

WL-TR-94-027

AD-A282 911



**THE MECHANICAL PROPERTY DATA BASE FROM AN
AIR FORCE/INDUSTRY COOPERATIVE TEST PROGRAM ON HIGH
TEMPERATURE ALUMINUM ALLOYS**

MARY ANN PHILLIPS and STEVEN R. THOMPSON
Materials Engineering Branch
Systems Support Division

February 1994

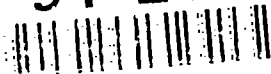
Final Report for Period November 1989 - January 1994

Approved for public release; distribution is unlimited.

Materials Directorate
Wright Laboratory
Air Force Materiel Command
Wright-Patterson Air Force Base, Ohio 45433-7734

1994

94-24419



DTIC

94

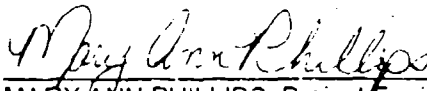
1994

NOTICE

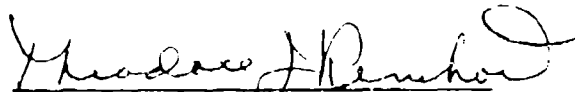
When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely Government-related procurement, the United States Government incurs no responsibility or any obligation, whatsoever. The fact that the government may have formulated or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication, or otherwise in any manner construed, as licensing the holder, or any other person or corporation; or as conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This report is releaseable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This Technical report has been reviewed and is approved for publication.


MARY ANN PHILLIPS, Project Engineer
Engineering and Design Data
Materials Engineering Branch


STEVEN R. THOMPSON, Project Engineer
Engineering and Design Data
Materials Engineering Branch


THEODORE J. REINHART, Chief
Materials Engineering Branch
Systems Support Division
Materials Directorate


THOMAS D. COOPER, Chief
Systems Support Division
Materials Directorate
Wright Laboratory

If your address has changed, if you wish to be removed from our mailing list, or if the addressee is no longer employed by your organization, please notify WL/MLSE, 2179 Twelfth St STE 1, WPAFB, OH 45433-7718 to help us maintain a current mailing list.

Copies of this report should not be return unless return is required be security considerations, contractual obligations, or notice on a specific document.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.					
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE February 1994		3. REPORT TYPE AND DATES COVERED Final 11/01/89 -- 01/01/94	
4. TITLE AND SUBTITLE The Mechanical Property Data Base from an Air Force/ Industry Cooperative Test Program on High Temperature Aluminum Alloys.				5. FUNDING NUMBERS PE 62102F PR 2418 TA 07 WU 03	
6. AUTHOR(S) Mary Ann Phillips Steven R. Thompson					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Materials Directorate Wright Laboratory Air Force Materiel Command Wright Patterson AFB OH 45433-7718				8. PERFORMING ORGANIZATION REPORT NUMBER WL-TR-94-4027	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Materials Directorate Wright Laboratory Air Force Materiel Command Wright Patterson AFB OH 45433-7734				10. SPONSORING/MONITORING AGENCY REPORT NUMBER WL-TR-94-4027	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for Public Release; Distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) A mechanical property data base on high temperature aluminum alloys produced by Allied Signal (8009 sheet and extrusion) and Alcoa (CZ42 sheet and extrusion, 8019 extrusion) was generated. Mechanical property data consisted of tension, compression, shear, bearing, and fracture toughness values. Fatigue, fatigue crack growth rate, and spectrum fatigue crack growth rate data were generated.					
14. SUBJECT TERMS 8009 tension bearing fatigue crack growth rate CZ42 compression fatigue fracture toughness 8019 shear spectrum				15. NUMBER OF PAGES 229	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified		18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified		19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	
				20. LIMITATION OF ABSTRACT UL	

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
1. INTRODUCTION	1
2. MATERIALS AND TESTS	3
3. PRESENTATION	4
4. RESULTS AND DISCUSSION	5
5. CONCLUSIONS	6

APPENDICES

APPENDIX A	8009	SHEET	7
APPENDIX B	8009	EXTRUSION	96
APPENDIX C	CZ42	SHEET	158
APPENDIX D	CZ42	EXTRUSION	170
APPENDIX E	8019	EXTRUSION	184

Account for

1	✓
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	
91	
92	
93	
94	
95	
96	
97	
98	
99	
100	

Dist. 1

A-1

LIST OF TABLES

<u>TABLE</u>		<u>PAGE</u>
A1	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	8
A2	Tensile Results for Allied Signal FVS0912 (8009) Sheet (0.090" Thick)	9
A3	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	10
A4	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	10
A5	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	11
A6	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	12
A7	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	13
A8	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	14
A9	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	15
A10	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)(After 1000 Hrs @ 450F)	15
A11	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick) (After 100 Hrs @ 450F)	16
A12	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)(After 100 Hrs @ 450F)	16
A13	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)(After 100 Hrs @ 600F)	17
A14	Tensile Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)(After 100 Hrs @ 600F)	17
A15	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	18
A16	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	19
A17	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	20

<u>TABLE</u>		<u>PAGE</u>
A18	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	20
A19	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	21
A20	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	22
A21	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	23
A22	Compression Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	24
A23	Slotted Shear Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	25
A24	Slotted Shear Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	25
A25	Slotted Shear Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	26
A26	Slotted Shear Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	26
A27	Slotted Shear Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	27
A28	Slotted Shear Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	27
A29	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	28
A30	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	29
A31	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	30
A32	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	30
A33	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	31
A34	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	32
A35	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	33

<u>TABLE</u>		<u>PAGE</u>
A36	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	34
A37	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	35
A38	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	36
A39	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	37
A40	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	37
A41	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	38
A42	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	39
A43	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	40
A44	Bearing Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	41
A45	Fracture Toughness Results for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	42
A46	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	43
A47	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	45
A48	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	47
A49	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	49
A50	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	50
A51	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	51
A52	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	53
A53	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	55

<u>TABLE</u>		<u>PAGE</u>
A54	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	57
A55	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	59
A56	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	60
A57	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	61
A58	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	63
A59	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick) (After 100 Hrs @ 450F)	63
A60	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick) (After 100 Hrs @ 450F)	63
A61	Fatigue Results with R=0.1 and Kt=2.7 for Allied Signal FVS0812 (8009) Sheet (0.090" Thick)	66
A62	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, Rm Temp; T-L Orientation, 450 F) R=0.1, Freq=5HZ	75
A63	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, Rm Temp)R=0.1 Specimen #E6FL1 Northrop	78
A64	Fatigue Crack Growth Rate Results of 8009 Sheet (T-L Orientation, Rm Temp)R=0.1 Specimen #E6FT1 Northrop	79
A65	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, 300 F) R=0.1 Specimen #E6FL4 Northrop	80
A65	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, 300 F) R=0.1 Specimen #E6FL4 Northrop (cont'd)	81
A65	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, 300 F) R=0.1 Specimen #E6FL4 Northrop (cont'd)	82
A66	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, 450 F) R=0.1 Specimen #E6FL2 Northrop	83

<u>TABLE</u>		<u>PAGE</u>
A67	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, Rm Temp, 450 F, and 600 F) R=0.1 USAF	85
A68	Fatigue Crack Growth Rate Results of 8009 Sheet (T-L Orientation, Rm Temp, 450 F, and 600 F) R=0.1 USAF	87
A69	FALSTAFF Spectrum Fatigue Crack Growth Rate Data for 8009 Sheet (L-T Orientation, Rm Temp) USAF	89
A70	FALSTAFF Spectrum Fatigue Crack Growth Rate Data for 8009 Sheet (L-T Orientation, 300 F) USAF	90
A71	FALSTAFF Spectrum Fatigue Crack Growth Rate Data for 8009 Sheet (L-T Orientation, 400 F) USAF	91
A72	Mini-TWIST Spectrum Fatigue Crack Growth Rate Data for 8009 Sheet (L-T Orientation, Rm Temp) USAF	93
A73	Mini-TWIST Spectrum Fatigue Crack Growth Rate Data for 8009 Sheet (L-T Orientation, 300 F) USAF	94
A74	Mini-TWIST Spectrum Fatigue Crack Growth Rate Data for 8009 Sheet (L-T Orientation, 400 F) USAF	95
B1	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	97
B2	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	98
B3	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	99
B4	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	99
B5	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	100
B6	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	101
B7	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	102
B8	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	102
B9	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4") (100 Hr F-Temperature @ 450F)	103

<u>TABLE</u>		<u>PAGE</u>
B10	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4") (100 Hr Exposure @ 450F)	103
B11	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4") (100 Hr Exposure @ 600F)	104
B12	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4") (100 Hr Exposure @ 600F)	104
B13	Tensile Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	105
B14	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	106
B15	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	106
B16	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	107
B17	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	107
B18	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	108
B19	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	108
B20	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	109
B21	Compression Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	109
B22	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	110
B23	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	110
B24	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	111
B25	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	111
B26	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	112
B27	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	112

<u>TABLE</u>		<u>PAGE</u>
B28	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	113
B29	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	113
B30	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	114
B31	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	114
B32	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	115
B33	Bearing Results at 1/2 Location For Allied Signal FVS0812 (8009) Extrusion (1" X 4")	115
B34	Fracture Toughness Results for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	116
B35	Fracture Toughness Results for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	117
B36	Fracture Toughness Results for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	117
B37	Fracture Toughness Results for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	118
B38	Fracture Toughness Results for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	119
B39	Fracture Toughness Results for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	119
B40	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	120
B41	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	121
B42	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	122
B43	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	123
B44	Fatigue Results with R=0.1 and Kt=3.0 for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	124
B45	Fatigue Results with R=0.1 and Kt=1.0 for Allied Signal FVS0812 (8009) Extrusion (1" X 4")	125

<u>TABLE</u>		<u>PAGE</u>
B45	Fatigue Crack Growth Rate Results for 8009 (L-T Orientation, Rm Temp, 300 F, 450 F) Nasa-Langley	132
B46	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, Rm Temp) Spec #E7FL1A Northrop	134
B47	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, Rm Temp) Spec #E7FL1B Northrop	135
B47	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, Rm Temp) Spec #E7FL1B Northrop (cont'd)	136
B48	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, Rm Temp) Spec #E7FT1A Northrop	138
B49	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, Rm Temp) Spec #E7FT1B Northrop	139
B49	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, Rm Temp) Spec #E7FT1B Northrop (cont'd)	140
B49	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, Rm Temp) Spec #E7FT1B Northrop (cont'd)	141
B50	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, Rm Temp, R=0.1) USAF	143
B51	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, 450 F, R=0.1) USAF	145
B52	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, 600 F, R=0.1) USAF	147
B53	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, Rm Temp, R=0.1) USAF	149
B54	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, 450 F, R=0.1) USAF	151
B55	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, 600 F, R=0.1) USAF	153
B56	FALSTAFF Spectrum Fatigue Crack Growth Rate Data for 8009 Extrusion (L-T Orientation) USAF	155
B57	Mini-TWIST Spectrum Fatigue Crack Growth Rate Data for 8009 Extrusion (L-T Orientation) USAF	157

<u>TABLE</u>		<u>PAGE</u>
C1	Tensile Results for Alcoa CZ42 Sheet (0.090" Thick)	159
C2	Tensile Results for Alcoa CZ42 Sheet (0.090" Thick)	159
C3	Tensile Results for Alcoa CZ42 Sheet (0.090" Thick)	160
C4	Tensile Results for Alcoa CZ42 Sheet (0.090" Thick)	160
C5	Tensile Results for Alcoa CZ42 Sheet (0.090" Thick)	161
C6	Tensile Results for Alcoa CZ42 Sheet (0.090" Thick)	161
C7	Tensile Results for Alcoa CZ42 Sheet (0.090" Thick)	162
C8	Compression Results for Alcoa CZ42 Sheet (0.090" Thick)	163
C9	Compression Results for Alcoa CZ42 Sheet (0.090" Thick)	163
C10	Compression Results for Alcoa CZ42 Sheet (0.090" Thick)	164
C11	Compression Results for Alcoa CZ42 Sheet (0.090" Thick)	164
C12	Compression Results for Alcoa CZ42 Sheet (0.090" Thick)	165
C13	Compression Results for Alcoa CZ42 Sheet (0.090" Thick)	165
C14	Fatigue Crack Growth Rate Results CZ42 Sheet (L-T Orientation, Rm Temp, 450 F, and 600 F) USAF	167
C15	Fatigue Crack Growth Rate Results CZ42 Sheet (T-L Orientation, Rm Temp, 450 F, and 600 F) USAF	169
D1	Tensile Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	171
D2	Tensile Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	171
D3	Tensile Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	172

