.999365	3.77	.1215E-05
51	1445.44	0.8333	0.8328	0.999328	3.84	.1285E-05
52	1451.27	0.8404	0.8408	0.999771	3.92	.1353E-05
53	1456.55	0.8480	0.8478	0.999819	3.98	.1406E-05
54	1461.94	0.8555	0.8555	0.999895	4.06	.1478E-05
55	1467.30	0.8634	0.8636	0.999885	4.14	.1569E-05
56	1471.98	0.8712	0.8711	0.999921	4.21	.1637E-05
57	1476.45	0.8786	0.8786	0.999923	4.29	.1722E-05
58	1480.47	0.8858	0.8856	0.999788	4.37	.1816E-05
59	1484.44	0.8927	0.8928	0.999755	4.45	.1935E-05
60	1488.45	0.9006	0.9008	0.999814	4.54	.2061E-05
61	1491.92	0.9081	0.9081	0.999806	4.63	.2174E-05
62	1495.17	0.9158	0.9155	0.999882	4.73	.2299E-05
63	1498.37	0.9229	0.9230	0.999802	4.82	.2426E-05
64	1501.58	0.9307	0.9309	0.999808	4.93	.2572E-05
65	1504.50	0.9384	0.9384	0.999982	5.03	.2753E-05
66	[illegible].97	0.9454	0.9454	0.999974	5.13	.2921E-05

TABLE H16 (Continued)

67	1509.43	0.9527	0.9528	0.999970	5.24	.3102E-05
68	1511.95	0.9610	0.9608	0.999951	5.37	.3309E-05
69	1514.05	0.9678	0.9679	0.999878	5.48	.3523E-05
70	1516.14	0.9753	0.9753	0.999794	5.60	.3793E-05
71	1518.25	0.9834	0.9835	0.999966	5.75	.4127E-05
72	1519.99	0.9908	0.9909	0.999972	5.88	.4470E-05
73	1521.60	0.9983	0.9983	0.999997	6.02	.4811E-05
74	1523.13	1.0058	1.0058	0.999995	6.16	.5160E-05
75	1524.45	1.0129	1.0129	0.999972	6.31	.5501E-05
76	1525.74	1.0201	1.0201	0.999965	6.46	.5872E-05
77	1527.04	1.0278	1.0279	0.999963	6.63	.6302E-05
78	1528.27	1.0358	1.0358	0.999963	6.81	.6801E-05
79	1529.36	1.0434				
80	1530.33	1.0506				
81	1531.26	1.0582				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H17

MCAIR Fatigue Crack Growth Rate Data
Associated with Figure H3

Seven Point Incremental Polynomial Method per ASTM E647

06-07-1991

Specimen Number: 31 Specimen Type: CT

B= 0.2500 in W= 1.5970 in An= 0.0000

Pmax= 300.0 lbs Pmin= 30.0 lbs

R= 0.10 Frequency= 0.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES	Ameas	Areg	MCC	Delta K	da/dN
1	117.58	0.5710				
2	129.08	0.5900				
3	138.58	0.6100				
4	151.58	0.6300	0.6338	0.995046	6.17	.2416E-05
5	158.58	0.6490	0.6505	0.996549	6.34	.2864E-05
6	161.58	0.6600	0.6580	0.999323	6.42	.3048E-05
7	171.08	0.6900	0.6914	0.999610	6.80	.3739E-05
8	175.78	0.7100	0.7093	0.999313	7.01	.4140E-05
9	180.28	0.7290	0.7284	0.999470	7.25	.4580E-05
10	185.18	0.7500	0.7519	0.999424	7.56	.5088E-05
11	189.58	0.7700	0.7692	0.999524	7.81	.5585E-05
12	192.08	0.7900	0.7893	0.999451	8.11	.6242E-05
13	195.48	0.8100	0.8114	0.999038	8.47	.7091E-05
14	198.08	0.8300	0.8298	0.999649	8.78	.7965E-05
15	200.58	0.8500	0.8503	0.999758	9.15	.9148E-05
16	202.68	0.8700	0.8703	0.999697	9.55	.1037E-04
17	204.48	0.8890	0.8893	0.999943	9.95	.1162E-04
18	206.18	0.9100	0.9099	0.999866	10.41	.1310E-04
19	207.68	0.9300	0.9302	0.999903	10.91	.1463E-04
20	209.08	0.9510	0.9515	0.999939	11.48	.1616E-04
21	210.18	0.9700	0.9698	0.999971	12.01	.1750E-04
22	211.33	0.9910	0.9905	0.998298	12.66	.1993E-04
23	212.33	1.0100	1.0106	0.998227	13.35	.2273E-04
24	213.27	1.0300	1.0325	0.998806	14.18	.2650E-04
25	213.87	1.0500	1.0483	0.999177	14.84	.3034E-04
26	214.57	1.0700	1.0707	0.999181	15.85	.3558E-04
27	215.12	1.0900	1.0912	0.999194	16.89	.3993E-04
28	215.57	1.1100	1.1097	0.999037	17.92	.4243E-04
29	216.02	1.1310	1.1303	0.998853	19.19	.4711E-04
30	216.42	1.1500	1.1489	0.994269	20.50	.5414E-04
31	216.87	1.1700	1.1739	0.988422	22.47	.7066E-04
32	217.17	1.1910	1.1954	0.988397	24.43	.9967E-04
33	217.37	1.2120				
34	217.49	1.2310				
35	217.59	1.2500				

• DATA VIOLATES SIZE REQUIREMENTS

TABLE H18

Air Force Fatigue Crack Growth Rate Data Associated with Figure H3

Seven Point Incremental Polynomial Method per ASTM E647

08-14-1991

Specimen Number: LT12 Specimen Type: CT

B= 0.2500 in W= 1.6020 in An= 0.0000

Pmax= 114.0 lbs Pmin= 11.4 lbs

R= 0.10 Frequency= 30 hz.

Test Temperature= 72 F Environment= LAB AIR

PT	CYCLES (x1000)	Ameas (in.)	Areg	MCC	Delta K	da/dN
1	382.08	0.5848				
2	509.66	0.5898				
3	581.65	0.5948				
4	629.18	0.5998	0.6007	0.996207	2.21	.1320E-06
5	659.96	0.6048	0.6048	0.994138	2.23	.1419E-06
6	684.66	0.6098	0.6089	0.996425	2.24	.1542E-06
7	719.23	0.6148	0.6146	0.995043	2.26	.1699E-06
8	754.89	0.6198	0.6205	0.995522	2.28	.1907E-06
9	779.79	0.6248	0.6251	0.999173	2.30	.2182E-06
10	800.24	0.6298	0.6296	0.999508	2.32	.2541E-06
11	819.47	0.6348	0.6352	0.993385	2.34	.2532E-06
12	837.42	0.6398	0.6402	0.995282	2.36	.2518E-06
13	850.27	0.6448	0.6434	0.994717	2.37	.2522E-06
14	879.01	0.6498	0.6500	0.989338	2.40	.2470E-06
15	900.55	0.6548	0.6555	0.992192	2.42	.2760E-06
16	920.77	0.6598	0.6602	0.999183	2.44	.3197E-06
17	933.33	0.6648	0.6643	0.999056	2.45	.3513E-06
18	947.79	0.6698	0.6703	0.994629	2.48	.3496E-06
19	959.62	0.6748	0.6748	0.997743	2.50	.3467E-06
20	971.93	0.6798	0.6787	0.992542	2.51	.3328E-06
21	993.46	0.6848	0.6851	0.978568	2.54	.3501E-06
22	1012.31	0.6898	0.6915	0.984286	2.57	.4611E-06
23	1021.46	0.6948	0.6956	0.988025	2.59	.4943E-06
24	1026.66	0.6998	0.6985	0.984015	2.60	.4912E-06
25	1035.96	0.7048	0.7043	0.996486	2.63	.5499E-06
26	1047.54	0.7098	0.7103	0.996493	2.65	.4868E-06
27	1058.39	0.7148	0.7149	0.998449	2.68	.4230E-06
28	1068.90	0.7198	0.7188	0.992842	2.69	.4081E-06
29	1086.35	0.7248	0.7254	0.989327	2.73	.4421E-06
30	1099.29	0.7298	0.7309	0.993721	2.75	.5386E-06
31	1106.35	0.7349	0.7346	0.998375	2.77	.6010E-06
32	1114.09	0.7399	0.7399	0.991725	2.80	.6037E-06
33	1121.05	0.7449	0.7450	0.998743	2.82	.6210E-06
34	1128.20	0.7499	0.7490	0.995694	2.84	.5845E-06
35	1139.36	0.7549	0.7548	0.984968	2.87	.5765E-06
36	1151.20	0.7599	0.7612	0.983879	2.91	.7298E-06
37	1158.05	0.7649	0.7661	0.992841	2.93	.8800E-06
38	1161.70	0.7699	0.7693	0.989055	2.95	.8921E-06
39	1165.97	0.7749	0.7745	0.992475	2.98	.9304E-06
40	1171.74	0.7799	0.7799	0.996935	3.01	.8950E-06
41	1177.55	0.7849	0.7841	0.996478	3.03	.7524E-06
42	1187.30	0.7899	0.7902	0.993826	3.07	.6599E-06
43	1194.96	0.7949	0.7946	0.993812	3.09	.6867E-06
44	1204.10	0.7999	0.8009	0.997719	3.13	.7907E-06
45	1208.93	0.8049	0.8047	0.998016	3.15	.8857E-06
46	1214.08	0.8099	0.8095	0.997251	3.18	.9508E-06
47	1219.59	0.8149	0.8157	0.997367	3.22	.9597E-06
48	1223.54	0.8199	0.8194	0.997313	3.25	.9410E-06
49	1228.81	0.8249	0.8242	0.996282	3.28	.9217E-06
50	1236.26	0.8299	0.8307	0.995728	3.32	.9165E-06
51	1241.28	0.8349	0.8348	0.994274	3.35	.1020E-05
52	1246.24	0.8399	0.8399	0.996563	3.38	.1172E-05
53	1251.25	0.8450	0.8462	0.996521	3.42	.1343E-05
54	1253.33	0.8500	0.8495	0.988548	3.45	.1261E-05
55	1257.28	0.8550	0.8549	0.992689	3.49	.1271E-05
56	1260.51	0.8600	0.8590	0.993087	3.52	.1253E-05
57	1266.50	0.8650	0.8653	0.995990	3.56	.1095E-05
58	1271.48	0.8700	0.8703	0.994752	3.60	.1160E-05
59	1275.61	0.8750	0.8750	0.996596	3.64	.1191E-05
60	1279.89	0.8800	0.8806	0.996570	3.68	.1244E-05
61	1282.41	0.8850	0.8838	0.993227	3.71	.1338E-05
62	1287.30	0.8900	0.8905	0.970348	3.76	.1654E-05
63	1291.29	0.8950	0.8974	0.963601	3.82	.2584E-05
64	1293.07	0.9000	0.9017	0.943954	3.85	.2161E-05
65	1293.56	0.9051	0.9035	0.952046	3.87	.2240E-05
66	1294.93	0.9101	0.9072	0.967556	3.90	.2728E-05

TABLE H18 (Continued)

87	1299.23	0.9151	0.9159	0.967755	3.98	.2091E-05
88	1301.74	0.9202	0.9205	0.992219	4.02	.2195E-05
89	1303.88	0.9252	0.9255	0.982298	4.07	.2001E-05
70	1305.66	0.9302	0.9299	0.993181	4.11	.2182E-05
71	1307.50	0.9352	0.9339	0.993913	4.15	.2143E-05
72	1311.38	0.9402	0.9415	0.993523	4.22	.1910E-05
73	1313.35	0.9453	0.9449	0.995887	4.26	.1792E-05
74	1316.36	0.9503	0.9500	0.996437	4.31	.1771E-05
75	1319.12	0.9553	0.9551	0.996878	4.36	.1848E-05
76	1322.47	0.9604	0.9610	0.998925	4.42	.1933E-05
77	1324.63	0.9654	0.9650	0.997079	4.47	.2178E-05
78	1327.15	0.9704	0.9708	0.976663	4.53	.2905E-05
79	1329.21	0.9754	0.9780	0.926152	4.62	.4645E-05
80	1330.49	0.9804	0.9864	0.876563	4.72	.8673E-05
81	1330.70	0.9857	0.9873	0.844514	4.73	.6068E-05
82	1330.76	0.9910	0.9887	0.883194	4.74	.7916E-05
83	1330.95	0.9963	0.9897	0.878449	4.76	.7611E-05
84	1333.05	1.0014	1.0014	0.938299	4.90	.4291E-05
85	1334.33	1.0064	1.0058	0.975718	4.96	.4005E-05
86	1335.96	1.0114	1.0128	0.960196	5.05	.5628E-05
87	1337.05	1.0165	1.0197	0.947153	5.15	.9492E-05
88	1337.61	1.0222	1.0243	0.918992	5.21	.7832E-05
89	1337.72	1.0281	1.0264	0.934628	5.24	.8233E-05
90	1338.01	1.0331	1.0287	0.948971	5.28	.9494E-05
91	1339.40	1.0382	1.0380	0.951823	5.42	.5622E-05
92	1340.46	1.0432	1.0425	0.985652	5.48	.4272E-05
93	1342.10	1.0482	1.0485	0.987485	5.58	.4472E-05
94	1343.43	1.0533	1.0545	0.990467	5.68	.5304E-05
95	1344.27	1.0583	1.0590	0.982432	5.75	.5065E-05
96	1344.70	1.0633	1.0621	0.985662	5.80	.5199E-05
97	1345.71	1.0683	1.0675	0.988431	5.90	.5293E-05
98	1347.04	1.0733	1.0746	0.973698	6.02	.4014E-05
99	1348.54	1.0783	1.0784	0.943256	6.09	.3470E-05
100	1349.30	1.0835	1.0803	0.955032	6.13	.3683E-05
101	1350.50	1.0805	1.0844	0.973966	6.21	.3972E-05
102	1351.80	1.0907	1.0896	0.984461	6.31	.4542E-05
103	1353.80	1.1010	1.0997	0.987222	6.51	.6359E-05
104	1355.40	1.1112	1.1120	0.967967	6.78	.9416E-05
105	1356.80	1.1214	1.1262	0.973468	7.10	.1387E-04
106	1357.50	1.1317	1.1355	0.985863	7.33	.1844E-04
107	1357.90	1.1466	1.1428	0.971109	7.52	.1734E-04
108	1358.30	1.1529	1.1528	0.989913	7.79	.1890E-04
109	1358.80	1.1632	1.1619	0.991519	8.04	.1789E-04
110	1359.60	1.1734	1.1726	0.991567	8.37	.1386E-04
111	1360.50	1.1836	1.1832	0.980946	8.71	.1460E-04
112	1361.50	1.1939	1.1978	0.986638	9.22	.1966E-04
113	1361.90	1 2041				
114	1362.30	1.2163				
115	1362.70	1.2273				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H19

Air Force Fatigue Crack Growth Rate Data Associated with Figure H3

Seven Point Incremental Polynomial Method per ASTM E647

08-14-1991

Specimen Number: LT13 Specimen Type: CT

B= 0.2500 in W= 1.6010 in An= 0.0000

Pmax= 90.0 lbs Pmin= 9.0 lbs

R= 0.10 Frequency= 25 hz.