<u>TABLE</u>		<u>PAGE</u>
D4	Tensile Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	172
D5	Tensile Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	173
D6	Tensile Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	173
D7	Compression Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	174
D8	Compression Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	174
D9	Compression Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	175
D10	Compression Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	175
D11	Compression Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	176
D12	Compression Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	176
D13	Fracture Toughness Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	177
D14	Fracture Toughness Results for Alcoa CZ42 Extrusion (1" X 3" X 72")	177
D15	Fatigue Results with R=0.1 and Kt=1.0 for Alcoa CZ42 Extrusion (1" X 3" X 72")	178
D16	Fatigue Results with R=0.1 and Kt=1.0 for Alcoa CZ42 Extrusion (1" X 3" X 72")	178
D17	Fatigue Crack Growth Rate Results for CZ42 Extrusion (L-T Orientation, Rm Temp, 450 F, and 600 F) USAF	181
D18	Fatigue Crack Growth Rate Results for CZ42 Extrusion (T-L Orientation, Rm Temp, 450 F, and 600 F) USAF	183
E1	Tensile Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	185
E2	Tensile Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	185

<u>TABLE</u>		<u>PAGE</u>
E3	Tensile Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	186
E4	Tensile Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	186
E5	Tensile Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	187
E6	Tensile Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	187
E7	Compression Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	188
E8	Compression Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	188
E9	Compression Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	189
E10	Compression Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	189
E11	Compression Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	190
E12	Compression Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	190
E13	Bearing Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	191
E14	Bearing Results at 1/2 Location for Alcoa CU78 (8019) Extrusion	192
E15	Fracture Toughness Results for Alcoa CU78 (8019) Extrusion	193
E16	Fracture Toughness Results for Alcoa CU78 (8019) Extrusion	193
E17	Fatigue Results with R=0.1 and Kt=1.0 for Alcoa CU78 (8019) Extrusion	194
E18	Fatigue Results with R=0.1 and Kt=1.0 for Alcoa CU78 (8019) Extrusion	196
E19	Fatigue Results with R=0.1 and Kt=1.0 for Alcoa CU78 (8019) Extrusion	198
E20	Fatigue Results with R=0.1 and Kt=3.0 for Alcoa CU78 (8019) Extrusion	200

<u>TABLE</u>		<u>PAGE</u>
E21	Fatigue Crack Growth Results for 8019 Extrusion (L-T and T-L Orientations, Rm Temp) USAF	203
E22	Fatigue Crack Growth Rate Results for 8019 (L-T and T-L Orientations, 450 F) USAF	205
E23	Fatigue Crack Growth Rate Results for 8019 (L-T and T-L Orientations, 600 F) USAF	207

LIST OF FIGURES

<u>FIGURE</u>		<u>PAGE</u>
A1	Fatigue Results for 8009 Sheet (Longitudinal, Room Temperature)	44
A2	Fatigue Results for 8009 Sheet (Longitudinal, 450 F)	46
A3	Fatigue Results for 8009 Sheet (Longitudinal, 600 F)	46
A4	Fatigue Results for 8009 Sheet (Long Transverse, Kt=1) McDonnell Douglas	52
A5	Fatigue Results for 8009 Sheet (Longitudinal, Room Temperature, Kt=3)	54
A6	Fatigue Results for 8009 Sheet (Longitudinal, 450 F, Kt=3)	56
A7	Fatigue Results for 8009 Sheet (Longitudinal, 600 F, Kt=3)	58
A8	Fatigue Results for 8009 Sheet (Long Transverse, Kt=3) McDonnell Douglas	62
A9	Fatigue Results for 8009 Sheet (Longitudinal, 300 F, Kt=3) McDonnell Douglas	64
A10	Fatigue Results for 8009 Sheet (Longitudinal, 100 Hrs @ 450 F, 450 F) Northrop	65
A11	Fatigue Results for 8009 Sheet (Longitudinal, 450 F, Kt=2.7) General Dynamics TX	67
A12	R-Curve Results of 8009 Sheet (L-T Orientation, Room Temperature) USAF	68
A13	R-Curve Results of 8009 Sheet (T-L Orientation, Room Temperature) USAF	69
A14	R-Curve Results of 8009 Sheet (L-T Orientation, 450 F) USAF	70
A15	R-Curve Results of 8009 Sheet (L-T Orientation, 450 F) USAF	71
A16	R-Curve Results of 8009 Sheet (L-T Orientation, 600 F) USAF	72
A17	R-Curve Results of 8009 Sheet (T-L Orientation, 600 F) USAF	73

<u>FIGURE</u>		<u>PAGE</u>
A18	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, Rm Temp, T-L Orientation, 450 F) R=0.1, Freq=5HZ	74
A19	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T and T-L Orientations, Rm Temp) R=0.1, Northrop	76
A20	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T and T-L Orientations, Rm Temp, 300 F, 400 F) R=0.1, Northrop	77
A21	Fatigue Crack Growth Rate Results of 8009 Sheet (L-T Orientation, Rm Temp, 450 F, and 600 F) R=0.1, USAF	84
A22	Fatigue Crack Growth Rate Results of 8009 Sheet (T-L Orientation, Rm Temp, 450 F, and 600 F) R=0.1, USAF	86
A23	Comparison of 8009 Sheet and 7050-T76 Plate FALSTAFF Spectrum Fatigue Growth Rate Data	88
A24	Comparison of 8009 Sheet and 7050-T76 Plate Mini-TWIST Spectrum Fatigue Growth Rate Data	92
B1	Fatigue Results of 8009 Extrusion (Longitudinal Orientation) Northrop	126
B2	Fatigue Results of 8009 Extrusion (Longitudinal Orientation) Army	127
B3	Fatigue Results of 8009 Extrusion (Longitudinal Orientation, 100 Hr Expos.) Northrop	128
B4	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, Rm Temp) Nasa-Langley	129
B5	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, 300 F) Nasa-Langley	130
B6	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, 450 F) Nasa-Langley	131
B7	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, Rm Temp) Northrop	133
B8	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, Rm Temp) Northrop	137
B9	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, Rm Temp, R=0.1) USAF	142
B10	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, 450 F, R=0.1) USAF	144
B11	Fatigue Crack Growth Rate Results for 8009 Extrusion (L-T Orientation, 600 F, R=0.1) USAF	146

<u>FIGURE</u>		<u>PAGE</u>
B12	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, Rm Temp, R=0.1) USAF	148
B13	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, 450 F, R=0.1) USAF	150
B14	Fatigue Crack Growth Rate Results for 8009 Extrusion (T-L Orientation, 600 F, R=0.1) USAF	152
B15	Comparison of 8009 Extrusion and 7050 Plate FALSTAFF Spectrum Fatigue Crack Growth Rate Data (L-T Orientation) USAF	154
B16	Comparison of 8009 Extrusion and 7050 Plate Mini-TWIST Spectrum Fatigue Crack Growth Rate Data (L-T Orientation) USAF	156
C1	Fatigue Crack Growth Rate Results of (L-T Orientation, Rm Temp, 450 F, and 600 F) USAF	166
C2	Fatigue Crack Growth Rate Results of (T-L Orientation, Rm Temp, 450 F, and 600 F) USAF	168
D1	Fatigue Results for CZ42 Extrusion (Longitudinal Orientation, 450 F and 600 F) Army	179
D2	Fatigue Results for CZ42 Extrusion (L-T Orientation, Rm Temp, 450 F, and 600 F) USAF	180
D3	Fatigue Crack Growth Rate Results for CZ42 Extrusion (T-L Orientation, Rm Temp, 450 F, and 600 F) USAF	182
E1	Fatigue Results for 8019 Extrusion (Longitudinal, Rm Temp, Kt=1)	195
E2	Fatigue Results for 8019 Extrusion (Longitudinal, 450 F, Kt=1)	197
E3	Fatigue Results for 8019 Extrusion (Longitudinal, 600 F, Kt=1)	199
E4	Fatigue Results for 8019 Extrusion (Longitudinal, Kt=3)	201
E5	Fatigue Crack Growth Rate Results for 8019 Extrusion (L-T and T-L Orientations, Rm Temp) USAF	202
E6	Fatigue Crack Growth Rate Results for 8019 Extrusion (L-T and T-L Orientations, 450 F) USAF	204
E7	Fatigue Crack Growth Rate Results for 8019 (L-T and T-L Orientations, 600 F) USAF	206

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 General Dynamics TX, General Dynamics CA, McDonnell Douglas MO, McDonnell Douglas CA, NASA-Langley VA, Northrop CA, Army MA, Rohr Industries CA, and the Air Force.

SECTION 1

INTRODUCTION

High performance aerospace systems are dependent on materials that are lighter, have improved mechanical properties, have a potential for use at elevated temperatures, and/or offer a cost savings. Aluminum alloys that met these criteria were the newly developed high temperature aluminum alloys.

In 1989, 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 a report 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 rate testing on selected alloys. A list of participants is shown in the following table (Table 1).

This final report contains the high temperature aluminum alloys: 8009 (formerly known as FVS0812) Sheet and Extrusion produced by Allied Signal, CZ42 Sheet and Extrusion, and 8019 (formerly known as CU78) Extrusion produced by Alcoa. Comparisons to other materials and ranking of materials are generally avoided since each application may be based on different evaluation criteria.

TABLE 1. PARTICIPANTS AND ALLOYS IN THE COOPERATIVE TEST PROGRAM.

PARTICIPANTS	MATERIALS		ALCOA		
	FVS0812 (8009) SHEET (0.09" x 24" x 48")	FVS0812 (8009) EXTRUSION (1.0" x 4" x 48")	CZ42 SHEET (0.09" x 12" x 48")	CZ42 EXTRUSION (1" x 3" x 6")	CJ78 (8019) EXTRUSION (1" x 3" x 6")
Air Force, OH	X	X	X	X	X
Army, MA		X		X	X
Douglas Aircraft, CA	X	X			
General Dynamics Space Systems, CA	X	X	X		X
General Dynamics, TX	X				
McDonnell Douglas Space Systems, CA	X				
McDonnell Douglas Missile Systems, MO		X			
NASA, VA	X	X	X	X	X
Northrop, CA	X	X	X	X	X
Rohr, CA	X				

SECTION 2

MATERIALS AND TESTS

The Allied Signal high temperature aluminum alloys 8009 0.09 inch x 24 inch x 48 inch sheet and 8009 1 inch x 4 inch x 48 inch extrusion were received during 1990, the sheet material arriving in February and July and the extrusions in the Fourth Quarter. The Alcoa high temperature aluminum alloys were received on various dates: CZ42 0.09 inch x 12 inch x 48 inch sheet September 1991, CZ42 1 inch x 3 inch x 72 inch extrusion April 1991, and 8019 1 inch x 3 inch x 72 inch extrusion April 1991.

The 8009 alloys were tested by all of the participants as marked by an "X" in Table 1. The CZ42 sheet was tested by General Dynamics CA and the Air Force. The CZ42 and 8019 extrusions were tested by the Army and Air Force.

All testing (tension, compression, shear, bearing, fracture toughness, fatigue, and fatigue crack growth rate) was performed in accordance with the appropriate ASTM standards, unless otherwise specified.

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

SECTION 3

PRESENTATION

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, shear, and bearing are in tabular form. Fracture toughness, fatigue, fatigue crack growth rate, and spectrum fatigue crack growth rate are shown in tabular and graphical form.

SECTION 4

RESULTS AND DISCUSSION

The data generated by the participants on the 8009 sheet, 8009 extrusion, CZ42 sheet, CZ42 extrusion, and 8019 extrusion are in the appendices. The following table lists the high temperature aluminum alloy, form, and the appendix where the data can be found.

TABLE 2
CONTENTS OF APPENDICES

<u>Alloy</u>	<u>Form</u>	<u>Appendix</u>
8009	Sheet	A
8009	Extrusion	B
CZ42	Sheet	C
CZ42	Extrusion	D
8019	Extrusion	E

SECTION 5

CONCLUSIONS

Ten aerospace laboratories participated in generating data on the 8009, CZ42, and 8019 high temperature aluminum alloys for the cooperative test program. These data provide an extensive data base on high temperature aluminum alloys.