Test Temperature= 72 F Environment= LAB AIR

PT	CYCLES (x1000)	Ameas (in.)	Areg	MCC	Delta K	da/dN
1	0.00	0.5641				
2	119.00	0.5743				
3	233.00	0.5846				
4	329.00	0.5948	0.5950	0.999899	1.73	.1137E-06
5	412.00	0.6050	0.6048	0.999965	1.76	.1240E-06
6	493.00	0.6153	0.6154	0.999973	1.79	.1340E-06
7	566.00	0.6255	0.6255	0.999938	1.82	.1436E-06
8	635.00	0.6357	0.6355	0.999747	1.85	.1553E-06
9	703.00	0.6460	0.6463	0.999743	1.88	.1695E-06
10	762.00	0.6562	0.6564	0.999889	1.91	.1851E-06
11	814.00	0.6665	0.6662	0.999651	1.95	.2057E-06
12	864.00	0.6767	0.6768	0.999467	1.98	.2317E-06
13	909.00	0.6869	0.6874	0.999194	2.02	.2660E-06
14	945.00	0.6972	0.6972	0.999751	2.05	.2961E-06
15	979.00	0.7074	0.7078	0.999601	2.09	.3236E-06
16	1006.00	0.7176	0.7170	0.999671	2.12	.3500E-06
17	1036.00	0.7279	0.7277	0.998927	2.16	.3872E-06
18	1064.00	0.7381	0.7388	0.998950	2.21	.4296E-06
19	1087.00	0.7483	0.7485	0.998888	2.25	.4950E-06
20	1106.00	0.7586	0.7580	0.995793	2.28	.5947E-06
21	1126.00	0.7688	0.7703	0.996287	2.34	.7347E-06
22	1143.00	0.7818	0.7833	0.997701	2.39	.9175E-06
23	1151.00	0.7920	0.7908	0.995480	2.43	.9440E-06
24	1162.00	0.8023	0.8024	0.997338	2.48	.1029E-05
25	1170.00	0.8125	0.8115	0.998374	2.53	.1065E-05
26	1182.00	0.8228	0.8241	0.998198	2.59	.1025E-05
27	1190.00	0.8330	0.8322	0.996296	2.63	.1057E-05
28	1200.00	0.8432	0.8425	0.996942	2.69	.1068E-05
29	1212.00	0.8535	0.8558	0.997032	2.76	.1109E-05
30	1218.00	0.8637	0.8621	0.997702	2.80	.1122E-05
31	1228.00	0.8739	0.8734	0.995902	2.87	.1234E-05
32	1237.00	0.8842	0.8854	0.995230	2.94	.1272E-05
33	1245.00	0.8944	0.8952	0.996468	3.00	.1427E-05
34	1250.00	0.9046	0.9024	0.989849	3.05	.1572E-05
35	1260.00	0.9149	0.9103	0.989619	3.17	.1786E-05
36	1262.00	0.9251	0.9232	0.986984	3.20	.1777E-05
37	1268.00	0.9357	0.9341	0.988370	3.28	.1794E-05
38	1274.00	0.9460	0.9465	0.993673	3.38	.1883E-05
39	1280.00	0.9566	0.9563	0.998773	3.46	.1796E-05
40	1286.00	0.9669	0.9669	0.998914	3.55	.1885E-05
41	1292.00	0.9771	0.9784	0.998986	3.65	.1980E-05
42	1296.00	0.9873	0.9868	0.997550	3.73	.1971E-05
43	1301.00	0.9976	0.9971	0.998403	3.83	.2005E-05
44	1306.00	1.0078	1.0073	0.998790	3.94	.2012E-05
45	1312.00	1.0180	1.0189	0.999437	4.06	.1921E-05
46	1317.00	1.0283	1.0280	0.994015	4.17	.2041E-05
47	1322.00	1.0385	1.0378	0.991492	4.28	.2336E-05
48	1328.00	1.0487	1.0526	0.988252	4.47	.3173E-05
49	1330.00	1.0590	1.0581	0.994086	4.54	.3770E-05
50	1333.00	1.0692	1.0698	0.996565	4.70	.4510E-05
51	1335.00	1.0806	1.0803	0.998248	4.85	.4910E-05
52	1337.00	1.0909	1.0908	0.994278	5.01	.4757E-05
53	1339.00	1.1011	1.1011	0.993478	5.18	.5104E-05
54	1341.00	1.1121	1.1106	0.992811	5.34	.5162E-05
55	1344.00	1.1224	1.1262	0.993413	5.62	.5456E-05
56	1345.00	1.1334	1.1323	0.990062	5.74	.5193E-05
57	1347.00	1.1440	1.1426	0.987937	5.95	.5368E-05
58	1349.00	1.1550	1.1532	0.972903	6.17	.6092E-05
59	1352.00	1.1665	1.1730	0.947013	6.64	.9293E-05
60	1353.00	1.1771	1.1815	0.953133	6.85	.1008E-04
61	1354.00	1.1920	1.1926	0.946569	7.15	.1277E-04
62	1354.00	1.2031				
63	1356.00	1.2149				
64	1356.00	1.2263				

* - DATA VIOLATES SIZE REQUIREMENTS

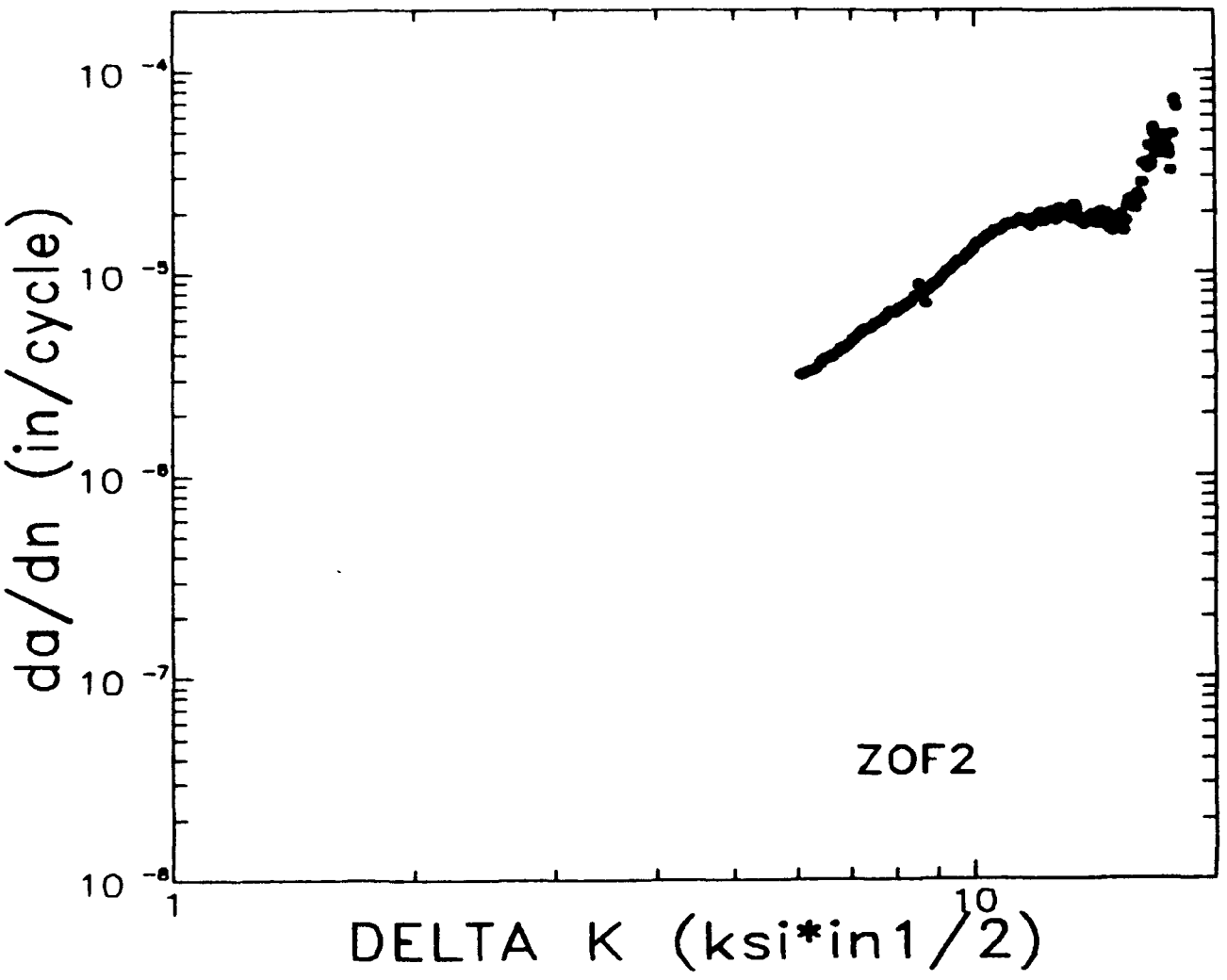

Figure H4 Fatigue Crack Growth Rate Data for AL905XL Forging (K-decreasing method, L-T Orientation, R=0.1, Lab Air, Room Temperature). Northrop.

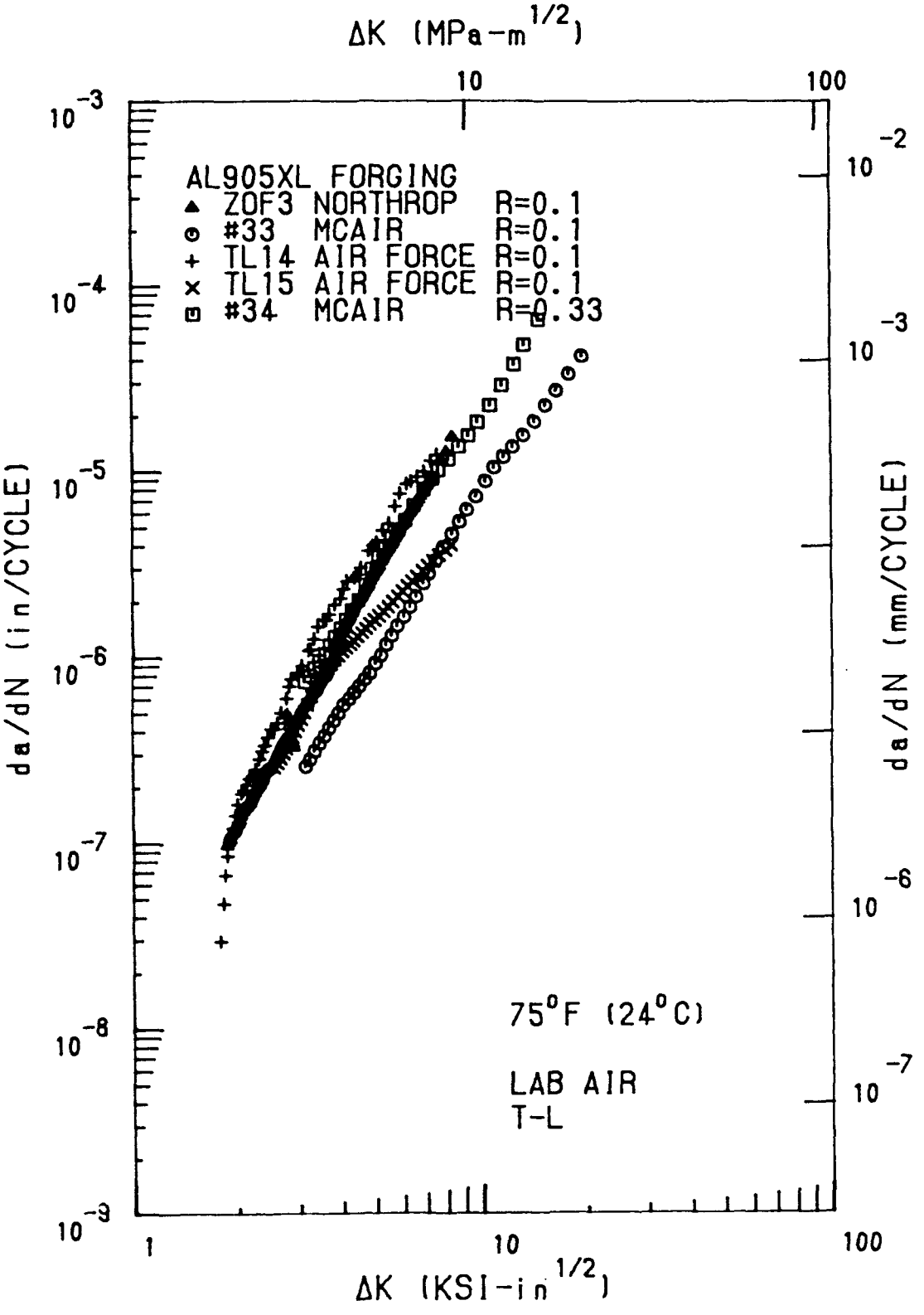

Figure H5 Fatigue Crack Growth Rate Data for AL905XL Forging (T-L Orientation). Northrop 10Hz, MCAIR Var Hz and Air Force 30 Hz.

TABLE H20

Northrop Fatigue Crack Growth Rate Data Associated with Figure H5

Seven Point Incremental Polynomial Method per ASTM E647

04-29-1991

Specimen Number: ZOF3 Specimen Type: CT

B= 0.2500 in W= 1.5000 in An= 0.0000

Pmax= 109.0 lbs Pmin= 10.9 lbs

R= 0.10 Frequency= 10.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES (X1000)	Ameas	Areg	MCC	Delta K	da/dN
1	55.72	0.4555				
2	97.97	0.4594				
3	141.77	0.4633				
4	180.18	0.4670	0.4670	0.999949	1.85	.9765E-07
5	215.42	0.4706	0.4705	0.999911	1.87	.1015E-06
6	253.29	0.4744	0.4744	0.999901	1.88	.1064E-06
7	290.27	0.4783	0.4784	0.999914	1.89	.1108E-06
8	323.14	0.4822	0.4822	0.999583	1.90	.1126E-06
9	354.69	0.4859	0.4859	0.999755	1.92	.1144E-06
10	387.58	0.4898	0.4897	0.999830	1.93	.1157E-06
11	420.47	0.4933	0.4934	0.999701	1.94	.1172E-06
12	451.98	0.4970	0.4971	0.999817	1.95	.1190E-06
13	483.52	0.5008	0.5008	0.999891	1.96	.1224E-06
14	515.03	0.5049	0.5048	0.999859	1.98	.1251E-06
15	542.44	0.5082	0.5083	0.999893	1.99	.1267E-06
16	571.30	0.5121	0.5120	0.999788	2.00	.1290E-06
17	603.26	0.5160	0.5160	0.999621	2.02	.1337E-06
18	633.04	0.5199	0.5200	0.999663	2.03	.1407E-06
19	659.52	0.5237	0.5238	0.999712	2.04	.1456E-06
20	682.67	0.5274	0.5273	0.999711	2.06	.1502E-06
21	705.82	0.5310	0.5309	0.999701	2.07	.1531E-06
22	730.09	0.5346	0.5347	0.999887	2.08	.1551E-06
23	754.35	0.5384	0.5384	0.999935	2.10	.1567E-06
24	778.61	0.5421	0.5422	0.999998	2.11	.1583E-06
25	802.90	0.5461	0.5461	0.999910	2.12	.1612E-06
26	825.03	0.5498	0.5497	0.999910	2.14	.1633E-06
27	846.45	0.5531	0.5532	0.999905	2.15	.1661E-06
28	868.31	0.5570	0.5570	0.999850	2.16	.1701E-06
29	893.03	0.5610	0.5610	0.999916	2.18	.1754E-06
30	914.10	0.5647	0.5648	0.999883	2.19	.1797E-06
31	932.56	0.5683	0.5682	0.999868	2.21	.1841E-06
32	951.90	0.5718	0.5718	0.999874	2.22	.1894E-06
33	972.12	0.5755	0.5756	0.999875	2.23	.1933E-06
34	992.31	0.5796	0.5795	0.999934	2.25	.1972E-06
35	1011.66	0.5835	0.5835	0.999908	2.27	.2008E-06
36	1030.19	0.5872	0.5872	0.999960	2.28	.2042E-06
37	1048.76	0.5911	0.5910	0.999748	2.30	.2096E-06
38	1067.33	0.5948	0.5949	0.999802	2.31	.2156E-06
39	1083.53	0.5983	0.5985	0.999742	2.33	.2200E-06
40	1098.17	0.6019	0.6017	0.999733	2.34	.2257E-06
41	1115.32	0.6057	0.6056	0.999710	2.36	.2347E-06
42	1133.57	0.6098	0.6100	0.999709	2.37	.2408E-06
43	1148.16	0.6135	0.6135	0.999623	2.39	.2423E-06
44	1161.45	0.6170	0.6169	0.999656	2.40	.2439E-06
45	1176.33	0.6206	0.6205	0.999743	2.42	.2467E-06
46	1192.35	0.6244	0.6244	0.999699	2.44	.2481E-06
47	1208.95	0.6283	0.6285	0.999859	2.45	.2510E-06
48	1223.26	0.6321	0.6321	0.999889	2.47	.2590E-06
49	1237.67	0.6360	0.6358	0.999887	2.49	.2654E-06
50	1251.89	0.6397	0.6398	0.999944	2.50	.2715E-06
51	1265.04	0.6434	0.6434	0.999935	2.52	.2748E-06
52	1279.14	0.6474	0.6473	0.999907	2.54	.2806E-06
53	1293.08	0.6511	0.6512	0.999851	2.56	.2884E-06
54	1305.69	0.6548	0.6548	0.999953	2.57	.2968E-06
55	1317.14	0.6583	0.6583	0.999890	2.59	.3033E-06
56	1329.18	0.6620	0.6620	0.999891	2.61	.3144E-06
57	1341.78	0.6661	0.6660	0.999863	2.63	.3211E-06
58	1353.23	0.6696	0.6697	0.999799	2.65	.3309E-06
59	1363.55	0.6734	0.6733	0.999751	2.66	.3371E-06
60	1375.16	0.6770	0.6771	0.999749	2.68	.3451E-06
61	1386.02	0.6811	0.6809	0.999763	2.70	.3555E-06
62	1395.99	0.6844	0.6845	0.999772	2.72	.3599E-06
63	1406.42	0.6883	0.6883	0.999832	2.74	.3681E-06
64	1416.83	0.6923	0.6917	0.997613	2.76	.4402E-06

TABLE H20 (Continued)

65	1426.34	0.6957	0.6971	0.8923?0	2.79	.4569E-06
66	1435.86	0.6994	0.7022	0.875050	2.81	.4289E-06
67	1446.28	0.7135	0.7070	0.867307	2.84	.3910E-06
68	1455.79	0.7075	0.7104	0.836167	2.86	.3601E-06
69	1464.60	0.7111	0.7128	0.784720	2.87	.3408E-06
70	1473.31	0.7148	0.7158	0.917497	2.88	.3275E-06
71	1481.30	0.7184	0.7184	0.999948	2.90	.4442E-06
72	1489.29	0.7219	0.7220	0.999911	2.92	.4517E-06
73	1497.66	0.7259	0.7258	0.999903	2.95	.4606E-06
74	1506.01	0.7297	0.7297	0.999904	2.97	.4678E-06
75	1514.01	0.7333	0.7334	0.999865	2.99	.4791E-06
76	1522.01	0.7373	0.7372	0.999950	3.02	.4934E-06
77	1529.65	0.7410	0.7410	0.999957	3.04	.5139E-06
78	1537.27	0.7450	0.7451	0.999940	3.06	.5332E-06
79	1544.18	0.7488	0.7488	0.999807	3.09	.5424E-06
80	1550.32	0.7523	0.7523	0.999900	3.11	.5483E-06
81	1556.80	0.7559	0.7558	0.999747	3.13	.5569E-06
82	1563.87	0.7597	0.7597	0.999614	3.16	.5690E-06
83	1570.92	0.7635	0.7637	0.999817	3.18	.5885E-06
84	1577.14	0.7674	0.7674	0.999771	3.21	.6051E-06
85	1582.46	0.7708	0.7707	0.999791	3.23	.6213E-06
86	1588.16	0.7744	0.7744	0.999963	3.26	.6372E-06
87	1594.59	0.7784	0.7784	0.999954	3.28	.6474E-06
88	1600.08	0.7820	0.7820	0.999965	3.31	.6553E-06
89	1605.34	0.7855	0.7855	0.999960	3.33	.6684E-06
90	1611.32	0.7896	0.7895	0.999825	3.36	.6928E-06
91	1617.05	0.7934	0.7935	0.999868	3.39	.7182E-06
92	1622.28	0.7972	0.7973	0.999868	3.42	.7409E-06
93	1627.30	0.8012	0.8011	0.999780	3.45	.7589E-06
94	1632.08	0.8049	0.8049	0.999944	3.48	.7752E-06
95	1636.86	0.8086	0.8086	0.999983	3.51	.7807E-06
96	1641.64	0.8123	0.8123	0.999873	3.54	.7922E-06
97	1646.17	0.8159	0.8158	0.999814	3.57	.8171E-06
98	1650.67	0.8194	0.8195	0.999902	3.60	.8498E-06
99	1655.17	0.8234	0.8234	0.999928	3.63	.8875E-06
100	1659.48	0.8274	0.8274	0.999778	3.66	.9148E-06
101	1663.40	0.8311	0.8311	0.999959	3.69	.9357E-06
102	1667.05	0.8346	0.8345	0.999910	3.72	.9527E-06
103	1670.98	0.8382	0.8382	0.999763	3.75	.9803E-06
104	1674.91	0.8420	0.8420	0.999694	3.79	.1033E-05
105	1678.68	0.8459	0.8460	0.999933	3.82	.1102E-05
106	1682.13	0.8498	0.8499	0.999927	3.86	.1173E-05
107	1684.96	0.8534	0.8533	0.999872	3.89	.1224E-05
108	1687.92	0.8571	0.8571	0.999929	3.93	.1282E-05
109	1691.07	0.8612	0.8611	0.999661	3.97	.1356E-05
110	1693.83	0.8648	0.8649	0.999794	4.00	.1416E-05
111	1696.45	0.8686	0.8687	0.999722	4.04	.1471E-05
112	1698.68	0.8723	0.8721	0.999712	4.07	.1515E-05
113	1700.86	0.8755	0.8755	0.999789	4.11	.1569E-05
114	1703.50	0.8796	0.8797	0.999783	4.15	.1614E-05
115	1705.93	0.8835	0.8835	0.999968	4.19	.1669E-05
116	1708.15	0.8874	0.8873	0.999967	4.23	.1740E-05
117	1710.36	0.8912	0.8912	0.999925	4.28	.1826E-05
118	1712.27	0.8948	0.8948	0.999921	4.32	.1896E-05
119	1714.13	0.8983	0.8984	0.999726	4.36	.1934E-05
120	1715.99	0.9022	0.9021	0.999814	4.40	.1993E-05
121	1717.68	0.9056	0.9055	0.999744	4.44	.2043E-05
122	1719.63	0.9093	0.9095	0.999751	4.49	.2097E-05
123	1721.49	0.9134	0.9134	0.999873	4.55	.2156E-05
124	1723.13	0.9171	0.9170	0.999877	4.58	.2233E-05
125	1724.88	0.9209	0.9210	0.999931	4.63	.2315E-05
126	1726.56	0.9249	0.9249	0.999922	4.68	.2392E-05
127	1728.11	0.9287	0.9286	0.999948	4.72	.2486E-05
128	1729.62	0.9321	0.9322	0.999922	4.77	.2598E-05
129	1730.93	0.9359	0.9359	0.999960	4.82	.2706E-05
130	1732.28	0.9396	0.9397	0.999748	4.87	.2775E-05
131	1733.47	0.9431	0.9430	0.999833	4.92	.2864E-05
132	1734.79	0.9470	0.9469	0.999836	4.97	.2951E-05
133	1736.05	0.9504	0.9506	0.999754	5.03	.3023E-05
134	1737.22	0.9542	0.9541	0.999837	5.08	.3127E-05
135	1738.57	0.9585	0.9584	0.999885	5.14	.3274E-05
136	1739.82	0.9626	0.9626	0.999900	5.20	.3405E-05
137	1740.86	0.9663	0.9662	0.999807	5.26	.3549E-05
138	1741.86	0.9698	0.9698	0.999809	5.32	.3675E-05
139	1742.60	0.9735	0.9737	0.999833	5.38	.3788E-05
140	1743.80	0.9773	0.9771	0.999844	5.44	.3913E-05
141	1744.72	0.9808	0.9808	0.999847	5.50	.4060E-05
142	1745.75	0.9850	0.9851	0.999858	5.57	.4210E-05
143	1746.61	0.9887	0.9887	0.999939	5.63	.4375E-05
144	1747.39	0.9922	0.9922	0.999918	5.69	.4533E-05
145	1748.22	0.9959	0.9960	0.999884	5.76	.4755E-05
146	1749.01	0.9999	0.9998	0.999884	5.83	.4918E-05
147	1749.74	1.0033	1.0034	0.999884	5.90	.5112E-05
148	1750.43	1.0071	1.0070	0.999874	5.97	.5327E-05
149	1751.07	1.0104	1.0104	0.999893	6.04	.5475E-05
150	1751.79	1.0145	1.0145	0.999928	6.12	.5714E-05
151	1752.52	1.0188	1.0187	0.999924	6.20	.5960E-05
152	1753.11	1.0222	1.0223	0.999892	6.28	.6130E-05
153	1753.66	1.0257	1.0257	0.999868	6.35	.6329E-05
154	1754.20	1.0293	1.0292	0.999863	6.42	.6502E-05
155	1754.81	1.0331	1.0332	0.999867	6.51	.6764E-05
156	1755.40	1.0373	1.0372	0.999862	6.60	.7038E-05
157	1755.91	1.0408	1.0408	0.999905	6.69	.7375E-05
158	1756.43	1.0447	1.0447	0.999897	6.78	.7788E-05
159	1756.92	1.0486	1.0486	0.999942	6.87	.8142E-05
160	1757.36	1.0524	1.0524	0.999836	6.96	.8382E-05
161	1757.79	1.0561	1.0559	0.999828	7.05	.8717E-05
162	1758.21	1.0598	1.0596	0.999795	7.15	.8978E-05
163	1758.70	1.0639	1.0640	0.999919	7.26	.9307E-05
164	1760.21	1.0792	1.0789	0.999463	7.68	.1152E-04
165	1760.99	1.0885	1.0886	0.999397	7.97	.1270E-04
166	1761.74	1.0978	1.0978	0.996156	8.26	.1522E-04
167	1762.59	1.1121				
168	1763.43	1.1241				
169	1764.64	1.1561				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H21

MCAIR Fatigue Crack Growth Rate Data
Associated with Figure H5

Seven Point Incremental Polynomial Method per ASTM E647

06-03-1991

Specimen Number: 33 Specimen Type: CT

B= 0.2490 in W= 1.6020 in An= 0.0000

Pmax= 200.0 lbs Pmin= 20.0 lbs

R= 0.10 Frequency= 0.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES	Ameas	Areg	MCC	Delta K	da/dN
1	0.00	0.4010				
2	95.00	0.4200				
3	180.00	0.4390				
4	275.00	0.4600	0.4612	0.999766	3.11	.2567E-06
5	345.00	0.4800	0.4795	0.999758	3.20	.2811E-06
6	415.00	0.5000	0.4997	0.999760	3.31	.3116E-06
7	480.00	0.5200	0.5208	0.999723	3.42	.3440E-06
8	538.00	0.5410	0.5411	0.999952	3.54	.3777E-06
9	588.00	0.5610	0.5605	0.999847	3.65	.4172E-06
10	634.00	0.5800	0.5804	0.999837	3.77	.4566E-06
11	677.00	0.6000	0.6005	0.999819	3.89	.5026E-06
12	714.00	0.6200	0.6194	0.999888	4.01	.5517E-06
13	751.00	0.6400	0.6408	0.999863	4.16	.6002E-06
14	782.00	0.6600	0.6600	0.999829	4.29	.6477E-06
15	811.00	0.6800	0.6792	0.999827	4.43	.6968E-06
16	841.00	0.7000	0.7008	0.999666	4.60	.7615E-06
17	866.00	0.7200	0.7200	0.999794	4.76	.8258E-06
18	890.00	0.7400	0.7400	0.999561	4.93	.9255E-06
19	910.00	0.7590	0.7590	0.999540	5.10	.1029E-05
20	930.00	0.7790	0.7800	0.999647	5.30	.1169E-05
21	947.00	0.8010	0.8005	0.999796	5.51	.1318E-05
22	961.00	0.8190	0.8194	0.999756	5.72	.1478E-05
23	975.00	0.8410	0.8411	0.999745	5.97	.1657E-05
24	987.00	0.8610	0.8613	0.999567	6.22	.1875E-05
25	996.50	0.8800	0.8796	0.999109	6.47	.2121E-05
26	1007.00	0.9010	0.9025	0.999129	6.80	.2500E-05
27	1014.00	0.9200	0.9202	0.999536	7.08	.2842E-05
28	1020.50	0.9390	0.9390	0.999221	7.39	.3320E-05
29	1026.60	0.9600	0.9601	0.998830	7.78	.3910E-05
30	1032.00	0.9800	0.9818	0.999380	8.21	.4601E-05
31	1036.00	1.0010	1.0006	0.999523	8.62	.5327E-05
32	1039.50	1.0200	1.0198	0.999362	9.07	.6184E-05
33	1042.80	1.0400	1.0411	0.998640	9.62	.7291E-05
34	1045.60	1.0610	1.0617	0.998547	10.21	.8861E-05
35	1047.70	1.0800	1.0806	0.999313	10.81	.1050E-04
36	1049.50	1.0990	1.1002	0.999763	11.49	.1202E-04
37	1051.10	1.1210	1.1203	0.999780	12.26	.1355E-04
38	1052.50	1.1410	1.1403	0.998951	13.12	.1567E-04
39	1053.80	1.1600	1.1612	0.996900	14.14	.1862E-04
40	1054.90	1.1800	1.1816	0.997861	15.25	.2265E-04
41	1055.75	1.2000	1.2010	0.999515	16.45	.2733E-04
42	1056.45	1.2210	1.2209	0.998778	17.84	.3336E-04
43	1057.02	1.2400	1.2405	0.995691	19.42	.4167E-04
44	1057.52	1.2590				
45	1057.90	1.2800				
46	1058.15	1.3000				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H22

Air Force Fatigue Crack Growth Rate Data
Associated with Figure H5

Seven Point Incremental Polynomial Method per ASTM E647

09-20-1991

Specimen Number: TL14 Specimen Type: CT

B= 0.2510 in W= 1.6010 in An= 0.0000

Pmax= 80.0 lbs Pmin= 8.0 lbs

R= 0.10 Frequency= 30 hz.