APPENDIX A

**8009 SHEET
0.09" X 24" X 48"**

TABLE A1
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	RT	LONG	66.6	63.1	7.0		11.3
			66.9	64.0	12.0		10.9
			66.8	64.2	15.0		11.0
MCDONNELL DOUGLAS	RT	LONG	62.6	59.5	9.0		11.3
			66.5	64.3	9.0		10.8
			67.2	65.3	7.0		11.1
ROHR INDUSTRIES	RT	LONG	70.6	64.4	9.5		11.4
			71.4	64.8	10.5		11.6
			71.4	64.7	9.5		11.4
GENERAL DYNAMICS, TX	RT	LONG	64.3	60.8	8.1		11.1
			64.3		6.8		12.4
			66.3	61.1	7.5		12.2
			66.4	62.3	6.8		11.3
			65.5	61.4	6.9		12.5
			66.4	63.4	4.7		11.7
			66.9	62.1	6.3		11.6
MCDONNELL DOUGLAS, CA	RT	LONG	68.1	63.6	10.0		10.7
			68.1	63.6	9.0		10.7
			68.1	63.6	8.0		10.8
AIR FORCE	RT	LONG	60.1	58.3	11.8		
			61.5	58.1	11.2		
			61.7	59.6	12.3		
NASA-LANGLEY	RT	LONG	71.5	62.0	16.0		12.2
			71.5	62.0	16.0		12.2
			71.7	62.0	16.0		12.4
			74.5	63.0	16.0		12.2
			72.0	63.0	17.0		12.1
			70.6	64.0			12.2
NORTHROP	RT	LONG	68.2	64.3	10.0		10.9
			68.3	64.7	10.0		10.7
			68.0	64.6	10.0		10.7
AVERAGE			67.5	62.7	10.3		11.5
STANDARD DEVIATION			3.4	1.9	3.4		0.6

TABLE A2
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	RT	L TRANS	65.8	61.2	17.0		11.0
			65.8	61.6	10.0		10.7
			65.6	63.8	10.0		11.3
MCDONNELL DOUGLAS	RT	L TRANS	63.3	59.2	10.0		11.4
			62.9	58.2	12.0		11.6
			63.0	58.8	10.0		11.3
ROHR INDUSTRIES	RT	L TRANS	71.7	60.9			11.5
			72.1	61.4			11.7
			72.5	62.8	8.5		12.2
GENERAL DYNAMICS, TX	RT	L TRANS	63.4	56.1	6.3		12.4
			62.2	55.3	10.9		11.6
MCDONNELL DOUGLAS, CA	RT	L TRANS	70.4	64.1	8.0		10.9
			68.8	62.5	7.0		10.9
			69.5	63.0	7.0		11.3
AIR FORCE	RT	L TRANS	60.0	55.7	15.8		
			60.3	56.2	13.5		
			60.5	57.2	14.3		
NASA-LANGLEY	RT	L TRANS	72.4	62.0			12.4
			73.1	62.0	20.0		12.4
			72.5	61.0	17.0		12.4
			73.8	62.0	15.0		12.4
			73.6	62.0			12.4
			73.2	62.0			12.3
NORTHROP	RT	L TRANS	67.4	62.6	12.5		10.4
			66.9	62.0	10.0		10.6
			67.0	61.6	12.0		11.4
AVERAGE			67.6	60.6	11.8		11.6
STANDARD DEVIATION			4.6	2.6	3.7		0.7

TABLE A3
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
MCDONNELL DOUGLAS, CA	300	LONG	56.4	53.2	5.0		9.6
			55.5	51.4	5.0		9.1
			56.7	54.1	5.0		9.6
NASA-LANGLEY	300	LONG	57.5	52.5			10.9
			59.1	53.0	9.0		11.1
			58.6	52.5			11.0
		AVERAGE	57.3	52.8	6.0		10.2
		STANDARD DEVIATION	1.4	0.9	2.0		0.9

TABLE A4
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
MCDONNELL DOUGLAS, CA	300	L TRANS	55.4	50.1	4.0		9.6
			55.6	50.4	5.0		9.3
			56.2	51.0	5.0		9.8
NASA-LANGLEY	300	L TRANS	60.6	53.0	7.0		11.3
			59.8	51.0			11.2
			59.9	52.0	9.0		11.2
		AVERAGE	57.9	51.2	6.0		10.4
		STANDARD DEVIATION	2.4	1.1	2.0		0.9

TABLE A5

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	450	LONG	42.2	38.1	12.0		
			40.4	36.6	10.0		
			42.2	39.1	12.0		
MCDONNELL DOUGLAS	450	LONG	41.3	39.8	8.0		9.7
			41.8	39.9	8.0		9.8
			42.0	40.7	8.0		10.1
			42.0	39.9	9.0		9.8
ROHR INDUSTRIES	450	LONG	48.7	44.7	9.5		9.5
			47.6	43.5	8.5		9.2
			46.8	43.0	8.3		9.0
GENERAL DYNAMICS, TX	450	LONG	39.9	38.3	10.0		10.3
			39.8	37.1	7.6		10.0
			41.1		10.6		10.7
MCDONNELL DOUGLAS, CA	450	LONG	44.4	42.3	8.0		8.8
			45.1	42.9	6.0		9.4
			45.0	42.8	8.0		9.6
AIR FORCE	450	LONG	43.9	41.3	8.9		
			42.1	40.3	9.7		
			45.2	44.4	7.5		
NASA-LANGLEY	450	LONG	48.9	42.0	13.0		10.2
			49.1	42.0	15.0		10.3
			48.4	41.0	12.0		10.0
AVERAGE			44.0	40.9	9.5		9.8
STANDARD DEVIATION			3.1	2.3	2.2		0.5

TABLE A6

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	450	L TRANS	42.1	36.2	12.0		
			42.2	36.5	10.0		
			41.7	34.6	7.0		
MCDONNELL DOUGLAS	450	L TRANS	39.4	34.8	9.0		9.6
			41.9	37.7	10.0		9.9
			40.7	37.0	10.0		10.1
ROHR INDUSTRIES	450	L TRANS	47.5	42.6	9.5		9.6
			48.3	42.9	9.2		9.6
			47.5	43.7	8.5		9.2
GENERAL DYNAMICS, TX	450	L TRANS	42.9		6.7		
			39.9	35.9	7.9		10.9
MCDONNELL DOUGLAS, CA	450	L TRANS	43.8	41.3	7.0		9.2
			44.9	41.4	8.0		9.0
			43.9	40.5	7.0		10.0
AIR FORCE	450	L TRANS	39.5	36.7	9.3		
			42.7	36.4	9.1		
			44.8	38.9	8.9		
NASA-LANGLEY	450	L TRANS	50.1	41.5			10.6
			49.4	40.0	12.0		10.5
			49.9	40.0			10.5
AVERAGE			44.2	38.9	9.0		9.9
STANDARD DEVIATION			3.5	2.9	1.6		0.6

TABLE A7
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	LONG	28.6	26.0	6.0		
			28.8	26.0	10.0		
			27.7	24.9	12.0		
MCDONNELL DOUGLAS	600	LONG	30.2	28.9	10.0		8.8
			32.3	29.4	10.0		8.8
			33.2	32.6	9.0		9.5
ROHR INDUSTRIES	600	LONG	33.0	28.9	14.2		7.8
			32.2	28.3	9.3		7.5
			32.2	27.8	14.7		7.5
GENERAL DYNAMICS, TX	600	LONG	30.2	25.8	12.1		9.9
			29.0	24.6	7.1		9.7
			24.5		11.8		8.4
AIR FORCE	600	LONG	31.3	29.3	11.8		
			30.1	27.3	12.0		
			31.7	29.6	11.7		
		AVERAGE	30.3	27.8	10.8		8.7
		STANDARD DEVIATION	2.3	2.2	2.4		0.9

TABLE A8

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	L TRANS	29.3 28.2 28.0	24.7 23.3 22.5	10.0 11.0 10.0		
MCDONNELL DOUGLAS	600	L TRANS	28.2 28.2 28.6	25.4 25.2 25.4	14.0 14.0 14.0		9.1 9.1 9.2
ROHR INDUSTRIES	600	L TRANS	32.9 33.6 33.3	27.5 30.9 27.9	14.5 10.3 12.9		8.1 8.3 7.4
GENERAL DYNAMICS, TX	600	L TRANS	29.4 31.2	24.6 25.8	15.8 14.6		9.3 9.6
AIR FORCE	600	L TRANS	31.8 32.5 32.0	28.9 27.7 28.2	12.5 10.5 11.1		
		AVERAGE	30.5	26.3	12.5		8.8
		STANDARD DEVIATION	2.1	2.3	2.0		0.7

TABLE A9

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	-320	LONG	101.4	93.4			
			107.8	86.0	1.0		
			108.0	93.0	1.5		
		AVERAGE	105.7	90.8	1.3		
		STANDARD DEVIATION	3.8	4.2	0.4		

TABLE A10

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
(1000 HR EXPOSURE @ 450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
MCDONNELL DOUGLAS, CA	RT	LONG	67.8	63.4	10.0		11.4
			67.8	63.0	10.0		11.6
			67.8	63.4	10.0		11.4
			68.0	62.8	10.0		11.9
			67.3	62.2	7.0		11.6
			67.9	62.6	8.0		11.7
		AVERAGE	67.8	62.9	9.2		11.6
		STANDARD DEVIATION	0.2	0.5	1.3		0.2

TABLE A11

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
(AFTER 100 HRS @450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	LONG	43.3	41.6	8.5		11.4
			43.4	42.3	9.0		10.1
		AVERAGE	43.4	42.0	8.8		10.8
		STANDARD DEVIATION	0.1	0.5	0.4		0.9

TABLE A12

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
(AFTER 100 HRS @450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	L TRANS	45.6	39.5	8.5		11.0
			44.1	39.9	9.0		10.8
			43.3	39.5	9.0		10.1
		AVERAGE	44.3	39.6	8.8		10.6
		STANDARD DEVIATION	1.2	0.2	0.3		0.5

TABLE A13

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
(AFTER 100 HRS @600F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	600	LONG	31.2	28.8	13.0		9.5
			30.2	29.4	13.0		9.6
			30.7	29.6	13.0		9.6
		AVERAGE	30.7	29.3	13.0		9.6
		STANDARD DEVIATION	0.5	0.4	0.0		0.1

TABLE A14

TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
(AFTER 100 HRS @600F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	600	L TRANS	30.1	28.7	13.5		10.0
			30.6	29.2	13.5		9.5
			29.9	29.4	14.0		10.0
		AVERAGE	30.2	29.1	13.7		9.8
		STANDARD DEVIATION	0.4	0.4	0.3		0.3

TABLE A15

COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	RT	LONG	48.5	
			49.5	
			49.1	
MCDONNELL DOUGLAS	RT	LONG	56.1	9.0
			52.6	
			51.9	
			51.1	11.7
			50.2	12.2
ROHR INDUSTRIES	RT	LONG	51.6	12.3
			53.8	12.1
			54.2	12.1
GENERAL DYNAMICS, TX	RT	LONG	47.8	12.0
MCDONNELL DOUGLAS, CA	RT	LONG	55.3	11.4
			56.3	11.8
			56.1	11.2
AIR FORCE	RT	LONG	39.6	
			45.8	
			45.5	
NORTHROP	RT	LONG	48.2	13.3
			50.4	12.4
AVERAGE			50.7	11.8
STANDARD DEVIATION			4.2	1.0

TABLE A16
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	RT	L TRANS	57.7	
			57.6	
			57.3	
MCDONNELL DOUGLAS	RT	L TRANS	59.5	12.0
			61.8	11.7
ROHR INDUSTRIES	RT	L TRANS	62.8	12.7
			64.2	12.4
			62.9	12.3
GENERAL DYNAMICS, TX	RT	L TRANS	50.5	11.6
MCDONNELL DOUGLAS, CA	RT	L TRANS	65.7	11.8
			65.5	12.1
			66.3	11.6
AIR FORCE	RT	L TRANS	57.6	
			59.7	
NORTHROP	RT	L TRANS	60.4	13.1
			61.1	13.1
AVERAGE			60.7	12.2
STANDARD DEVIATION			4.1	0.6

TABLE A17

COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
MCDONNELL	300	LONG	43.6	10.1
DOUGLAS, CA			51.9	10.7
			45.0	10.7
		AVERAGE	46.8	10.5
		STANDARD DEVIATION	4.4	0.3

TABLE A18

COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
MCDONNELL	300	L TRANS	49.7	9.8
DOUGLAS, CA			55.7	11.0
			56.7	10.5
		AVERAGE	54.0	10.4
		STANDARD DEVIATION	3.8	0.6

TABLE A19
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	450	LONG	32.4 35.4 31.0	
MCDONNELL DOUGLAS	450	LONG	32.5 29.7 30.4	11.7 10.6 9.5
ROHR INDUSTRIES	450	LONG	44.2 43.5 45.9	10.0 10.4 10.0
GENERAL DYNAMICS, TX	450	LONG	29.8	8.7
MCDONNELL DOUGLAS, CA	450	LONG	38.0 36.8 37.4	9.1 9.8 9.0
AIR FORCE	450	LONG	35.6 35.4 35.4	
AVERAGE			35.8	9.9
STANDARD DEVIATION			5.1	0.9

TABLE A20
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	450	L TRANS	36.9 40.5 38.6	
MCDONNELL DOUGLAS	450	L TRANS	42.6 40.5 43.4	11.2 9.8 11.5
ROHR INDUSTRIES	450	L TRANS		9.9 9.5 10.3
GENERAL DYNAMICS, TX	450	L TRANS	35.3 35.6	9.4 9.3
MCDONNELL DOUGLAS, CA	450	L TRANS	41.6 41.1 40.7	10.4 10.5 10.5
AIR FORCE	450	L TRANS	35.5 43.8 44.5	
		AVERAGE	40.4	10.2
		STANDARD DEVIATION	3.3	0.7

TABLE A21
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	600	LONG	23.6	
			27.3	
			25.9	
MCDONNELL DOUGLAS	600	LONG	23.3	9.1
			26.5	11.0
			30.1	11.6
ROHR INDUSTRIES	600	LONG	27.5	7.8
			23.9	8.1
			22.6	8.2
GENERAL DYNAMICS, TX	600	LONG		7.7
			23.7	8.8
			20.6	8.5
AIR FORCE	600	LONG	28.5	
			28.1	
AVERAGE			25.5	9.0
STANDARD DEVIATION			2.8	1.4

TABLE A22

COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	600	L TRANS	28.3	
			22.4	
			23.5	
MCDONNELL DOUGLAS	600	L TRANS	31.3	10.1
			31.5	10.8
			32.6	10.6
ROHR INDUSTRIES	600	L TRANS	24.5	8.3
			25.2	8.5
			24.0	8.4
GENERAL DYNAMICS, TX	600	L TRANS	24.3	
			25.2	8.6
AIR FORCE	600	L TRANS	30.9	
			31.7	
AVERAGE			27.3	9.3
STANDARD DEVIATION			3.8	1.1

TABLE A23

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	RT	L-S	39.7
			39.5
			39.4
		AVERAGE	39.5
		STANDARD DEVIATION	0.2

TABLE A24

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	RT	T-S	39.5
			39.6
			40.0
GENERAL DYNAMICS, TX	RT	T-S	40.3
			40.8
		AVERAGE	40.0
		STANDARD DEVIATION	0.5

TABLE A25

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	450	L-S	27.1
			27.2
			27.0
		AVERAGE	27.1
		STANDARD DEVIATION	0.1

TABLE A26

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	450	T-S	26.8
			28.0
			27.3
GENERAL DYNAMICS, TX	450	T-S	27.4
		AVERAGE	27.4
		STANDARD DEVIATION	0.5

TABLE A27

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	600	L-S	21.8
			22.6
			21.8
		AVERAGE	22.1
		STANDARD DEVIATION	0.5

TABLE A28

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	600	T-S	21.8
			21.6
			21.3
GENERAL DYNAMICS, TX	600	T-S	21.1
			20.7
		AVERAGE	21.6
		STANDARD DEVIATION	0.3

TABLE A29

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	LONG	1.5	90.2	76.7
				90.4	73.1
				88.4	72.5
MCDONNELL DOUGLAS	RT	LONG	1.5	90.4	85.6
				97.6	87.7
				96.3	87.5
ROHR INDUSTRIES	RT	LONG	1.5	104.5	99.6
				106.1	99.6
				105.5	101.3
MCDONNELL DOUGLAS, CA	RT	LONG	1.5	94.1	90.9
				92.9	89.2
				90.1	87.8
AIR FORCE	RT	LONG	1.5	81.8	77.3
				81.6	77.7
				81.8	79.8
NASA-LANGLEY	RT	LONG	1.5	100.4	93.6
				96.6	93.9
					92.4
				100.4	95.2
				101.3	94.3
AVERAGE				94.2	87.8
STANDARD DEVIATION				7.6	8.9

TABLE A30
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	L TRANS	1.5	117.3	102.4
				115.4	100.2
				116.2	102.9
MCDONNELL DOUGLAS	RT	L TRANS	1.5	96.3	93.6
				93.3	87.3
				92.0	86.1
ROHR INDUSTRIES	RT	L TRANS	1.5	107.3	101.9
				103.0	97.0
				104.0	98.5
MCDONNELL DOUGLAS, CA	RT	L TRANS	1.5	93.9	92.2
				91.6	91.3
				93.6	90.7
AIR FORCE	RT	L TRANS	1.5	82.2	76.4
				82.0	77.8
NASA-LANGLEY	RT	L TRANS	1.5	97.4	95.0
				103.3	
				94.2	94.1
				97.8	93.5
				96.7	90.2
AVERAGE				98.8	92.6
STANDARD DEVIATION				10.1	7.6

TABLE A31

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	300	LONG	1.5	80.4	72.1
DOUGLAS, CA				81.7	70.4
				85.9	73.7
			AVERAGE	82.7	72.1
			STANDARD DEVIATION	2.9	1.6

TABLE A32

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	300	L TRANS	1.5	85.7	76.4
DOUGLAS, CA				85.5	75.0
				85.4	75.5
			AVERAGE	85.5	75.6
			STANDARD DEVIATION	0.1	0.7

TABLE A33

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	450	LONG	1.5	61.7	49.4
				62.8	52.0
				63.8	50.3
MCDONNELL DOUGLAS	450	LONG	1.5	69.4	65.1
				68.1	63.8
				67.0	63.3
ROHR INDUSTRIES	450	LONG	1.5	75.2	65.4
				74.1	68.0
				78.1	66.7
MCDONNELL DOUGLAS, CA	450	LONG	1.5	66.0	60.5
				69.2	63.4
				70.6	61.4
AIR FORCE	450	LONG	1.5	71.3	58.6
				70.3	62.5
AVERAGE				69.2	60.7
STANDARD DEVIATION				4.8	6.0

TABLE A34
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	450	L TRANS	1.5	62.4	56.2
				60.8	49.8
				61.7	52.0
MCDONNELL DOUGLAS	450	L TRANS	1.5	68.2	64.2
				68.5	64.9
				70.7	66.4
ROHR INDUSTRIES	450	L TRANS	1.5	76.5	68.9
				74.2	65.0
				76.3	68.6
MCDONNELL DOUGLAS, CA	450	L TRANS	1.5	71.2	66.4
				70.4	62.8
				70.9	64.1
AIR FORCE	450	L TRANS	1.5	71.3	64.1
				69.7	60.6
				69.7	63.4
AVERAGE				69.5	62.5
STANDARD DEVIATION				4.8	5.6

TABLE A35

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	600	LONG	1.5	50.1	40.2
				49.8	39.3
				50.0	39.2
MCDONNELL DOUGLAS	600	LONG	1.5	49.4	46.3
				47.9	44.4
				47.5	45.0
ROHR INDUSTRIES	600	LONG	1.5	58.3	47.5
				57.7	47.7
				53.6	48.0
AIR FORCE	600	LONG	1.5	55.1	45.5
				53.9	47.2
				56.1	47.2
AVERAGE				52.5	44.8
STANDARD DEVIATION				3.8	3.3

TABLE A36

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8J09) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	600	L TRANS	1.5	49.9	43.2
				49.9	42.2
				50.3	41.8
MCDONNELL DOUGLAS	600	L TRANS	1.5	51.2	49.0
				51.2	48.4
				51.6	49.0
ROHR INDUSTRIES	600	L TRANS	1.5	58.3	49.6
				58.1	48.5
				57.3	48.1
AIR FORCE	600	L TRANS	1.5	54.7	47.4
				52.0	43.1
				56.4	47.1
AVERAGE				53.4	46.5
STANDARD DEVIATION				3.3	3.0

TABLE A37

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	LONG	2.0	113.3	84.8
				115.3	79.4
				113.6	79.5
MCDONNELL DOUGLAS	RT	LONG	2.0	111.0	91.7
				122.0	95.0
				123.0	95.3
ROHR INDUSTRIES	RT	LONG	2.0	128.5	110.5
				128.0	106.3
				123.5	109.2
GENERAL DYNAMICS, TX	RT	LONG	2.0	119.6	93.1
MCDONNELL DOUGLAS, CA	RT	LONG	2.0	116.3	96.2
				114.0	96.6
				115.0	95.5
AIR FORCE	RT	LONG	2.0	109.9	91.7
				103.6	94.2
				101.5	86.6
NASA-LANGLEY	RT	LONG	2.0	128.9	106.0
				129.5	108.0
				128.9	103.6
				130.5	103.6
				127.2	100.8
				126.3	98.3
NORTHROP	RT	LONG	2.0	128.9	105.1
				131.4	107.9
AVERAGE				120.9	97.6
STANDARD DEVIATION				8.9	8.9

TABLE A38

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	L TRANS	2.0	114.7 113.4 113.1	82.5 84.8 80.6
MCDONNELL DOUGLAS	RT	L TRANS	2.0	123.0 123.0 117.0	97.9 99.1 96.5
ROHR INDUSTRIES	RT	L TRANS	2.0	130.0 129.4 130.5	114.3 112.6 113.6
GENERAL DYNAMICS, TX	RT	L TRANS	2.0	93.6	93.6
MCDONNELL DOUGLAS, CA	RT	L TRANS	2.0	110.3 118.0 114.7	98.7 98.1 98.5
AIR FORCE	RT	L TRANS	2.0	95.4 96.4 96.5	81.7 81.4 87.3
NASA-LANGLEY	RT	L TRANS	2.0	131.6 129.0 130.3 126.1 129.4 132.5 131.7	105.9 105.1 102.8 101.1 102.8 103.8 110.9
NORTHROP	RT	L TRANS	2.0	128.5 130.0	107.6 107.6
AVERAGE				119.5	98.7
STANDARD DEVIATION				12.7	10.5

TABLE A39

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	300	LONG	2.0	105.5	78.3
DOUGLAS, CA				106.9	79.3
				105.7	77.4
			AVERAGE	106.0	78.3
			STANDARD DEVIATION	0.8	0.9

TABLE A40

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	300	L TRANS	2.0	108.1	82.9
DOUGLAS, CA				107.6	82.7
				107.4	81.6
			AVERAGE	107.7	82.4
			STANDARD DEVIATION	0.3	0.7

TABLE A41
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	450	LONG	2.0	84.1	58.4
				84.2	56.1
				83.6	55.2
MCDONNELL DOUGLAS	450	LONG	2.0	86.5	70.6
				85.3	69.6
				84.0	69.1
ROHR INDUSTRIES	450	LONG	2.0	98.3	72.8
				110.8	75.2
				101.7	76.9
GENERAL DYNAMICS, TX	450	LONG	2.0	90.5	65.9
MCDONNELL DOUGLAS, CA	450	LONG	2.0	94.8	59.7
				86.0	68.1
				89.1	68.2
AIR FORCE	450	LONG	2.0	73.0	69.2
				72.0	65.1
				71.9	67.2
AVERAGE				87.2	66.7
STANDARD DEVIATION				10.6	6.4

TABLE A42

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	450	L TRANS	2.0	84.5 78.6 80.2	59.8 53.9 53.8
MCDONNELL DOUGLAS	450	L TRANS	2.0	86.5 83.7 84.9	74.2 72.6 72.7
ROHR INDUSTRIES	450	L TRANS	2.0	93.3 97.8 92.7	77.3 74.9 69.9
GENERAL DYNAMICS, TX	450	L TRANS	2.0	88.8 84.6	80.7 67.0
MCDONNELL DOUGLAS, CA	450	L TRANS	2.0	89.1 89.2 90.9	73.7 72.0 72.1
AIR FORCE	450	L TRANS	2.0	66.5 68.8 68.0	62.3 61.8 62.9
AVERAGE				84.0	68.3
STANDARD DEVIATION				9.1	7.9

TABLE A43

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	600	LONG	2.0	64.0	45.8
				63.0	45.9
MCDONNELL DOUGLAS	600	LONG	2.0	59.1	49.9
				57.6	50.3
				60.3	50.0
ROHR INDUSTRIES	600	LONG	2.0	72.0	54.6
				74.1	51.9
				76.1	56.3
GENERAL DYNAMICS, TX	600	LONG	2.0	58.1	47.3
				61.3	48.9
				62.2	52.4
AIR FORCE	600	LONG	2.0	51.3	47.5
				52.1	50.2
				51.6	48.0
AVERAGE				61.6	49.9
STANDARD DEVIATION				7.9	3.1

TABLE A44

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	600	L TRANS	2.0	62.8 62.3 62.9	46.8 46.6 46.2
MCDONNELL DOUGLAS	600	L TRANS	2.0	60.8 60.3 60.9	51.6 50.9 50.9
ROHR INDUSTRIES	600	L TRANS	2.0	76.6 76.4 73.1	57.2 56.5 57.1
GENERAL DYNAMICS, TX	600	L TRANS	2.0	60.7 61.1	59.5 53.0
AIR FORCE	600	L TRANS	2.0	47.0 48.1 46.8	43.4 43.8 45.6
AVERAGE				61.4	50.7
STANDARD DEVIATION				9.6	5.4

TABLE A45

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	Kc (KSI in ^{-0.5})	COMMENT
NORTHROP	RT	L-T	155.0	INVALID
		T-L	155.0	INVALID