Test Temperature= 72 F Environment= LAB AIR

PT	CYCLES (x1000)	Ameas (in.)	Areg	MCC	Delta K	da/dN
1	265.90	0.6485				
2	979.50	0.6588				
3	1474.00	0.6690				
4	2087.70	0.6792	0.6818	0.976003	1.77	.2959E-07
5	2478.50	0.6895	0.6945	0.969312	1.81	.4736E-07
6	2547.50	0.6997	0.7023	0.988846	1.83	.6734E-07
7	2764.10	0.7100	0.7094	0.998796	1.85	.8576E-07
8	2869.50	0.7202	0.7192	0.996956	1.89	.1027E-06
9	2987.90	0.7304	0.7322	0.997100	1.93	.1214E-06
10	3062.70	0.7407	0.7412	0.997241	1.96	.1424E-06
11	3120.10	0.7509	0.7493	0.996018	1.99	.1626E-06
12	3196.20	0.7611	0.7630	0.997978	2.04	.1858E-06
13	3238.80	0.7714	0.7712	0.997650	2.07	.1936E-06
14	3285.60	0.7816	0.7804	0.997614	2.11	.2071E-06
15	3337.40	0.7918	0.7921	0.998669	2.15	.2231E-06
16	3387.50	0.8021	0.8030	0.999404	2.20	.2310E-06
17	3424.50	0.8123	0.8114	0.998768	2.24	.2500E-06
18	3467.70	0.8226	0.8225	0.997976	2.29	.2836E-06
19	3508.10	0.8328	0.8343	0.998129	2.34	.3143E-06
20	3534.60	0.8430	0.8427	0.998771	2.38	.3382E-06
21	3561.20	0.8533	0.8521	0.998585	2.43	.3735E-06
22	3592.10	0.8635	0.8644	0.998647	2.49	.4131E-06
23	3616.10	0.8737	0.8747	0.996789	2.54	.4112E-06
24	3636.40	0.8840	0.8830	0.993832	2.59	.4439E-06
25	3657.80	0.8942	0.8927	0.988050	2.65	.5035E-06
26	3688.30	0.9044	0.9086	0.989325	2.74	.6029E-06
27	3698.60	0.9147	0.9142	0.990721	2.78	.7015E-06
28	3710.00	0.9247	0.9223	0.991592	2.83	.7692E-06
29	3727.40	0.9352	0.9385	0.994232	2.94	.8085E-06
30	3734.30	0.9454	0.9435	0.990437	2.97	.8269E-06
31	3747.20	0.9556	0.9538	0.986941	3.04	.8996E-06
32	3764.50	0.9659	0.9700	0.986283	3.17	.1090E-05
33	3770.00	0.9761	0.9756	0.991296	3.21	.1105E-05
34	3777.70	0.9863	0.9844	0.990688	3.29	.1255E-05
35	3785.70	0.9966	0.9960	0.989382	3.38	.1473E-05
36	3795.30	1.0068	1.0100	0.992931	3.51	.1613E-05
37	3799.50	1.0170	1.0171	0.990867	3.58	.1604E-05
38	3803.80	1.0273	1.0243	0.990574	3.65	.1720E-05
39	3811.00	1.0375	1.0377	0.987723	3.79	.1946E-05
40	3817.90	1.0478	1.0506	0.992235	3.93	.2096E-05
41	3821.50	1.0580	1.0578	0.994797	4.01	.2341E-05
42	3824.70	1.0682	1.0656	0.994692	4.11	.2591E-05
43	3830.10	1.0785	1.0816	0.993888	4.31	.2693E-05
44	3832.60	1.0887	1.0880	0.992036	4.40	.2779E-05
45	3835.70	1.0989	1.0961	0.986568	4.51	.3047E-05
46	3840.90	1.1092	1.1130	0.985614	4.76	.3749E-05
47	3842.97	1.1194	1.1203	0.990692	4.88	.4003E-05
48	3844.60	1.1296	1.1269	0.990459	4.99	.4171E-05
49	3847.10	1.1399	1.1395	0.995550	5.21	.4832E-05
50	3849.60	1.1501	1.1509	0.994521	5.42	.5259E-05
51	3851.70	1.1604	1.1617	0.995365	5.64	.6514E-05
52	3853.10	1.1706	1.1707	0.998088	5.83	.7635E-05
53	3854.50	1.1808	1.1820	0.997491	6.08	.8566E-05
54	3855.30	1.1911	1.1898	0.997404	6.27	.8849E-05
55	3856.50	1.2013	1.2009	0.997839	6.55	.9320E-05
56	3857.60	1.2115	1.2112	0.995920	6.83	.9956E-05
57	3858.80	1.2218	1.2226	0.997180	7.16	.1136E-04
58	3359.70	1.2320	1.2331	0.997082	7.49	.1229E-04
59	3860.40	1.2422				
60	3861.00	1.2525				
61	3861.90	1.2627				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H23

Air Force Fatigue Crack Growth Rate Data
Associated with Figure H5

Seven Point Incremental Polynomial Method per ASTM E647

08-14-1991

Specimen Number: TL15 Specimen Type: CT

B= 0.2497 in W= 1.5980 in An= 0.0000

Pmax= 100.0 lbs Pmin= 10.0 lbs

R= 0.10 Frequency= 30 hz.

Test Temperature= 72 F Environment= LAB AIR

PT	CYCLES (x1000)	Ameas (in.)	Areg	MCC	Delta K	da/dN
1	405.63	0.7269				
2	448.08	0.7369				
3	493.04	0.7469				
4	532.07	0.7569	0.7568	0.999881	2.54	.2544E-06
5	572.01	0.7669	0.7670	0.999951	2.59	.2682E-06
6	607.59	0.7769	0.7768	0.999910	2.64	.2846E-06
7	642.64	0.7869	0.7869	0.999961	2.69	.3023E-06
8	675.29	0.7969	0.7970	0.999928	2.74	.3235E-06
9	705.28	0.8069	0.8068	0.999961	2.80	.3468E-06
10	733.74	0.8169	0.8170	0.999972	2.85	.3730E-06
11	759.93	0.8269	0.8270	0.999982	2.91	.4000E-06
12	783.93	0.8369	0.8368	0.999947	2.97	.4304E-06
13	806.87	0.8469	0.8469	0.999911	3.03	.4652E-06
14	828.27	0.8569	0.8571	0.999890	3.09	.5052E-06
15	847.31	0.8669	0.8668	0.999838	3.16	.5534E-06
16	865.22	0.8769	0.8770	0.999780	3.23	.6138E-06
17	881.40	0.8869	0.8872	0.999886	3.30	.6756E-06
18	895.43	0.8969	0.8969	0.999964	3.37	.7384E-06
19	908.14	0.9069	0.9068	0.999863	3.45	.7887E-06
20	920.65	0.9169	0.9171	0.999898	3.53	.8319E-06
21	931.71	0.9269	0.9265	0.999834	3.60	.8738E-06
22	943.44	0.9369	0.9369	0.999744	3.69	.9242E-06
23	954.57	0.9469	0.9473	0.999779	3.79	.9764E-06
24	964.19	0.9569	0.9568	0.999907	3.87	.1025E-05
25	973.45	0.9669	0.9666	0.999923	3.97	.1080E-05
26	982.74	0.9769	0.9770	0.999965	4.07	.1133E-05
27	991.43	0.9869	0.9870	0.999981	4.18	.1178E-05
28	999.70	0.9969	0.9968	0.999973	4.29	.1235E-05
29	1007.72	1.0069	1.0069	0.999972	4.40	.1296E-05
30	1015.41	1.0169	1.0170	0.999972	4.53	.1362E-05
31	1022.43	1.0269	1.0268	0.999983	4.65	.1431E-05
32	1029.42	1.0369	1.0370	0.999981	4.78	.1509E-05
33	1035.93	1.0470	1.0470	0.999975	4.92	.1589E-05
34	1042.11	1.0570	1.0570	0.999998	5.07	.1669E-05
35	1047.97	1.0670	1.0670	0.999959	5.22	.1765E-05
36	1053.55	1.0770	1.0770	0.999942	5.38	.1872E-05
37	1058.89	1.0870	1.0871	0.999947	5.55	.1998E-05
38	1063.74	1.0970	1.0970	0.999985	5.73	.2130E-05
39	1068.32	1.1070	1.1070	0.999999	5.91	.2268E-05
40	1072.63	1.1171	1.1171	0.999995	6.11	.2410E-05
41	1076.69	1.1271	1.1271	0.999987	6.32	.2555E-05
42	1080.54	1.1371	1.1371	0.999972	6.54	.2713E-05
43	1084.16	1.1471	1.1471	0.999942	6.78	.2896E-05
44	1087.56	1.1571	1.1571	0.999963	7.03	.3097E-05
45	1090.74	1.1671	1.1672	0.999988	7.29	.3304E-05
46	1093.66	1.1772	1.1771	0.999964	7.57	.3535E-05
47	1096.43	1.1872	1.1872	0.999968	7.87	.3763E-05
48	1099.08	1.1972	1.1974	0.999958	8.19	.4007E-05
49	1101.44	1.2072				
50	1103.82	1.2173				
51	1105.97	1.2273				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H24

MCAIR Fatigue Crack Growth Rate Data
Associated with Figure H5

Seven Point Incremental Polynomial Method per ASTM E647

06-03-1991

Specimen Number: 34 Specimen Type: CT

B= 0.2500 in W= 1.6000 in An= 0.0000

Pmax= 200.0 lbs Pmin= 66.0 lbs

R= 0.33 Frequency= 0.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES	Ameas	Areg	MCC	Delta K	da/dN
1	360.20	0.5620				
2	440.20	0.6000				
3	471.20	0.6200				
4	501.20	0.6410	0.6414	0.999347	3.09	.7344E-06
5	526.20	0.6630	0.6610	0.999374	3.19	.7961E-06
6	550.20	0.6800	0.6804	0.998438	3.30	.8773E-06
7	572.70	0.6990	0.7004	0.998672	3.41	.9549E-06
8	593.70	0.7200	0.7204	0.999612	3.54	.1049E-05
9	611.70	0.7420	0.7403	0.999512	3.66	.1167E-05
10	627.70	0.7590	0.7597	0.999165	3.79	.1294E-05
11	643.20	0.7790	0.7800	0.999228	3.94	.1440E-05
12	656.20	0.7990	0.7987	0.999964	4.08	.1604E-05
13	668.70	0.8200	0.8198	0.999882	4.25	.1811E-05
14	679.70	0.8400	0.8404	0.999642	4.43	.2036E-05
15	689.70	0.8610	0.8611	0.995973	4.63	.2449E-05
16	698.70	0.8820	0.8836	0.996653	4.85	.2998E-05
17	705.20	0.9000	0.9033	0.998114	5.07	.3543E-05
18	709.70	0.9220	0.9195	0.998681	5.26	.3973E-05
19	714.20	0.9390	0.9388	0.998773	5.50	.4403E-05
20	718.70	0.9590	0.9599	0.998815	5.78	.4884E-05
21	722.60	0.9790	0.9782	0.999167	6.05	.5461E-05
22	726.40	0.9990	0.9997	0.996910	6.40	.6546E-05
23	729.90	1.0210	1.0232	0.997777	6.82	.7997E-05
24	732.40	1.0420	1.0436	0.998994	7.22	.9172E-05
25	733.90	1.0600	1.0578	0.998900	7.52	.1009E-04
26	735.90	1.0800	1.0794	0.998196	8.02	.1156E-04
27	737.90	1.1010	1.1031	0.997625	8.64	.1355E-04
28	739.20	1.1200	1.1204	0.999476	9.15	.1551E-04
29	740.35	1.1390	1.1385	0.998991	9.73	.1829E-04
30	741.55	1.1610	1.1616	0.996739	10.56	.2270E-04
31	742.45	1.1800	1.1824	0.995284	11.41	.2910E-04
32	743.15	1.2010	1.2034	0.996399	12.39	.3787E-04
33	743.60	1.2190	1.2200	0.997602	13.27	.4791E-04
34	744.03	1.2400	1.2415	0.989786	14.57	.6548E-04
35	744.38	1.2610				
36	744.58	1.2790				
37	744.73	1.3030				