NOTE: VALUES INVALID PER ASTM E561

TABLE A46

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	RT	LONG	35.0	230,000
			34.0	54,900
			34.0	102,000
			33.0	28,541,600
			32.5	2,713,400
			32.2	206,900
			32.0	7,406,700
			30.9	21,336,800 *
			30.0	12,616,500 *
MCDONNELL DOUGLAS	RT	LONG	47.3	16,373
			47.3	18,430
			45.4	29,129 !
			45.4	25,080
			41.0	31,072 !
			41.0	71,659 !
			37.8	128,163 !
			37.8	110,037
ROHR INDUSTRIES	RT	LONG	50.0	15,000
			50.0	105,500
			50.0	1,280,000 *
			45.0	544,800
			45.0	998,000
			40.0	1,000,000 *
			40.0	503,500
			40.0	1,170,000 *
			35.0	1,000,000 *
			35.0	1,000,000 *
GENERAL DYNAMICS, TX	RT	LONG	50.0	23,020
			50.0	52,760
			47.0	136,150
			45.0	110,290
			42.0	1,000,000
			42.0	279,000
			40.0	1,200,000
			40.0	492,000
AIR FORCE	RT	LONG	49.5	32,700
			49.5	40,100
			49.0	179,000
			48.0	39,800
			47.0	36,900
			45.0	75,500
			45.0	63,500
			44.3	46,000
			44.0	461,500
			43.0	1,638,600
			42.0	6,740,000
			40.0	9,132,000
NORTHROP	RT	LONG	55.0	23,140
			52.0	91,416
			50.0	1,304,914
			48.0	562,313 #
			45.0	555,726
			43.0	190,784
			40.0	3,000,000
			30.0	3,000,000 *

(*) : RUN OUT

(#): BROKE IN GRIP AREA

(!): FAILED AT PIN HOLE & TEST CONTINUED

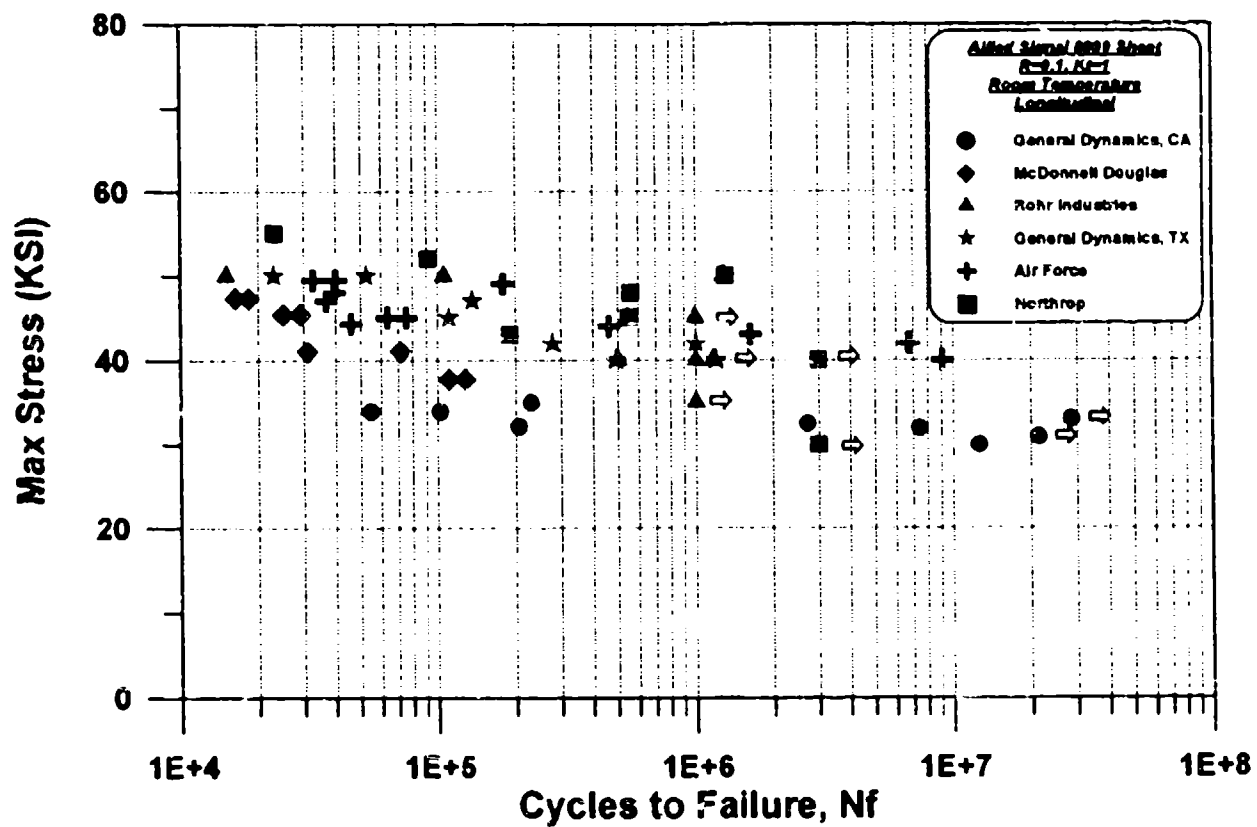


FIGURE A1. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, ROOM TEMPERATURE).

TABLE A47

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	450	LONG	30.0	102,300
			25.0	3,000,000
			20.0	3,322,100
MCDONNELL DOUGLAS	450	LONG	44.1	61,116
			44.1	42,240
			38.1	68,417
			38.1	87,324
			36.1	174,196
			36.1	195,374
			32.1	788,601 #
			32.1	659,468 #
ROHR INDUSTRIES	450	LONG	35.0	370,500
			35.0	624,500
			35.0	200,900
			30.0	318,300
			30.0	347,500
			30.0	132,700
			25.0	1,000,000 *
			25.0	1,000,000 *
			25.0	1,000,000 *
GENERAL DYNAMICS, TX	450	LONG	42.5	33,702
			37.5	66,399
			37.5	66,456
			35.0	133,663
			32.5	423,815
			32.5	192,932
			27.5	771,911
			27.5	479,943
			22.5	1,251,023
			20.0	4,534,928
AIR FORCE	450	LONG	45.0	29,600
			40.0	49,800
			35.0	172,100
			30.0	2,589,700
			27.5	3,135,300
			25.0	4,219,900
			22.5	6,115,200

(*): RUN OUT

(#): BROKE IN GRIP AREA



TABLE A48

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	600	LONG	25.0	186,300
			23.0	351,300
			22.5	165,500
			22.3	103,200
			22.1	332,900
			22.0	10,527,400 *
			22.0	414,800
			20.0	504,700
MCDONNELL DOUGLAS	600	LONG	47.0	35,246
			47.0	31,234
			42.4	52,935
			42.4	87,192
			36.4	393,377
			36.4	299,173
			28.8	1,000,000 *
			28.8	1,000,000 *
ROHR INDUSTRIES	600	LONG	35.0	45,200
			35.0	55,400
			35.0	50,200
			30.0	173,800
			30.0	213,400
			30.0	289,100
			25.0	1,000,000 *
			25.0	1,000,000 *
			25.0	1,000,000 *
GENERAL DYNAMICS, TX	600	LONG	20.0	1,000,000 *
			40.0	693
			40.0	2,006
			35.0	37,096
			35.0	24,532
			30.0	132,940
			30.0	43,350
			25.0	242,851
			25.0	985,031
AIR FORCE	600	LONG	20.0	1,671,616
			35.0	17,700
			30.0	66,230
			25.0	357,900
			25.0	609,700
			22.0	9,900,000

(*): RUN OUT

TABLE A49

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (800S) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	RT	L TRANS	52.9	38,255
			52.9	27,853
			47.0	48,533 1
			47.0	58,110 1
			41.2	97,090
			41.2	99,455
			35.3	1,000,000 *
			35.3	698,178

(*): RUN OUT

(1): FAILED AT PIN HOLE & TEST CONTINUED

TABLE A50

FATIGUE RESULTS WITH R=0.1 AND K_t=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
MCDONNELL DOUGLAS	450	L TRANS	40.2	135,584	
			40.2	112,975	
			34.7	197,670	
			34.7	224,606	
			31.0	699,997	#
			31.0	832,632	
			29.2	1,000,000	*
			29.2	1,000,000	*

(*): RUN OUT

(#): BROKE IN GRIP AREA

TABLE AS1

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
MCDONNELL DOUGLAS	600	L TRANS	35.4	174,795	
			35.4	220,271	
			30.4	247,847	#
			30.4	325,351	
			25.3	623,630	
			25.3	1,000,000	*
			22.8	1,000,000	*
			22.8	1,000,000	*

(*): RUN OUT

(#): BROKE OUTSIDE OF REDUCED SECTION

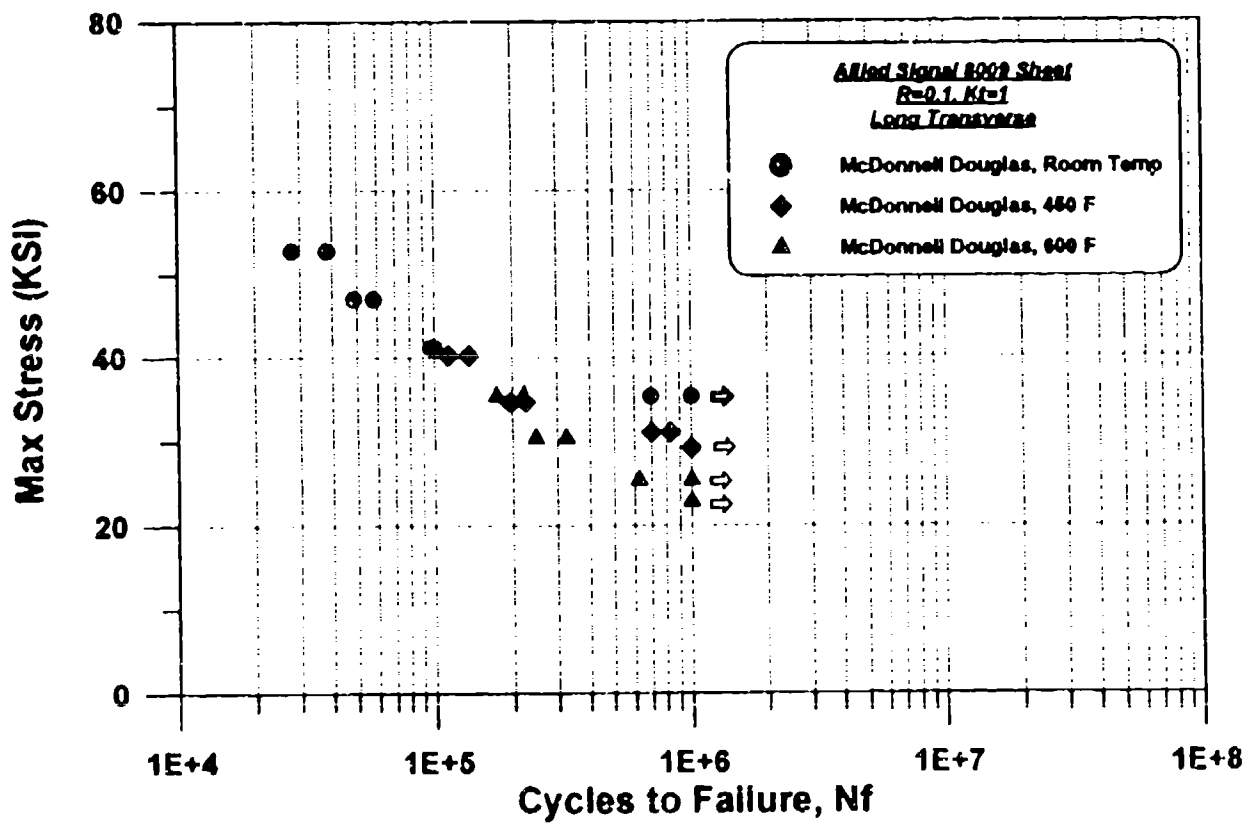


FIGURE A4. FATIGUE RESULTS FOR 8009 SHEET
 (LONG TRANSVERSE, $K_t=1$)
 MCDONNELL DOUGLAS.