* - DATA VIOLATES SIZE REQUIREMENTS

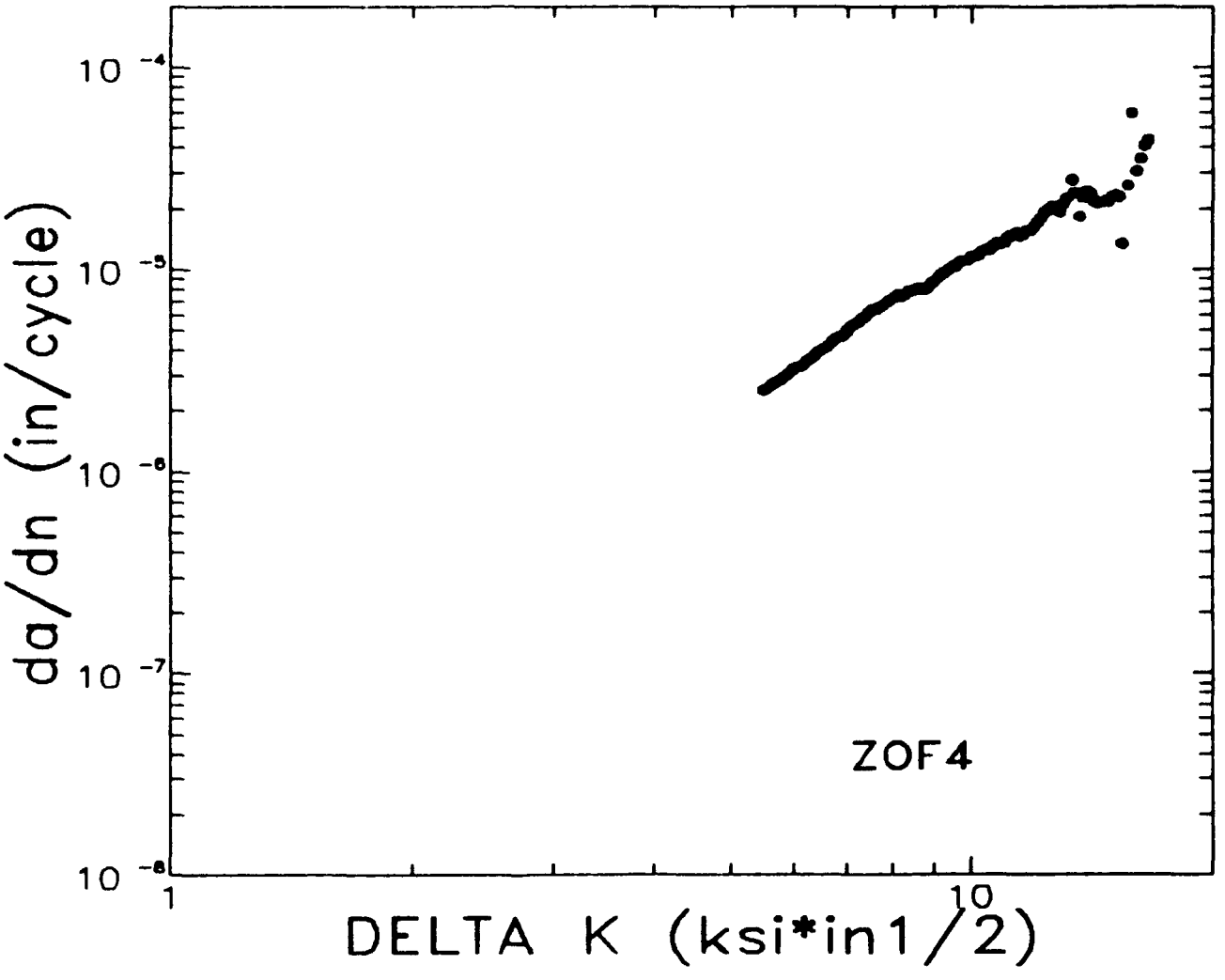

Figure H6 Fatigue Crack Growth Rate Data for AL905XL Forging (K-decreasing method, T-L Orientation, R=0.1 Lab Air, Room Temperature). Northrop.

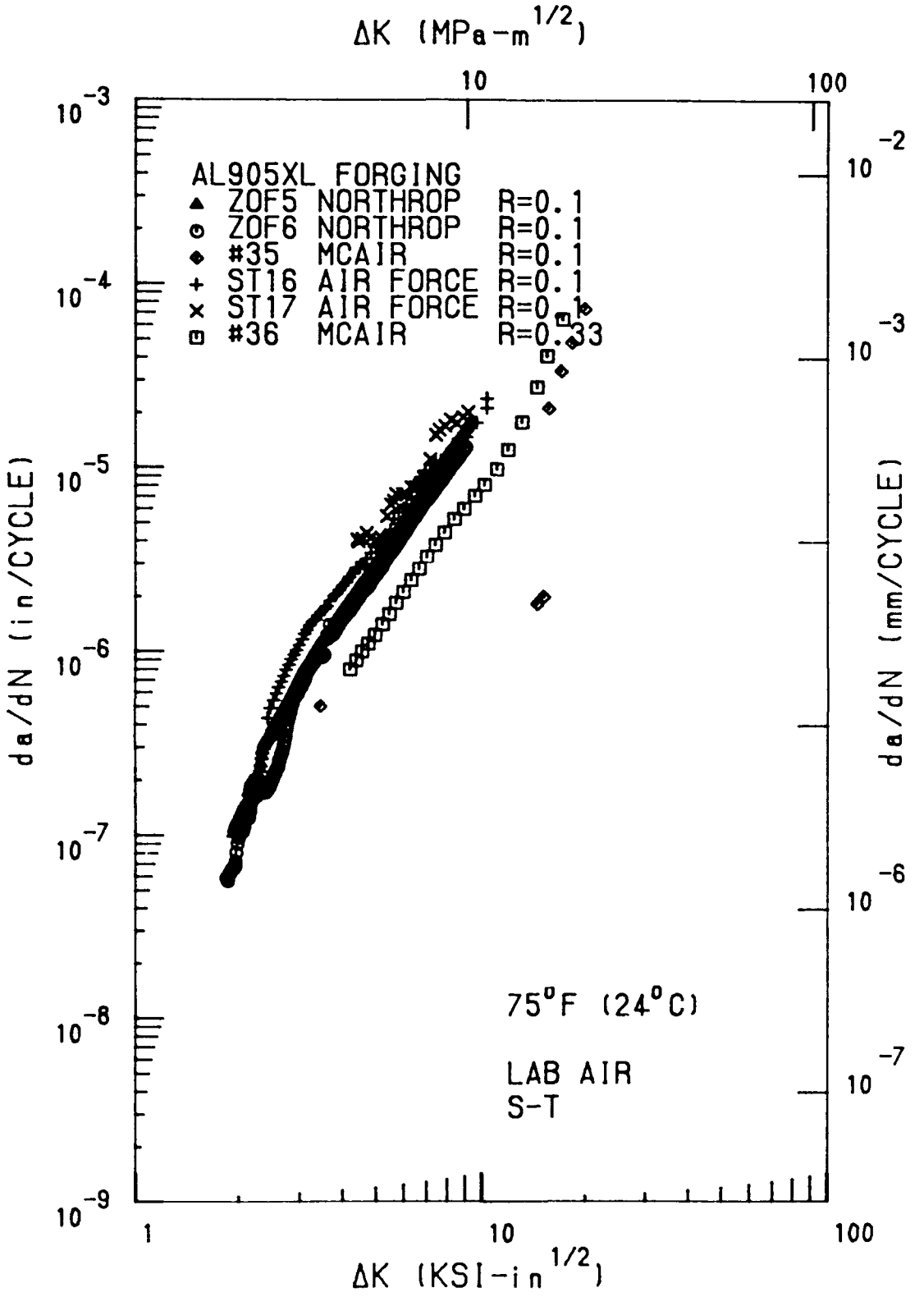

Figure H7 Fatigue Crack Growth Rate Data for AL905XL Forging (S-T Orientation). Nortrhop 10 Hz, MCAIR Var Hz and Air Force #ST16 25Hz, #ST17 30Hz.

TABLE H25

Northrop Fatigue Crack Growth Rate Data
Associated with Figure H7

Seven Point Incremental Polynomial Method per ASTM E647

05-08-1991

Specimen Number: ZOF5 Specimen Type: CT

B= 0.2500 in W= 1.5000 in An= 0.0000

Pmax= 113.0 lbs Pmin= 11.3 lbs

R= 0.10 Frequency= 10.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES (X1000)	Ameas	Areg	MCC	Delta K	da/dN
1	67.92	0.4556				
2	122.97	0.4596				
3	167.95	0.4634				
4	200.83	0.4670	0.4668	0.999721	1.92	.1019E-06
5	234.10	0.4705	0.4705	0.999724	1.93	.1088E-06
6	271.51	0.4747	0.4748	0.999944	1.95	.1144E-06
7	304.74	0.4787	0.4786	0.999948	1.96	.1174E-06
8	333.85	0.4821	0.4821	0.999974	1.97	.1204E-06
9	362.97	0.4856	0.4856	0.999974	1.98	.1228E-06
10	393.45	0.4894	0.4894	0.999988	2.00	.1249E-06
11	423.96	0.4933	0.4933	0.999972	2.01	.1283E-06
12	454.44	0.4972	0.4972	0.999960	2.02	.1320E-06
13	483.52	0.5010	0.5011	0.999973	2.04	.1361E-06
14	509.84	0.5047	0.5047	0.999979	2.05	.1410E-06
15	534.48	0.5082	0.5082	0.999898	2.06	.1446E-06
16	561.10	0.5121	0.5122	0.999510	2.08	.1454E-06
17	587.66	0.5163	0.5161	0.999624	2.09	.1453E-06
18	613.15	0.5200	0.5198	0.998733	2.10	.1485E-06
19	639.77	0.5234	0.5236	0.997971	2.12	.1568E-06
20	664.21	0.5271	0.5273	0.999328	2.13	.1706E-06
21	685.27	0.5310	0.5310	0.999501	2.15	.1838E-06
22	704.13	0.5348	0.5348	0.999044	2.16	.1916E-06
23	721.90	0.5385	0.5384	0.999776	2.17	.1967E-06
24	740.55	0.5422	0.5421	0.999922	2.19	.1957E-06
25	760.11	0.5458	0.5459	0.999925	2.20	.1913E-06
26	779.74	0.5497	0.5496	0.999651	2.21	.1898E-06
27	800.17	0.5534	0.5533	0.999121	2.23	.1954E-06
28	821.43	0.5572	0.5575	0.999278	2.24	.2031E-06
29	839.13	0.5610	0.5611	0.998923	2.26	.2051E-06
30	854.77	0.5648	0.5644	0.998930	2.27	.2151E-06
31	871.86	0.5683	0.5682	0.998366	2.29	.2281E-06
32	889.65	0.5718	0.5722	0.998375	2.30	.2454E-06
33	904.02	0.5761	0.5761	0.999694	2.32	.2585E-06
34	918.81	0.5798	0.5797	0.999580	2.33	.2885E-06
35	930.78	0.5835	0.5834	0.999953	2.35	.3061E-06
36	942.75	0.5872	0.5872	0.999944	2.36	.3155E-06
37	954.73	0.5911	0.5911	0.999968	2.38	.3220E-06
38	965.60	0.5947	0.5946	0.999964	2.39	.3272E-06
39	976.61	0.5982	0.5982	0.999962	2.41	.3326E-06
40	988.55	0.6022	0.6022	0.999975	2.43	.3386E-06
41	999.55	0.6060	0.6060	0.999993	2.44	.3465E-06
42	1009.65	0.6095	0.6095	0.999970	2.46	.3570E-06
43	1020.22	0.6133	0.6133	0.999979	2.48	.3668E-06
44	1030.80	0.6172	0.6173	0.999973	2.49	.3765E-06
45	1040.44	0.6210	0.6209	0.999978	2.51	.3863E-06
46	1050.53	0.6249	0.6249	0.999978	2.53	.3945E-06
47	1060.16	0.6287	0.6287	0.999982	2.54	.4019E-06
48	1068.87	0.6323	0.6322	0.999978	2.56	.4097E-06
49	1077.77	0.6359	0.6359	0.999961	2.58	.4209E-06
50	1086.57	0.6396	0.6397	0.999963	2.60	.4313E-06
51	1095.39	0.6435	0.6435	0.999961	2.61	.4457E-06
52	1103.47	0.6472	0.6472	0.999939	2.63	.4576E-06
53	1111.51	0.6508	0.6509	0.999935	2.65	.4673E-06
54	1119.53	0.6548	0.6547	0.999936	2.67	.4762E-06
55	1127.25	0.6584	0.6584	0.999912	2.69	.4869E-06
56	1134.90	0.6621	0.6622	0.999903	2.70	.4989E-06
57	1142.28	0.6658	0.6658	0.999992	2.72	.5101E-06
58	1149.69	0.6697	0.6697	0.999994	2.74	.5264E-06
59	1156.49	0.6733	0.6733	0.999996	2.76	.5408E-06
60	1163.27	0.6770	0.6770	0.999994	2.78	.5534E-06
61	1170.36	0.6810	0.6810	0.999989	2.80	.5680E-06
62	1177.14	0.6849	0.6849	0.999989	2.82	.5829E-06
63	1183.94	0.6883	0.6884	0.999989	2.84	.5954E-06
64	1189.22	0.6921	0.6921	0.999970	2.86	.6122E-06
65	1195.41	0.6959	0.6959	0.999957	2.88	.6335E-06
66	1201.32	0.6998	0.6997	0.999978	2.90	.6519E-06

TABLE H25 (Continued)

67	1206.94	0.7034	0.7034	0.999944	2.92	.6704E-06
68	1212.23	0.7071	0.7070	0.999950	2.94	.6896E-06
69	1217.75	0.7108	0.7109	0.999958	2.97	.7091E-06
70	1223.26	0.7148	0.7148	0.999971	2.99	.7266E-06
71	1228.28	0.7185	0.7185	0.999982	3.01	.7468E-06
72	1233.32	0.7223	0.7223	0.999984	3.03	.7716E-06
73	1238.36	0.7262	0.7262	0.999984	3.06	.7916E-06
74	1243.16	0.7301	0.7301	0.999975	3.08	.8099E-06
75	1247.48	0.7337	0.7337	0.999982	3.10	.8252E-06
76	1251.74	0.7372	0.7372	0.999969	3.13	.8424E-06
77	1256.25	0.7410	0.7410	0.999976	3.15	.8563E-06
78	1260.56	0.7447	0.7447	0.999965	3.17	.8772E-06
79	1264.88	0.7486	0.7485	0.999967	3.20	.9013E-06
80	1269.19	0.7524	0.7525	0.999961	3.22	.9240E-06
81	1273.11	0.7562	0.7561	0.999953	3.25	.9488E-06
82	1276.90	0.7598	0.7598	0.999950	3.27	.9692E-06
83	1280.64	0.7634	0.7635	0.999964	3.30	.9935E-06
84	1284.23	0.7671	0.7670	0.999981	3.32	.1015E-05
85	1287.82	0.7707	0.7707	0.999977	3.35	.1043E-05
86	1291.41	0.7745	0.7745	0.999966	3.38	.1068E-05
87	1295.00	0.7784	0.7784	0.999971	3.40	.1093E-05
88	1298.28	0.7821	0.7820	0.999981	3.43	.1119E-05
89	1301.57	0.7857	0.7858	0.999979	3.46	.1140E-05
90	1305.00	0.7897	0.7897	0.999972	3.49	.1166E-05
91	1308.29	0.7936	0.7936	0.999979	3.52	.1192E-05
92	1311.27	0.7971	0.7972	0.999986	3.55	.1218E-05
93	1314.05	0.8006	0.8006	0.999988	3.57	.1239E-05
94	1317.18	0.8045	0.8045	0.999988	3.60	.1267E-05
95	1320.32	0.8085	0.8085	0.999950	3.64	.1306E-05
96	1323.08	0.8121	0.8121	0.999968	3.67	.1334E-05
97	1325.83	0.8158	0.8159	0.999961	3.70	.1366E-05
98	1328.47	0.8195	0.8195	0.999964	3.73	.1396E-05
99	1331.24	0.8234	0.8234	0.999973	3.76	.1426E-05
100	1333.74	0.8270	0.8270	0.999906	3.79	.1463E-05
101	1336.19	0.8306	0.8306	0.999953	3.82	.1508E-05
102	1338.88	0.8346	0.8347	0.999914	3.86	.1559E-05
103	1341.27	0.8385	0.8385	0.999832	3.89	.1588E-05
104	1343.28	0.8419	0.8418	0.999849	3.92	.1623E-05
105	1345.49	0.8454	0.8454	0.999774	3.96	.1666E-05
106	1348.11	0.8496	0.8497	0.999855	4.00	.1707E-05
107	1350.19	0.8533	0.8533	0.999908	4.03	.1747E-05
108	1352.15	0.8569	0.8568	0.999920	4.07	.1797E-05
109	1354.34	0.8608	0.8608	0.999955	4.11	.1851E-05
110	1356.45	0.8647	0.8648	0.999962	4.15	.1884E-05
111	1358.32	0.8683	0.8683	0.999972	4.18	.1925E-05
112	1359.99	0.8716	0.8715	0.999977	4.22	.1967E-05
113	1361.86	0.8752	0.8752	0.999945	4.26	.2022E-05
114	1363.89	0.8794	0.8794	0.999964	4.30	.2079E-05
115	1365.67	0.8831	0.8832	0.999949	4.34	.2127E-05
116	1367.46	0.8871	0.8870	0.999921	4.39	.2199E-05
117	1369.25	0.8910	0.8910	0.999913	4.43	.2250E-05
118	1370.88	0.8948	0.8947	0.999904	4.47	.2311E-05
119	1372.50	0.8986	0.8985	0.999921	4.52	.2364E-05
120	1374.12	0.9023	0.9024	0.999917	4.56	.2437E-05
121	1375.66	0.9062	0.9062	0.999909	4.61	.2489E-05
122	1377.08	0.9097	0.9097	0.999932	4.65	.2537E-05
123	1378.51	0.9135	0.9134	0.999938	4.70	.2610E-05
124	1379.94	0.9171	0.9172	0.999955	4.75	.2676E-05
125	1381.30	0.9208	0.9208	0.999951	4.79	.2760E-05
126	1382.72	0.9248	0.9248	0.999967	4.85	.2841E-05
127	1384.07	0.9287	0.9287	0.999989	4.90	.2937E-05
128	1385.23	0.9322	0.9321	0.999985	4.95	.3013E-05
129	1386.44	0.9358	0.9358	0.999985	5.00	.3097E-05
130	1387.71	0.9398	0.9398	0.999981	5.05	.3200E-05
131	1388.76	0.9432	0.9432	0.999980	5.10	.3277E-05
132	1389.84	0.9468	0.9468	0.999940	5.15	.3396E-05
133	1390.94	0.9506	0.9505	0.999951	5.21	.3506E-05
134	1392.07	0.9545	0.9546	0.999956	5.27	.3636E-05
135	1393.22	0.9589	0.9588	0.999948	5.34	.3762E-05
136	1394.12	0.9623	0.9623	0.999936	5.39	.3882E-05
137	1395.03	0.9659	0.9659	0.999946	5.45	.4005E-05
138	1395.93	0.9695	0.9696	0.999967	5.51	.4099E-05
139	1396.81	0.9732	0.9731	0.999960	5.57	.4227E-05
140	1397.65	0.9768	0.9768	0.999956	5.63	.4333E-05
141	1398.56	0.9807	0.9807	0.999881	5.70	.4498E-05
142	1399.40	0.9846	0.9845	0.999934	5.76	.4655E-05
143	1400.20	0.9882	0.9883	0.999947	5.83	.4846E-05
144	1401.04	0.9925	0.9925	0.999947	5.91	.5065E-05
145	1401.76	0.9962	0.9962	0.999928	5.98	.5229E-05
146	1402.45	0.9999	0.9999	0.999983	6.05	.5382E-05
147	1403.14	1.0037	1.0036	0.999976	6.12	.5517E-05
148	1403.80	1.0073	1.0073	0.999880	6.19	.5716E-05
149	1404.45	1.0110	1.0111	0.999923	6.27	.5911E-05
150	1405.11	1.0149	1.0150	0.999965	6.35	.6164E-05
151	1405.70	1.0188	1.0187	0.999957	6.43	.6410E-05
152	1406.24	1.0222	1.0223	0.999964	6.51	.6614E-05
153	1406.79	1.0260	1.0260	0.999973	6.59	.6793E-05
154	1407.35	1.0298	1.0298	0.999964	6.67	.6984E-05
155	1407.85	1.0333	1.0333	0.999965	6.75	.7186E-05
156	1408.35	1.0369	1.0369	0.999976	6.84	.7410E-05
157	1408.90	1.0411	1.0410	0.999845	6.94	.7834E-05
158	1409.38	1.0448	1.0449	0.999893	7.03	.8279E-05
159	1409.79	1.0482	1.0483	0.999862	7.12	.8627E-05
160	1410.21	1.0521	1.0520	0.999857	7.21	.9006E-05
161	1410.60	1.0557	1.0556	0.999920	7.30	.9395E-05
162	1411.00	1.0594	1.0595	0.999928	7.41	.9704E-05
163	1411.42	1.0636	1.0638	0.999970	7.52	.9996E-05
164	1411.81	1.0676	1.0675	0.999940	7.63	.1041E-04
165	1412.14	1.0710	1.0710	0.999913	7.73	.1083E-04
166	1412.48	1.0746	1.0747	0.999926	7.83	.1117E-04
167	1412.82	1.0786	1.0785	0.999872	7.95	.1172E-04
168	1413.13	1.0824	1.0823	0.999868	8.07	.1222E-04
169	1413.43	1.0859	1.0861	0.999868	8.18	.1270E-04
170	1413.74	1.0901	1.0900	0.999864	8.31	.1312E-04
171	1414.02	1.0938	1.0938	0.999820	8.43	.1368E-04
172	1414.28	1.0974	1.0974	0.999820	8.55	.1421E-04
173	1414.54	1.1010	1.1011	0.999950	8.68	.1465E-04
174	1414.78	1.1048	1.1047	0.999894	8.81	.1538E-04
175	1415.01	1.1083	1.1083	0.999905	8.94	.1604E-04
176	1415.26	1.1122	1.1123	0.999888	9.09	.1689E-04
177	1415.47	1.1161	1.1160	0.999953	9.23	.1768E-04
178	1415.68	1.1197				
179	1415.88	1.1235				
180	1416.08	1.1274				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H26

Northrop Fatigue Crack Growth Rate Data
Associated with Figure H7

Seven Point Incremental Polynomial Method per ASTM E647

05-09-1991

Specimen Number: ZOF6 Specimen Type: CT

B= 0.2500 in W= 1.5000 in An= 0.0000

Pmax= 113.0 lbs Pmin= 11.3 lbs

R= 0.10 Frequency= 10.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES (x1000)	Ameas	Areg	MCC	Delta K	da/dN
1	1.23	0.4362				
2	24.23	0.4381				
3	73.42	0.4409				
4	88.76	0.4418	0.4417	0.998528	1.84	.5835E-07
5	140.12	0.4445	0.4445	0.999678	1.85	.5634E-07
6	208.76	0.4483	0.4484	0.999947	1.86	.5896E-07
7	268.13	0.4520	0.4520	0.999843	1.87	.6170E-07
8	326.67	0.4558	0.4558	0.999788	1.89	.6372E-07
9	385.20	0.4597	0.4596	0.999967	1.90	.6507E-07
10	443.79	0.4635	0.4635	0.999980	1.91	.6561E-07
11	502.33	0.4673	0.4673	0.999972	1.92	.6558E-07
12	558.70	0.4710	0.4710	0.999528	1.94	.6726E-07
13	614.98	0.4748	0.4747	0.998622	1.95	.7190E-07
14	671.41	0.4784	0.4787	0.998511	1.96	.8074E-07
15	719.25	0.4824	0.4826	0.999405	1.97	.9037E-07
16	756.39	0.4861	0.4861	0.999081	1.99	.9677E-07
17	791.16	0.4899	0.4898	0.999393	2.00	.1014E-06
18	825.83	0.4935	0.4935	0.999932	2.01	.1040E-06
19	860.59	0.4971	0.4971	0.999926	2.02	.1045E-06
20	897.03	0.5008	0.5008	0.999972	2.04	.1047E-06
21	935.10	0.5048	0.5048	0.999944	2.05	.1070E-06
22	971.47	0.5087	0.5087	0.999815	2.06	.1118E-06
23	1006.16	0.5125	0.5126	0.999718	2.08	.1193E-06
24	1037.30	0.5162	0.5163	0.999899	2.09	.1278E-06
25	1065.01	0.5199	0.5199	0.999891	2.10	.1353E-06
26	1091.38	0.5237	0.5237	0.999862	2.12	.1421E-06
27	1115.04	0.5272	0.5276	0.977308	2.13	.1243E-06
28	1139.54	0.5308	0.5301	0.944890	2.14	.1355E-06
29	1165.09	0.5347	0.5333	0.950189	2.15	.1455E-06
30	1189.47	0.5374	0.5368	0.957980	2.17	.1551E-06
31	1212.75	0.5421	0.5406	0.958718	2.18	.1625E-06
32	1236.03	0.5457	0.5449	0.962405	2.20	.1716E-06
33	1260.45	0.5495	0.5500	0.967312	2.22	.1816E-06
34	1284.85	0.5533	0.5534	0.999980	2.23	.1820E-06
35	1308.12	0.5572	0.5572	0.999984	2.24	.1857E-06
36	1331.41	0.5611	0.5611	0.999964	2.26	.1899E-06
37	1353.57	0.5649	0.5649	0.999953	2.27	.1923E-06
38	1374.25	0.5685	0.5685	0.999911	2.29	.1927E-06
39	1394.69	0.5722	0.5721	0.999952	2.30	.1925E-06
40	1416.03	0.5758	0.5758	0.999953	2.32	.1919E-06
41	1439.13	0.5797	0.5797	0.999936	2.33	.1910E-06
42	1462.27	0.5836	0.5836	0.999990	2.35	.1903E-06
43	1483.70	0.5873	0.5873	0.999990	2.36	.1912E-06
44	1505.10	0.5910	0.5910	0.999989	2.38	.1922E-06
45	1526.43	0.5946	0.5946	0.999904	2.39	.1949E-06
46	1546.96	0.5982	0.5982	0.999942	2.41	.1975E-06
47	1569.25	0.6021	0.6022	0.999947	2.43	.1826E-06
48	1590.62	0.6062	0.6061	0.999948	2.44	.1889E-06
49	1609.80	0.6097	0.6098	0.999941	2.46	.1941E-06
50	1627.99	0.6134	0.6134	0.999948	2.48	.1994E-06
51	1646.69	0.6172	0.6172	0.999931	2.49	.2034E-06
52	1665.38	0.6210	0.6210	0.999826	2.51	.2107E-06
53	1683.19	0.6248	0.6248	0.999868	2.53	.2158E-06
54	1700.51	0.6284	0.6285	0.999880	2.54	.2225E-06
55	1716.91	0.6324	0.6322	0.999852	2.56	.2312E-06
56	1731.89	0.6357	0.6357	0.999860	2.58	.2394E-06
57	1747.61	0.6395	0.6396	0.999771	2.59	.2514E-06
58	1762.60	0.6434	0.6434	0.999867	2.61	.2603E-06
59	1777.60	0.6473	0.6474	0.999872	2.63	.2744E-06
60	1791.15	0.6513	0.6512	0.999870	2.65	.2858E-06
61	1803.14	0.6545	0.6546	0.999456	2.67	.3036E-06
62	1815.74	0.6585	0.6585	0.999519	2.69	.3231E-06
63	1827.77	0.6622	0.6624	0.999713	2.71	.3494E-06
64	1838.67	0.6663	0.6661	0.999707	2.72	.3744E-06
65	1847.70	0.6697	0.6698	0.999720	2.74	.3991E-06
66	1856.90	0.6737	0.6736	0.999772	2.76	.4241E-06

TABLE H26 (Continued)