TABLE A52

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
GENERAL DYNAMICS, CA	RT	LONG	25.4	11,100	
			18.2	90,400	
			17.0	163,700	
			15.3	104,400	
			14.5	10,000,000	*
			14.5	13,600,400	*
			13.5	10,746,900	*
MCDONNELL DOUGLAS	RT	LONG	50.4	3,872	
			50.4	2,186	
			47.3	4,588	
			47.3	4,660	
			44.1	6,137	
			37.8	10,278	
			31.5	38,122	
			25.2	295,724	
ROHR INDUSTRIES	RT	LONG	40.0	13,000	
			30.0	57,000	
			30.0	32,000	
			27.7	80,000	
			25.0	294,000	
			25.0	776,000	
			25.0	1,008,000	*
			20.0	6,839,000	*
			20.0	1,824,000	*
			20.0	1,156,000	*
MCDONNELL DOUGLAS, CA	RT	LONG	20.0	54,000	
			20.0	140,700	
			19.0	200,600	
			19.0	10,000,000	*
			19.0	250,700	
			18.5	2,635,300	
			18.0	101,000	
			18.0	10,000,000	*
			16.0	10,000,000	*
			14.0	10,000,000	*
AIR FORCE	RT	LONG	38.0	3,500	
			35.0	6,000	
			34.1	10,500	
			28.7	15,600	
			26.0	20,500	
			20.7	314,700	
			19.1	2,000,000	
NORTHROP	RT	LONG	25.0	62,410	
			23.0	150,250	
			22.0	106,340	
			21.0	1,013,700	#
			20.0	3,000,000	*

(*): RUN OUT

(#): BROKE IN GRIP AREA

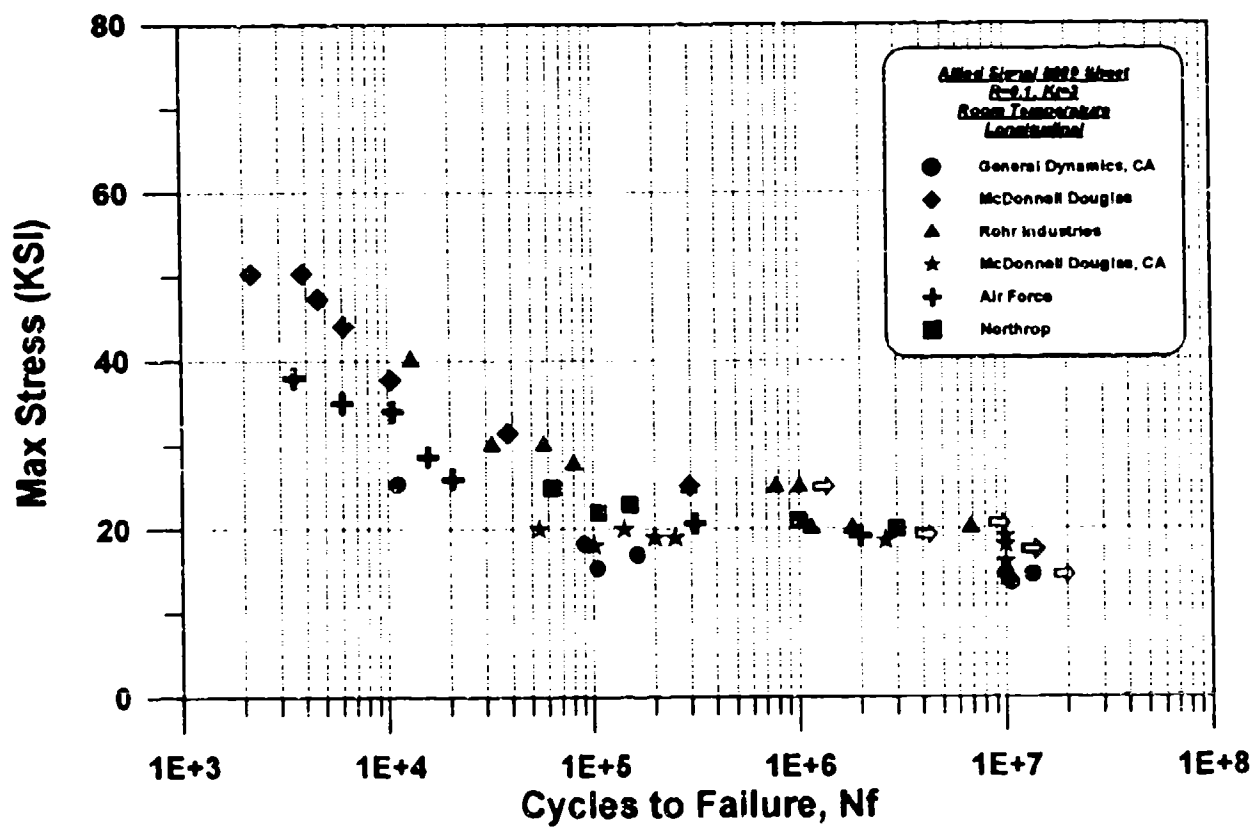


FIGURE A5. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, ROOM TEMPERATURE, K=3).

TABLE A53

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	450	LONG	15.0	58,400
			14.1	134,100
			13.3	364,400
			12.9	169,800
			12.4	220,400
			12.0	259,500
			11.8	10,012,600 *
			8.0	10,000,750 *
MCDONNELL DOUGLAS	450	LONG	30.1	23,383
			30.1	23,507
			24.1	88,717
			24.1	54,050
			20.1	135,456
			20.1	209,852
			16.0	1,000,000 *
			16.0	989,458 #
ROHR INDUSTRIES	450	LONG	25.0	68,800
			15.0	1,000,000 *
			20.0	167,800
			15.0	1,000,000 *
			15.0	1,000,000 *
			20.0	197,000
			20.0	144,800
			25.0	55,400
			30.0	19,000
			30.0	16,900
AIR FORCE	450	LONG	40.0	2,500
			30.0	13,300
			19.6	28,600
			21.2	39,600
			19.3	63,100
			15.7	130,500
			17.3	137,100
			15.3	1,260,000

(*): RUN OUT

(#): BROKE OUTSIDE OF NOTCH

TABLE A54

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	600	LONG	14.8	84,400
			11.5	156,000
			10.0	215,300
			9.2	10,003,900 *
			8.3	454,500
			8.0	10,016,000 *
			7.5	7,603,000 *
			6.6	10,000,000 *
MCDONNELL DOUGLAS	600	LONG	19.7	77,624
			19.7	50,203
			18.5	92,086
			18.5	106,995
			18.2	265,516
			17.9	1,000,000 *
			17.9	1,000,000 *
ROHR INDUSTRIES	600	LONG	20.0	74,300
			20.0	82,500
			15.0	301,500
			15.0	302,300
			15.0	514,200
			12.5	1,000,000 *
			12.5	858,000
			10.0	1,000,000 *
			10.0	1,000,000 *
AIR FORCE	600	LONG	10.0	1,000,000 *
			33.6	4,200
			21.8	19,700
			18.7	55,200
			14.6	665,400
			12.1	967,300
			11.9	2,015,000

(*): RUN OUT

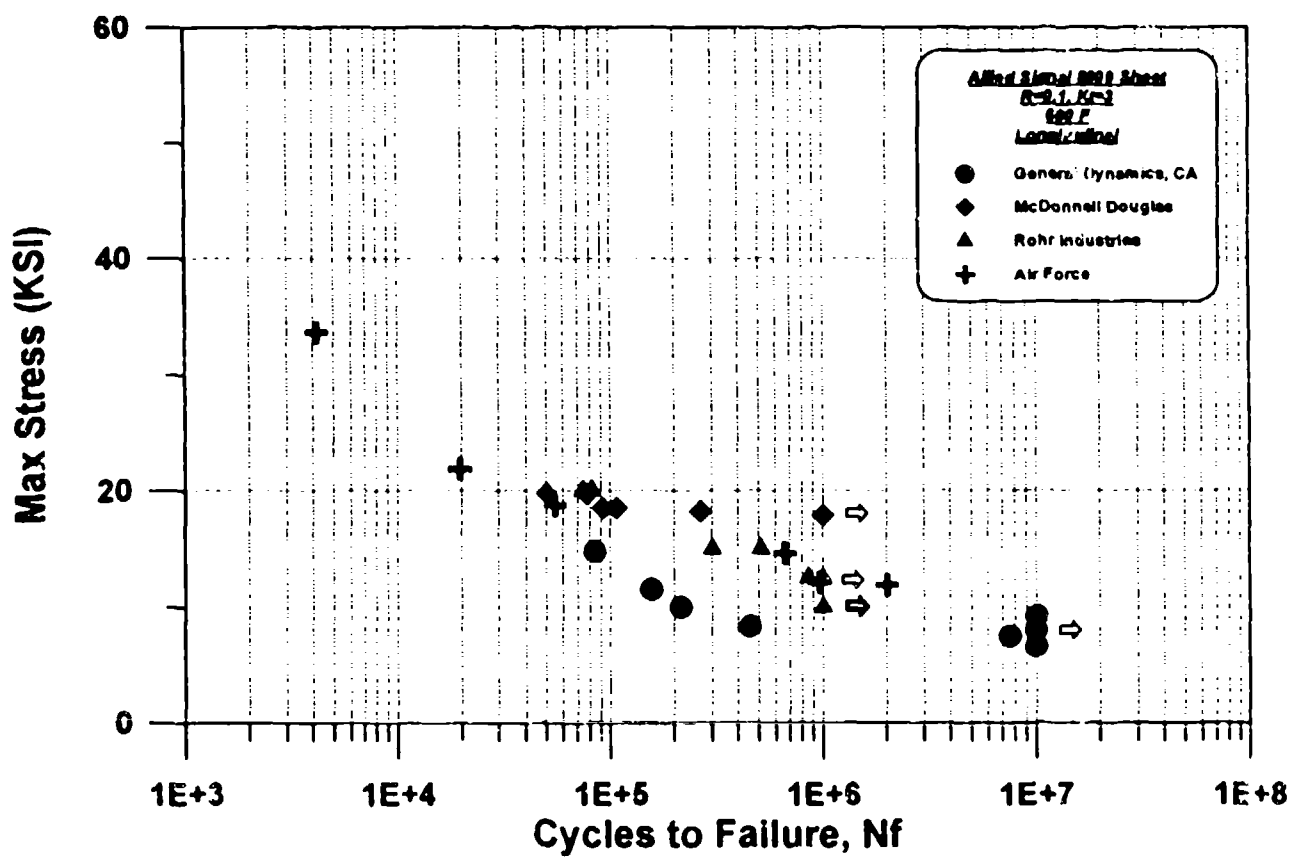


FIGURE A7. FATIGUE RESULTS FOR 8009 SHEET
 (LONGITUDINAL, 600 F, $K_t=3$).

TABLE A55

FATIGUE RESULTS WITH $R=0.1$ AND $K_t=3.0$ FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	RT	L TRANS	44.1	2,609
			44.1	6,793
			41.2	11,422
			41.2	9,154
			38.2	13,076
			38.2	15,047
			28.2	52,738
			23.5	1,000,000 *

(*): RUN OUT

TABLE A56

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	450	L TRANS	22.6	78,908
			22.6	62,591
			21.9	110,815
			21.9	92,891
			19.3	372,003
			19.3	472,003
			18.3	1,000,000 *
			18.3	1,000,000 *

(*): RUN OUT

TABLE A57

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	600	L TRANS	25.3	58,558
			25.3	76,109
			24.0	65,783
			24.0	72,733
			21.5	194,949
			21.5	143,872
			19.0	1,000,000 *
			19.0	1,000,000 *

(*): RUN OUT

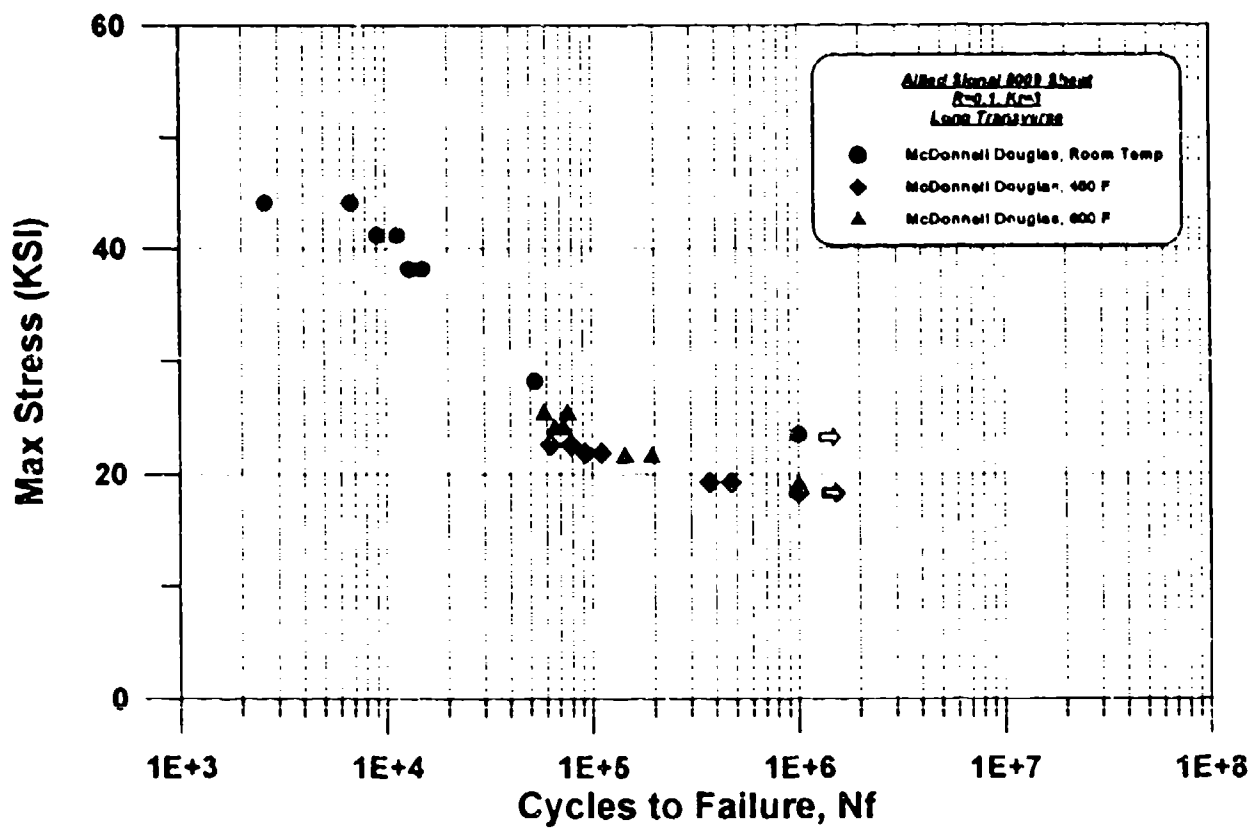


FIGURE A8. FATIGUE RESULTS FOR 8009 SHEET
(LONG TRANSVERSE, $K_t=3$)
MCDONNELL DOUGLAS.