67	1865.09	0.6771	0.6771	0.999870	2.78	.4427E-06
68	1873.68	0.6811	0.6811	0.999949	2.80	.4668E-06
69	1881.87	0.6850	0.6849	0.999913	2.82	.4918E-06
70	1889.21	0.6886	0.6887	0.999897	2.84	.5132E-06
71	1896.18	0.6922	0.6923	0.999891	2.86	.5314E-06
72	1902.72	0.6960	0.6958	0.999812	2.88	.5561E-06
73	1909.79	0.6998	0.6999	0.999686	2.90	.5730E-06
74	1916.58	0.7037	0.7039	0.999689	2.93	.5852E-06
75	1922.49	0.7076	0.7073	0.999650	2.95	.5986E-06
76	1928.69	0.7110	0.7111	0.999608	2.97	.6193E-06
77	1934.58	0.7146	0.7148	0.999615	2.99	.6324E-06
78	1940.12	0.7183	0.7183	0.999715	3.01	.6423E-06
79	1945.87	0.7222	0.7221	0.999892	3.03	.6649E-06
80	1951.62	0.7259	0.7259	0.999858	3.06	.6824E-06
81	1957.15	0.7296	0.7297	0.999853	3.08	.7047E-06
82	1962.68	0.7336	0.7336	0.999931	3.10	.7290E-06
83	1967.96	0.7375	0.7375	0.999933	3.13	.7607E-06
84	1972.53	0.7412	0.7411	0.999941	3.15	.7859E-06
85	1977.04	0.7446	0.7447	0.999925	3.17	.8047E-06
86	1981.53	0.7484	0.7484	0.999936	3.20	.8230E-06
87	1985.84	0.7520	0.7519	0.999941	3.22	.8365E-06
88	1990.53	0.7559	0.7559	0.999976	3.25	.8557E-06
89	1995.03	0.7598	0.7598	0.999994	3.27	.8703E-06
90	1999.16	0.7634	0.7634	0.999996	3.30	.8895E-06
91	2003.28	0.7671	0.7671	0.999996	3.32	.9111E-06
92	2007.21	0.7707	0.7707	0.999985	3.35	.9363E-06
93	2011.32	0.7746	0.7746	0.999982	3.38	.9623E-06
94	2015.25	0.7784	0.7785	0.999955	3.41	.9827E-06
95	2019.04	0.7823	0.7822	0.999965	3.43	.1001E-05
96	2022.64	0.7859	0.7863	0.995304	3.46	.9293E-06
97	2026.22	0.7895	0.7899	0.971705	3.49	.9401E-06
98	2029.96	0.7934	0.7931	0.947595	3.51	.9597E-06
99	2038.54	0.7974	0.8016	0.942382	3.58	.1220E-05
100	2036.97	0.8010	0.7994	0.946388	3.56	.1164E-05
101	2040.07	0.8048	0.8033	0.943248	3.59	.1234E-05
102	2043.19	0.8084	0.8079	0.945021	3.63	.1388E-05
103	2046.31	0.8124	0.8123	0.999935	3.67	.1216E-05
104	2049.27	0.8159	0.8159	0.999903	3.70	.1229E-05
105	2052.31	0.8196	0.8196	0.999858	3.73	.1254E-05
106	2055.46	0.8235	0.8235	0.999993	3.76	.1281E-05
107	2058.35	0.8273	0.8273	0.999972	3.79	.1314E-05
108	2061.24	0.8312	0.8312	0.999953	3.83	.1356E-05
109	2064.01	0.8350	0.8350	0.999953	3.86	.1394E-05
110	2066.52	0.8384	0.8385	0.999945	3.89	.1433E-05
111	2069.04	0.8422	0.8421	0.999940	3.93	.1468E-05
112	2071.45	0.8457	0.8457	0.999941	3.96	.1505E-05
113	2073.80	0.8494	0.8494	0.999972	4.00	.1538E-05
114	2076.36	0.8533	0.8533	0.999976	4.03	.1564E-05
115	2078.94	0.8574	0.8574	0.999967	4.07	.1600E-05
116	2081.19	0.8610	0.8610	0.999991	4.11	.1631E-05
117	2083.46	0.8647	0.8647	0.999982	4.15	.1677E-05
118	2085.62	0.8684	0.8684	0.999992	4.19	.1717E-05
119	2087.60	0.8718	0.8718	0.999974	4.22	.1752E-05
120	2089.86	0.8759	0.8759	0.999966	4.26	.1799E-05
121	2091.97	0.8797	0.8796	0.999893	4.30	.1858E-05
122	2093.91	0.8832	0.8833	0.999884	4.34	.1904E-05
123	2095.85	0.8870	0.8870	0.999894	4.39	.1953E-05
124	2097.72	0.8909	0.8907	0.999896	4.43	.2014E-05
125	2099.59	0.8945	0.8946	0.999910	4.47	.2060E-05
126	2101.44	0.8984	0.8984	0.999910	4.52	.2095E-05
127	2103.22	0.9023	0.9022	0.999924	4.56	.2136E-05
128	2104.92	0.9058	0.9059	0.999945	4.61	.2186E-05
129	2106.78	0.9099	0.9100	0.999944	4.66	.2222E-05
130	2108.47	0.9138	0.9137	0.999938	4.70	.2275E-05
131	2110.01	0.9173	0.9173	0.999852	4.75	.2355E-05
132	2111.64	0.9210	0.9211	0.999891	4.80	.2434E-05
133	2113.20	0.9249	0.9250	0.999880	4.85	.2505E-05
134	2114.62	0.9287	0.9286	0.999878	4.90	.2576E-05
135	2116.04	0.9324	0.9324	0.999974	4.95	.2636E-05
136	2117.47	0.9361	0.9361	0.999923	5.00	.2692E-05
137	2118.75	0.9396	0.9396	0.999964	5.05	.2754E-05
138	2120.08	0.9432	0.9433	0.999979	5.10	.2833E-05
139	2121.44	0.9472	0.9472	0.999968	5.16	.2942E-05
140	2122.70	0.9510	0.9509	0.999972	5.22	.3047E-05
141	2123.91	0.9546	0.9547	0.999973	5.27	.3151E-05
142	2125.07	0.9584	0.9584	0.999976	5.33	.3243E-05
143	2126.22	0.9622	0.9622	0.999974	5.39	.3348E-05
144	2127.32	0.9659	0.9659	0.999986	5.45	.3446E-05
145	2128.36	0.9695	0.9695	0.999992	5.51	.3524E-05
146	2129.40	0.9733	0.9732	0.999980	5.57	.3626E-05
147	2130.45	0.9771	0.9771	0.999980	5.63	.3734E-05
148	2131.50	0.9810	0.9810	0.999967	5.70	.3862E-05
149	2132.45	0.9848	0.9848	0.999988	5.77	.4000E-05
150	2133.40	0.9886	0.9886	0.999989	5.84	.4153E-05
151	2134.27	0.9923	0.9923	0.999976	5.91	.4279E-05
152	2135.11	0.9960	0.9960	0.999974	5.97	.4408E-05
153	2135.98	0.9999	0.9999	0.999950	6.05	.4571E-05
154	2136.79	1.0035	1.0036	0.999953	6.12	.4731E-05
155	2137.56	1.0072	1.0072	0.999982	6.19	.4896E-05
156	2138.25	1.0107	1.0107	0.999985	6.26	.5074E-05
157	2139.00	1.0146	1.0146	0.999989	6.34	.5259E-05
158	2139.72	1.0184	1.0184	0.999990	6.42	.5416E-05
159	2140.38	1.0221	1.0220	0.999955	6.50	.5595E-05
160	2141.05	1.0258	1.0258	0.999937	6.58	.5813E-05
161	2141.69	1.0295	1.0296	0.999953	6.67	.6046E-05
162	2142.33	1.0335	1.0335	0.999961	6.76	.6273E-05
163	2142.91	1.0373	1.0373	0.999973	6.85	.6503E-05
164	2143.47	1.0410	1.0410	0.999981	6.94	.6663E-05
165	2144.05	1.0449	1.0449	0.999956	7.03	.6841E-05
166	2144.58	1.0486	1.0485	0.999861	7.12	.7080E-05
167	2145.08	1.0520	1.0521	0.999900	7.21	.7318E-05
168	2145.63	1.0561	1.0562	0.999916	7.32	.7626E-05
169	2146.11	1.0600	1.0599	0.999924	7.42	.7949E-05
170	2146.53	1.0633	1.0634	0.999932	7.51	.8193E-05
171	2146.99	1.0671	1.0671	0.999921	7.62	.8452E-05
172	2147.43	1.0710	1.0709	0.999922	7.72	.8732E-05
173	2147.87	1.0747	1.0748	0.999883	7.84	.9127E-05
174	2148.31	1.0788	1.0788	0.999916	7.96	.9517E-05
175	2148.70	1.0826	1.0826	0.999960	8.07	.9927E-05
176	2149.05	1.0862	1.0862	0.999977	8.19	.1029E-04
177	2149.40	1.0898	1.0898	0.999966	8.30	.1066E-04
178	2149.75	1.0937	1.0936	0.999963	8.43	.1103E-04
179	2150.08	1.0972	1.0973	0.999976	8.55	.1137E-04
180	2150.39	1.1009	1.1009	0.999967	8.67	.1179E-04
181	2150.72	1.1048	1.1048	0.999951	8.81	.1231E-04
182	2151.03	1.1086	1.1087	0.999952	8.95	.1284E-04
183	2151.31	1.1123				
184	2151.58	1.1161				
185	2151.85	1.1198				

TABLE H27

MCAIR Fatigue Crack Growth Rate Data
Associated with Figure H7

Seven Point Incremental Polynomial Method per ASTM E647

06-03-1991

Specimen Number: 35 Specimen Type: CT

B= 0.2500 in W= 1.6010 in An= 0.0000

Pmax= 200.0 lbs Pmin= 20.0 lbs

R= 0.10 Frequency= 0.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES	Ameas	Areg	MCC	Delta K	da/dN
1	0.00	0.4600				
2	86.00	0.4800				
3	155.00	0.5000				
4	235.00	0.5200	0.5258	0.998997	3.44	.5029E-05
5	810.75	1.1400	1.1670	0.997748	14.43	.1805E-05
6	812.15	1.1590	1.1789	0.994541	15.08	.1988E-05
7	813.45	1.1810	1.1877	0.999.50	15.60	.2094E-04
8	814.45	1.2020	1.2080	0.987912	16.91	.3356E-04
9	814.95	1.2220	1.2253	0.984009	18.17	.4781E-04
10	815.35	1.2400	1.2456	0.977529	19.86	.7288E-04
11	815.65	1.2610				
12	815.79	1.2800				
13	815.88	1.3000				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H28

Air Force Fatigue Crack Growth Rate Data
Associated with Figure H7

Seven Point Incremental Polynomial Method per ASTM E647

08-15-1991

Specimen Number: ST-16 Specimen Type: CT

B= 0.2510 in W= 1.5980 in An= 0.0000

Pmax= 130.0 lbs Pmin= 13.0 lbs

R= 0.10 Frequency= 25 hz.

Test Temperature= 72 F Environment= LAB AIR

PT	CYCLES (x1000)	Ameas (in.)	Areg	MCC	Delta K	da/dN
1	472.00	0.5459				
2	537.00	0.5561				
3	565.00	0.5664				
4	591.00	0.5766	0.5762	0.999362	2.42	.4320E-06
5	613.00	0.5868	0.5868	0.999810	2.46	.4906E-06
6	634.00	0.5971	0.5975	0.999925	2.51	.5420E-06
7	651.00	0.6073	0.6070	0.999908	2.55	.5904E-06
8	668.00	0.6175	0.6174	0.999911	2.59	.6373E-06
9	684.00	0.6278	0.6281	0.999921	2.64	.6841E-06
10	698.00	0.6380	0.6377	0.999855	2.68	.7344E-06
11	712.00	0.6482	0.6483	0.999852	2.72	.7939E-06
12	725.00	0.6585	0.6589	0.999855	2.77	.8478E-06
13	736.00	0.6687	0.6684	0.999833	2.82	.9069E-06
14	747.00	0.6789	0.6788	0.999814	2.87	.9619E-06
15	758.00	0.6892	0.6897	0.999831	2.92	.1015E-05
16	767.00	0.6994	0.6988	0.999449	2.97	.1082E-05
17	777.00	0.7097	0.7099	0.999506	3.03	.1164E-05
18	786.00	0.7199	0.7206	0.999518	3.08	.1250E-05
19	793.00	0.7301	0.7295	0.999644	3.13	.1312E-05
20	801.00	0.7404	0.7405	0.999752	3.19	.1392E-05
21	808.00	0.7506	0.7505	0.999749	3.25	.1463E-05
22	815.00	0.7608	0.7609	0.999707	3.32	.1495E-05
23	822.00	0.7715	0.7716	0.999420	3.38	.1580E-05
24	828.00	0.7817	0.7811	0.999457	3.44	.1646E-05
25	835.00	0.7919	0.7930	0.999318	3.52	.1705E-05
26	840.00	0.8022	0.8016	0.999283	3.58	.1763E-05
27	846.00	0.8128	0.8122	0.998678	3.65	.1882E-05
28	852.00	0.8230	0.8238	0.998683	3.74	.2011E-05
29	857.00	0.8333	0.8339	0.998869	3.82	.2067E-05
30	861.00	0.8435	0.8425	0.998812	3.88	.2157E-05
31	866.00	0.8541	0.8538	0.999122	3.97	.2287E-05
32	871.00	0.8644	0.8652	0.999127	4.07	.2381E-05
33	875.00	0.8746	0.8745	0.999584	4.15	.2533E-05
34	879.00	0.8852	0.8850	0.999208	4.25	.2658E-05
35	883.00	0.8955	0.8961	0.999303	4.35	.2841E-05
36	886.00	0.9057	0.9050	0.998803	4.44	.2866E-05
37	890.00	0.9160	0.9166	0.998735	4.56	.2966E-05
38	893.00	0.9266	0.9253	0.995934	4.65	.3180E-05
39	897.00	0.9368	0.9380	0.997175	4.79	.3441E-05
40	900.00	0.9475	0.9486	0.997127	4.91	.3806E-05
41	902.00	0.9581	0.9565	0.995592	5.01	.3841E-05
42	905.00	0.9683	0.9692	0.997706	5.17	.4135E-05
43	907.00	0.9786	0.9773	0.997020	5.27	.4280E-05
44	910.00	0.9888	0.9898	0.998397	5.44	.4567E-05
45	912.00	0.9990	0.9989	0.995137	5.57	.5243E-05
46	914.00	1.0093	1.0095	0.996573	5.73	.5715E-05
47	916.00	1.0203	1.0222	0.995637	5.94	.5990E-05
48	917.00	1.0309	1.0283	0.994882	6.04	.6305E-05
49	919.00	1.0415	1.0411	0.992373	6.26	.6956E-05
50	921.00	1.0526	1.0550	0.992121	6.52	.8138E-05
51	922.00	1.0628	1.0627	0.998250	6.66	.8927E-05
52	923.00	1.0730	1.0722	0.997431	6.86	.9625E-05
53	924.00	1.0833	1.0832	0.999905	7.09	.1043E-04
54	925.00	1.0935	1.0936	0.999936	7.33	.1066E-04
55	926.00	1.1041	1.1044	0.999837	7.59	.1083E-04
56	927.00	1.1156	1.1155	0.999837	7.86	.1101E-04
57	928.00	1.1270	1.1267	0.978063	8.17	.1264E-04
58	929.00	1.1376	1.1394	0.978910	8.53	.1444E-04
59	930.00	1.1490	1.1545	0.974981	9.00	.1459E-04
60	930.00	1.1608	1.1546	0.960556	9.01	.1595E-04
61	931.00	1.1726	1.1723	0.963056	9.61	.1740E-04
62	932.00	1.1837	1.1904	0.944076	10.30	.2093E-04
63	932.00	1.1955	1.1903	0.914975	10.30	.2359E-04
64	933.00	1.2073				
65	933.00	1.2191				
66	933.00	1.2293				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H29

Air Force Fatigue Crack Growth Rate Data
Associated with Figure H7

Seven Point Incremental Polynomial Method per ASTM E647

09-20-1991

Specimen Number: ST17 Specimen Type: CT

B= 0.2511 in W= 1.6025 in An= 0.0000

Pmax= 126.0 lbs Pmin= 12.0 lbs

R= 0.10 Frequency= 30 hz.

Test Temperature= 72 F Environment= LAB AIR

PT	CYCLES (x1000)	Ameas (in.)	Areg	MCC	Delta K	da/dN
1	518.55	0.8792				
2	521.68	0.8893				
3	524.75	0.8997				
4	528.85	0.9097	0.9139	0.991099	4.38	.4054E-05
5	529.83	0.9199	0.9182	0.988561	4.42	.3927E-05
6	532.30	0.9301	0.9285	0.988817	4.53	.4087E-05
7	534.82	0.9403	0.9398	0.990720	4.65	.4379E-05
8	537.79	0.9506	0.9519	0.997650	4.78	.4145E-05
9	540.11	0.9608	0.9620	0.995003	4.90	.3944E-05
10	541.86	0.9710	0.9689	0.994538	4.99	.3979E-05
11	544.73	0.9810	0.9799	0.985913	5.13	.4153E-05
12	548.29	0.9911	0.9941	0.971217	5.32	.5418E-05
13	550.23	1.0013	1.0044	0.980355	5.46	.6273E-05
14	551.38	1.0116	1.0116	0.979072	5.57	.6575E-05
15	551.96	1.0218	1.0173	0.987553	5.65	.7158E-05
16	554.18	1.0319	1.0333	0.987312	5.91	.7135E-05
17	555.55	1.0421	1.0415	0.990771	6.04	.7115E-05
18	557.23	1.0523	1.0532	0.990030	6.25	.7750E-05
19	558.32	1.0625	1.0628	0.996164	6.43	.7785E-05
20	559.51	1.0730	1.0723	0.996383	6.61	.7954E-05
21	560.63	1.0831	1.0813	0.984736	6.79	.8824E-05
22	562.28	1.0932	1.0954	0.980128	7.10	.1107E-04
23	563.38	1.1035	1.1076	0.988254	7.38	.1500E-04
24	563.86	1.1160	1.1143	0.990876	7.54	.1598E-04
25	564.43	1.1261	1.1251	0.990543	7.82	.1681E-04
26	564.99	1.1368	1.1362	0.997117	8.12	.1826E-04
27	565.68	1.1474	1.1476	0.998815	8.44	.1748E-04
28	566.37	1.1584	1.1593	0.998025	8.80	.1866E-04
29	566.86	1.1690	1.1682	0.999130	9.09	.1989E-04
30	567.44	1.1792				
31	567.83	1.1898				
32	568.29	1.2000				

* - DATA VIOLATES SIZE REQUIREMENTS

TABLE H30

MCAIR Fatigue Crack Growth Rate Data
Associated with Figure H7

Seven Point Incremental Polynomial Method per ASTM E647

06-03-1991

Specimen Number: 36 Specimen Type: CT

B= 0.2500 in W= 1.6000 in An= 0.0000

Pmax= 200.0 lbs Pmin= 66.0 lbs

R= 0.33 Frequency= 0.00 hz.

Test Temperature= 75 F Environment= Lab Air

PT	CYCLES	Ameas	Areg	MCC	Delta K	da/dN
1	1081.00	0.7490				
2	1114.00	0.7710				
3	1144.00	0.7910				
4	1171.00	0.8090	0.8099	0.998932	4.17	.7942E-06
5	1196.00	0.8290	0.8298	0.999650	4.34	.8907E-06
6	1218.00	0.8500	0.8499	0.999990	4.52	.9983E-06
7	1237.00	0.8700	0.8699	0.999987	4.71	.1104E-05
8	1254.50	0.8900	0.8899	0.999783	4.92	.1222E-05
9	1271.50	0.9110	0.9110	0.998811	5.16	.1399E-05
10	1285.50	0.9300	0.9308	0.999192	5.40	.1592E-05
11	1298.00	0.9500	0.9512	0.999568	5.66	.1834E-05
12	1308.00	0.9710	0.9699	0.999617	5.93	.2100E-05
13	1317.50	0.9900	0.9907	0.999309	6.25	.2433E-05
14	1325.50	1.0100	1.0108	0.999131	6.59	.2808E-05
15	1332.00	1.0290	1.0290	0.999680	6.93	.3243E-05
16	1338.00	1.0490	1.0493	0.999523	7.33	.3776E-05
17	1343.50	1.0700	1.0707	0.999600	7.81	.4417E-05
18	1348.00	1.0910	1.0912	0.999170	8.32	.5215E-05
19	1351.60	1.1100	1.1104	0.999589	8.85	.5955E-05
20	1355.10	1.1310	1.1321	0.999409	9.51	.6941E-05
21	1357.60	1.1510	1.1497	0.999156	10.12	.7941E-05
22	1360.35	1.1710	1.1725	0.997120	10.99	.9717E-05
23	1362.35	1.1910	1.1922	0.991305	11.86	.1244E-04
24	1364.10	1.2110	1.2152	0.986587	13.01	.1750E-04
25	1365.35	1.2320	1.2394	0.978051	14.43	.2726E-04
26	1365.90	1.2500	1.2542	0.980551	15.43	.4027E-04
27	1366.40	1.2690	1.2761	0.973908	17.12	.6372E-04
28	1366.74	1.2920				
29	1366.91	1.3100				
30	1366.98	1.3300				

* - DATA VIOLATES SIZE REQUIREMENTS

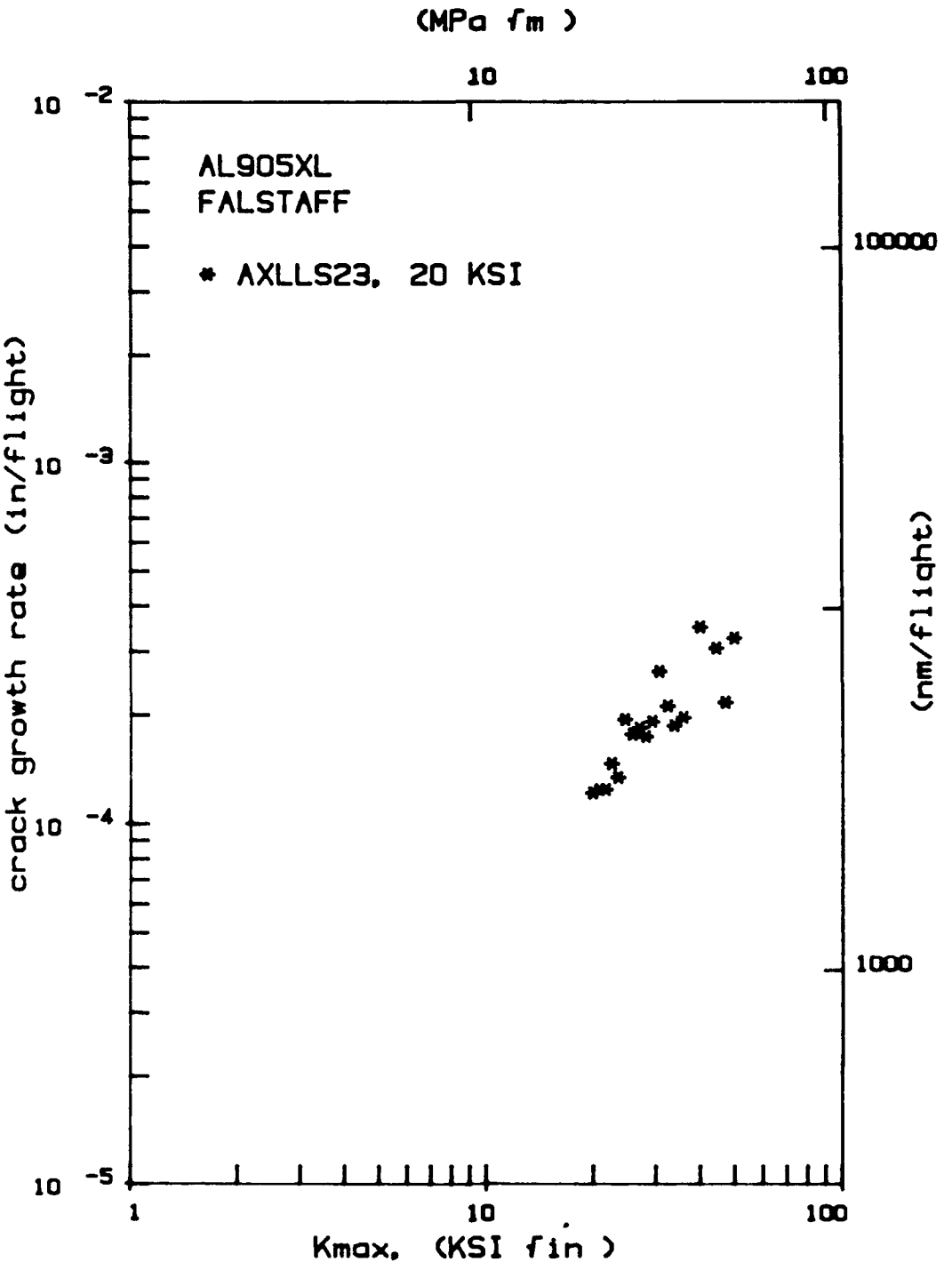

Figure H8 FALSTAFF Spectrum Fatigue Crack Growth Rate Data for AL905XL Forging (L-S Orientation, Maximum Stress = 20 KSI, Lab Air and Room Temperature). Air Force.

TABLE H31

FALSTAFF Spectrum Fatigue Crack Growth
Rate Data Associated with Figure H8

MATERIAL : AL905XL
FORM : FORGING
ORIENTATION : L-S
TEST CONDITION : LAB AIR ROOM TEMP
TYPE SPECTRUM : FALSTAFF

SPECIMEN ID : AXLLS23
DATE : 24 JAN 90

WIDTH, W = 3.506 INCHES
THICK, B = 0.250 INCHES

MAX SPECTRUM STRESS = 20.0 KSI

POINT #	CRACK (2a) (INCHES)	TOTAL FLIGHTS	K-MAX KSI SQR(IN)	Da/dF 10^-6 IN/FLT
1	0.547	200		
2	0.581	400	19.87	122.50
3	0.630	600	20.73	125.00
4	0.680	800	21.59	125.00
5	0.730	1000	22.50	147.50
6	0.789	1200	23.43	135.00
7	0.843	1400	24.50	195.00
8	0.921	1600	25.71	177.50
9	0.992	1800	26.87	185.00
10	1.066	2000	28.03	175.00
11	1.136	2200	29.21	192.50
12	1.213	2400	30.71	265.00
13	1.319	2600	32.31	212.50
14	1.404	2800	33.68	187.50
15	1.479	3000	35.75	197.50
16	1.637	3400	39.97	351.25
17	1.918	3800	44.37	307.50
18	2.041	4000	46.93	217.50
19	2.128	4200	49.85	327.50
20	2.259	4400		

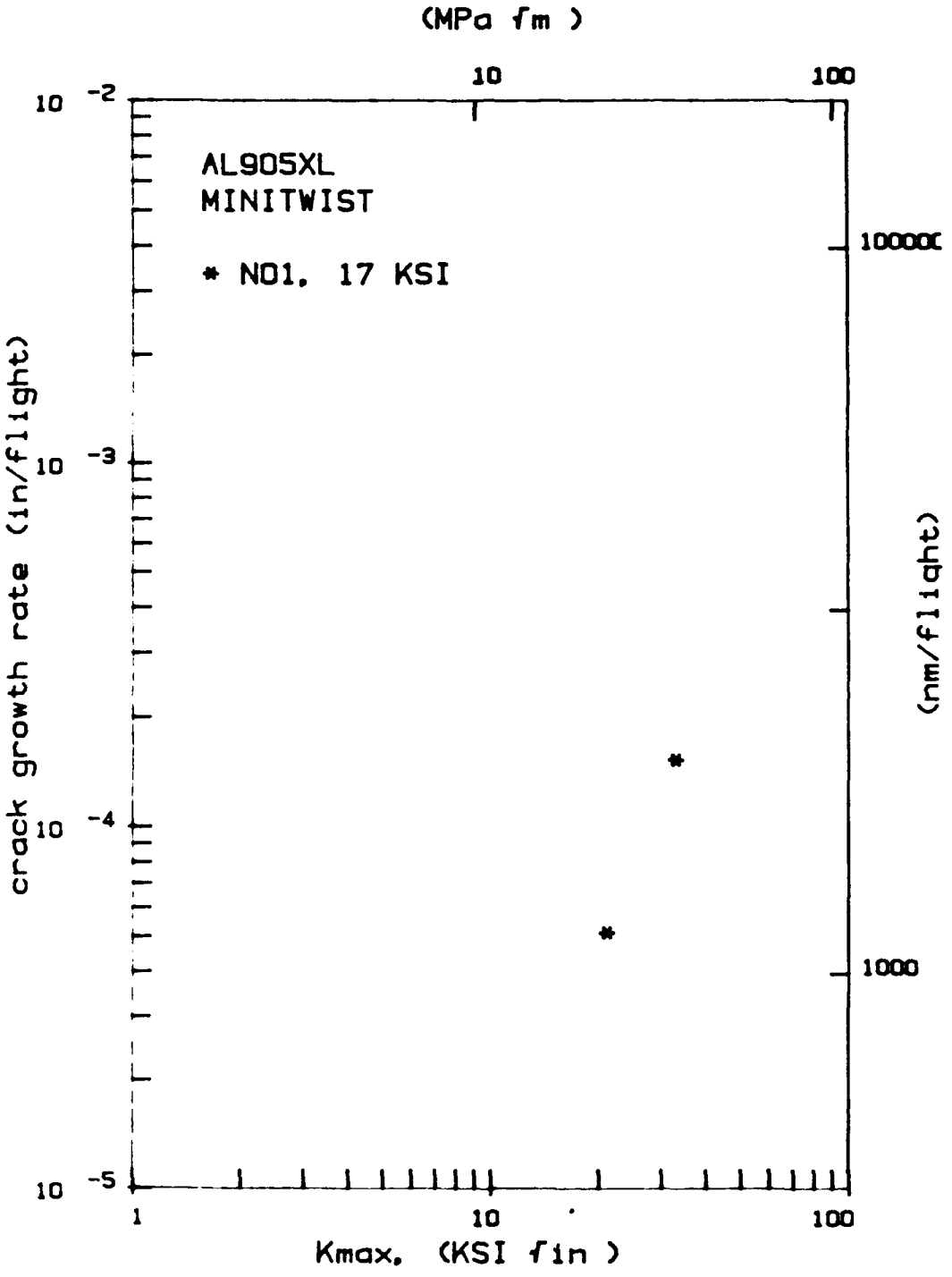

Figure H9 Mini-TWIST Spectrum Fatigue Crack Growth Rate Data for AL905XL Forging (L-S Orientation, Maximum Stress = 16.9 KSI, Lab Air and Room Temperature). Air Force.

TABLE H32

Mini-TWIST Spectrum Fatigue Crack Growth
Rate Data Associated with Figure H9

MATERIAL : AL905XL
FORM : FORGING
ORIENTATION : L-S
TEST CONDITION : LAB AIR ROOM TEMP
TYPE SPECTRUM : MINITWIST

SPECIMEN ID : NO1
DATE : 22 JAN 90

WIDTH, W = 3.505 INCHES
THICK, B = 0.252 INCHES

MAX SPECTRUM STRESS = 16.9 KSI

POINT #	CRACK (2a) (INCHES)	TOTAL FLIGHTS	K-MAX KSI SQR(IN)	Da/dF 10^-6 IN/FLT
1	0.503	1		
2	0.705	4000		
			21.09	51.25
3	1.115	8000		
			32.92	153.13
4	2.340	12000		

TABLE H33

STRESS CORROSION PROPERTIES
FOR AL905XL FORGING
WYMAN GORDON

ASTM G47
Specimen Size: .125" dia. x 1.80" long
Tested at Dirats Laboratories

S/N	Orientation	Location	Applied Load (ksi)	No. of Days** to Failure
31	S	rail	30	Passed
32	S	rail	30	Passed
33	S	rib	30	Passed
34	S	rail	40	Passed
35	S	rail	40	Passed
36	S	rib	40	Passed
39***	S	rail	50	Passed
40	S	rail	55	Passed

** Minimum 30 days by alternate immersion in 3.5% NaCl.

*** Specimens actually ran 50 days and then was terminated.

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