TABLE A58

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS, CA	300	LONG	20.0	74,200
			16.0	204,200
			16.0	205,700
			12.0	390,300
			11.0	2,649,900
			10.0	10,000,000 *
			8.0	10,000,000 *

(*): RUN OUT

TABLE A59

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
AFTER 100 HRS @ 450F

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
NORTHROP	450	LONG	40.0	145,322
			38.0	234,575
			35.0	98,899
			32.0	442,850
			30.0	1,000,000 *

(*): RUN-OUT

TABLE A60

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
NORTHROP	450	LONG	25.0	73,648
			20.0	171,384
			15.0	317,361
			14.0	1,000,000 *
			12.0	1,000,000 *

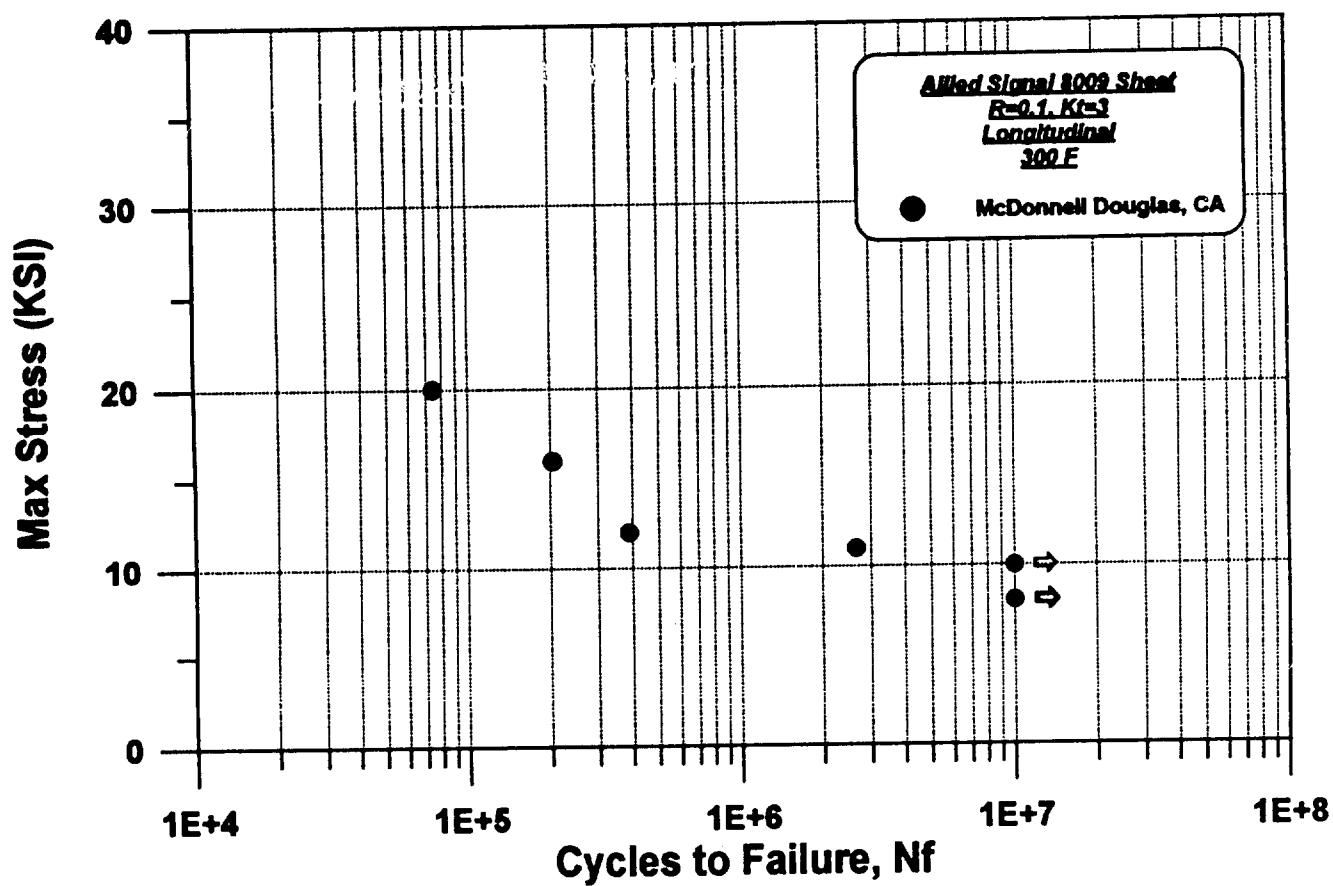


FIGURE A9. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 300 F, Kt=3)
MCDONNELL DOUGLAS.

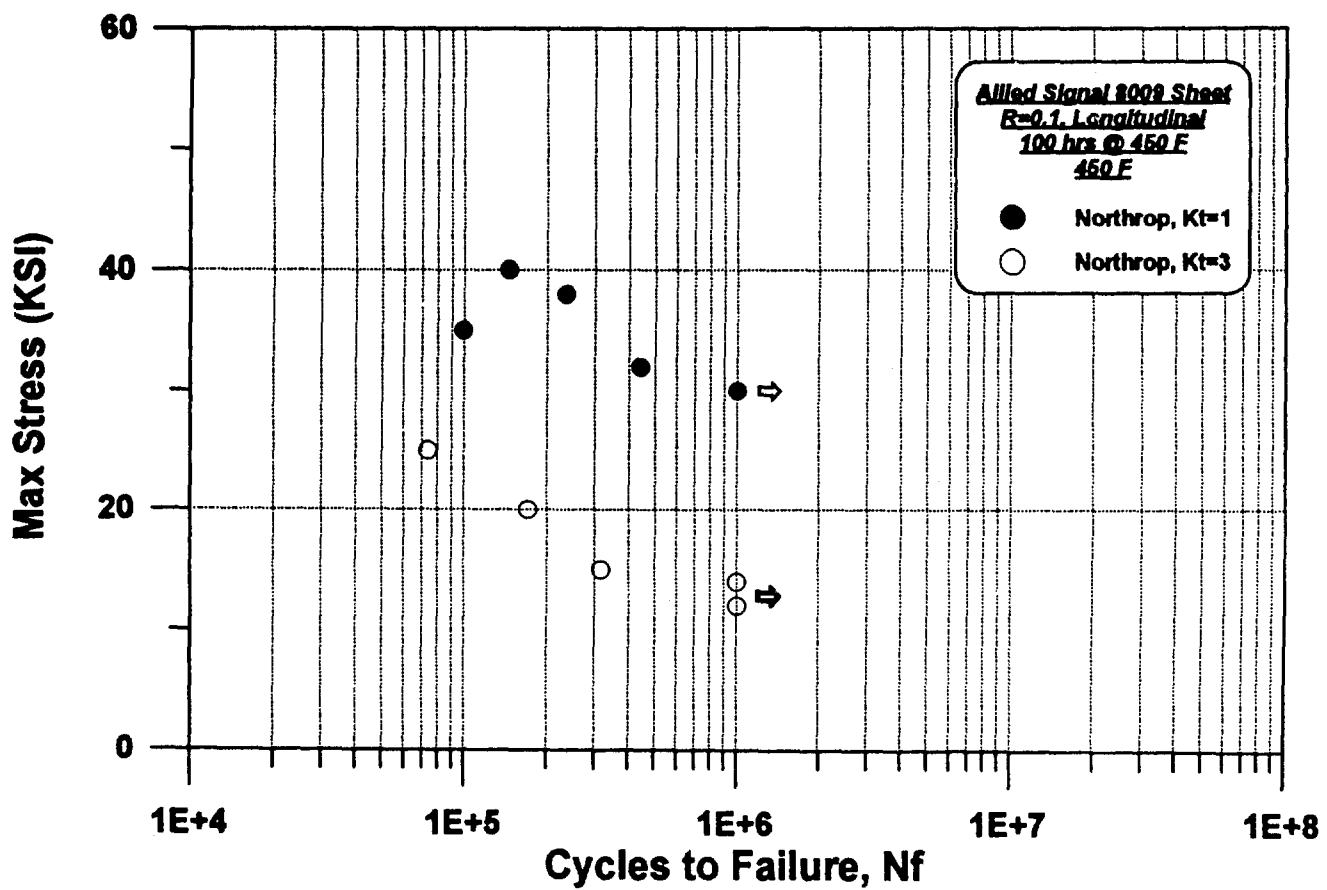


FIGURE A10. FATIGUE RESULTS FOR 8009 SHEET
 (LONGITUDINAL, 100 HRS @ 450 F, 450 F)
 NORTHROP.

TABLE A51

FATIGUE RESULTS WITH $R=0.1$ AND $K_t=2.7$ FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, TX	150	LONG	35.0	4,939
			30.0	9,140
			30.0	9,339
			20.0	42,200
			20.0	66,673
			15.0	33,749
			12.5	912,903
			10.0	1,554,906

(*): RUN OUT

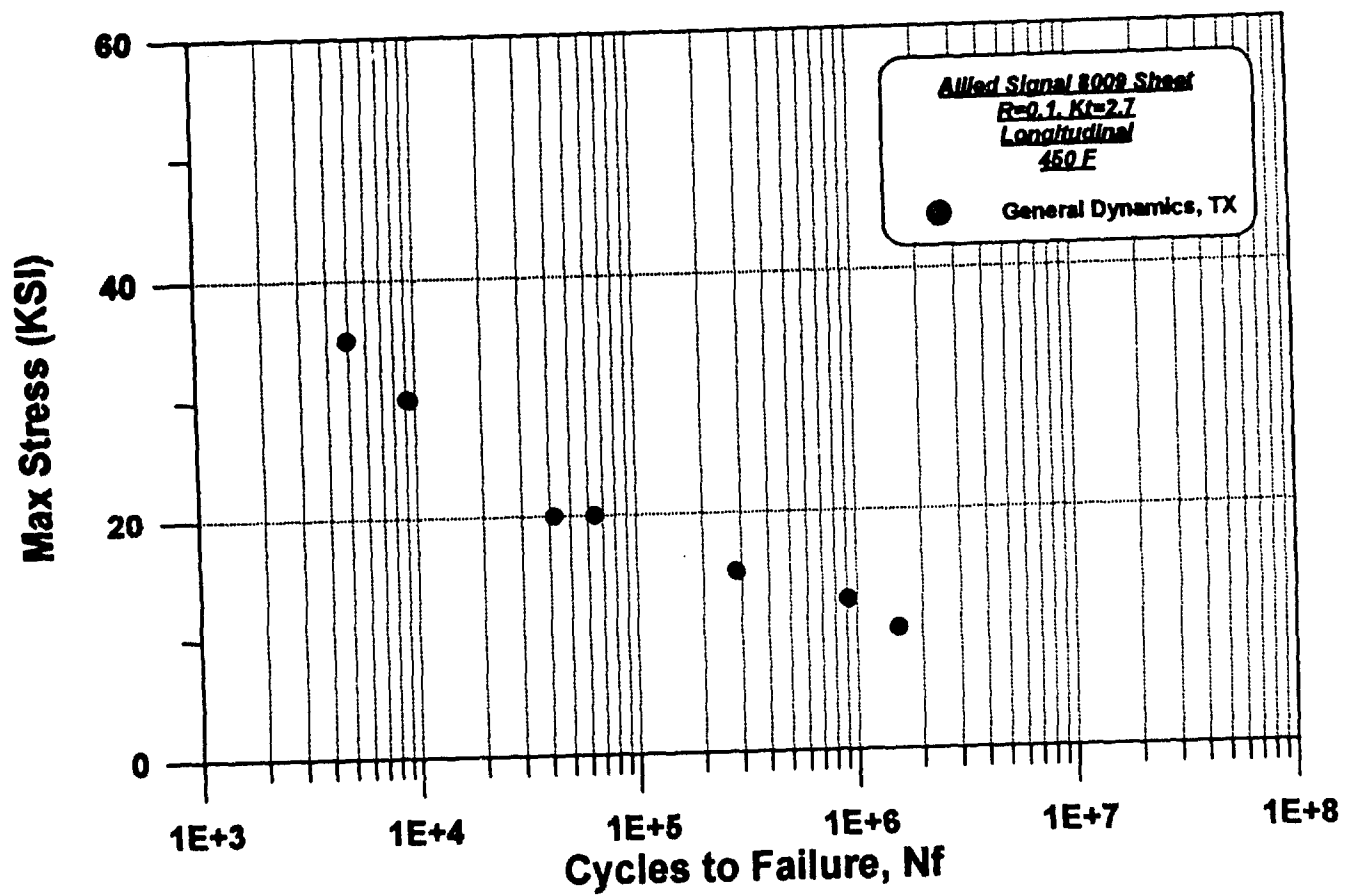


FIGURE A11. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 450 F, Kt=2.7)
GENERAL DYNAMICS, TX.

R-CURVE TEST

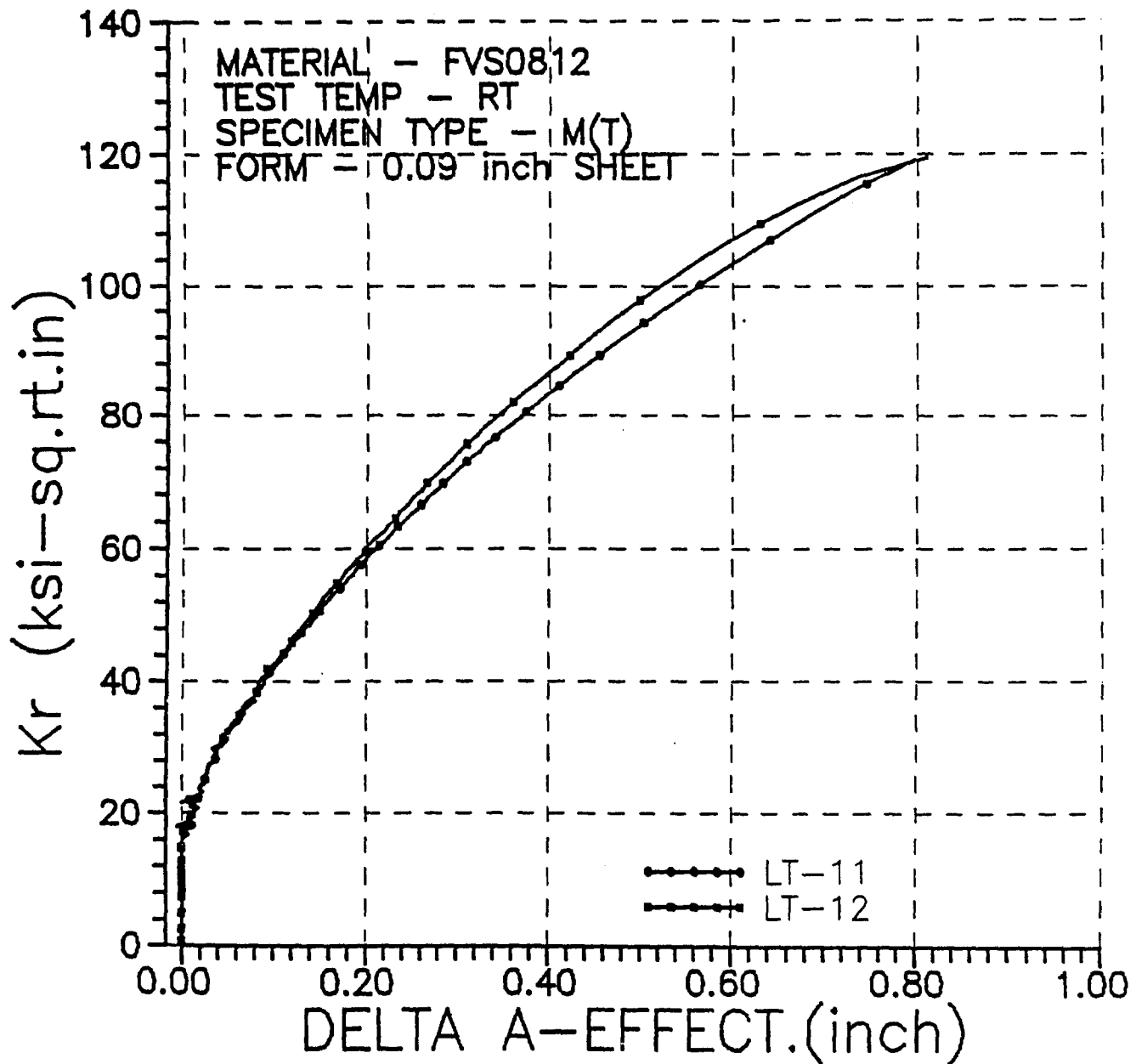


FIGURE A12. R-CURVE RESULTS OF 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE)
AIR FORCE.

R-CURVE TEST

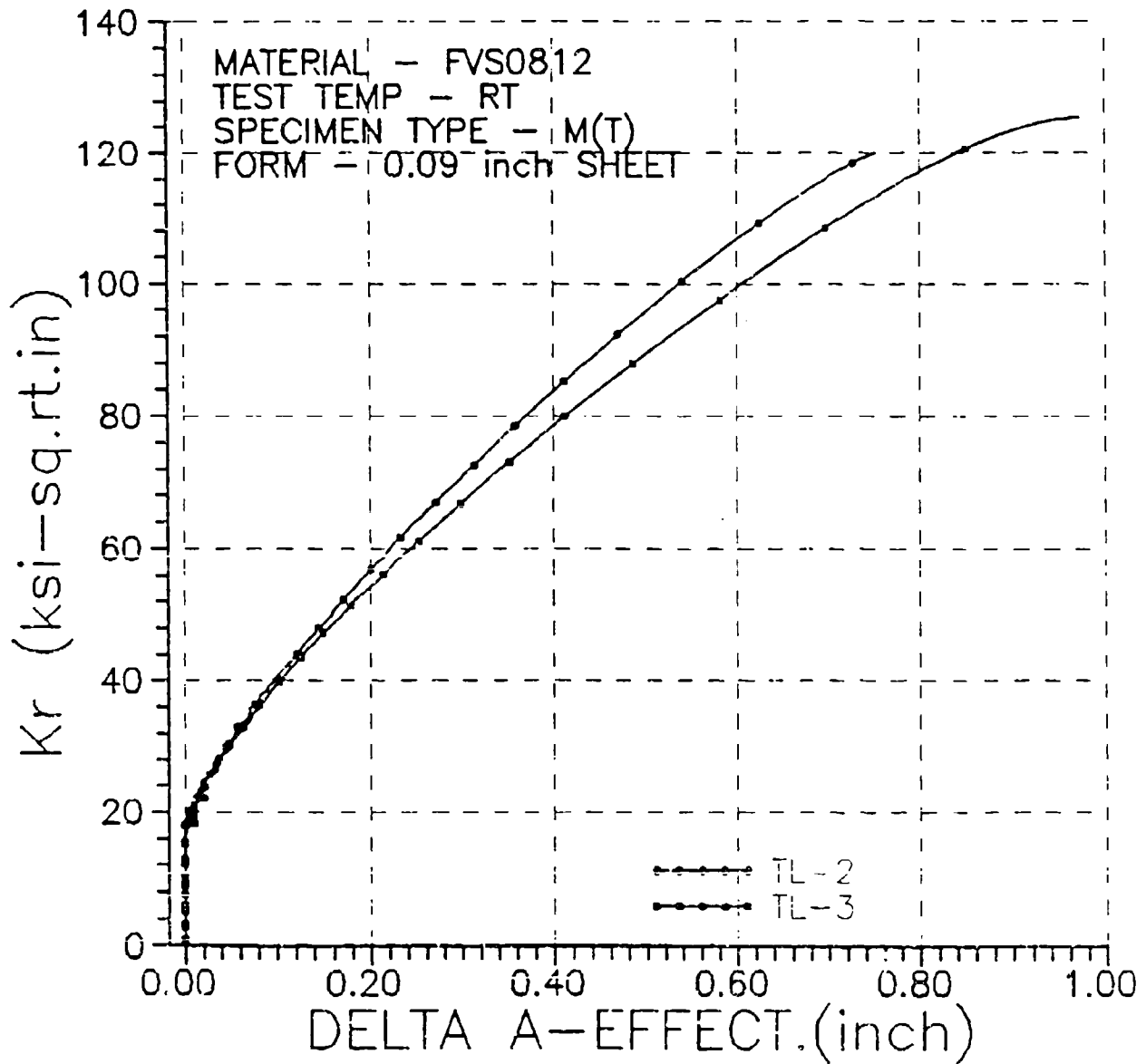


FIGURE A13. R-CURVE RESULTS OF 8009 SHEET
(T-L ORIENTATION, ROOM TEMPERATURE)
AIR FORCE.

R-CURVE TEST

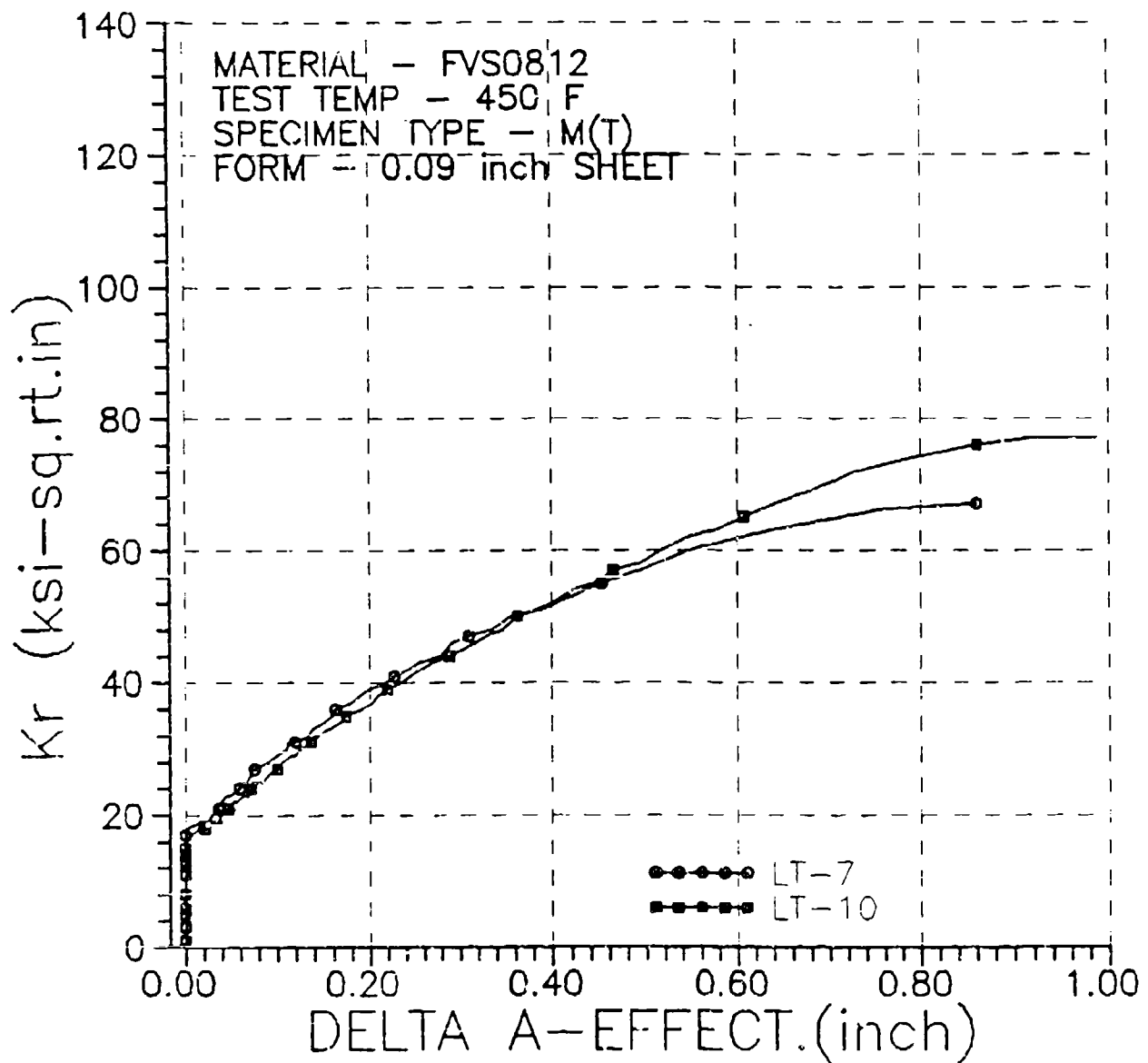


FIGURE A14. R-CURVE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 450 F)
AIR FORCE.

R-CURVE TEST

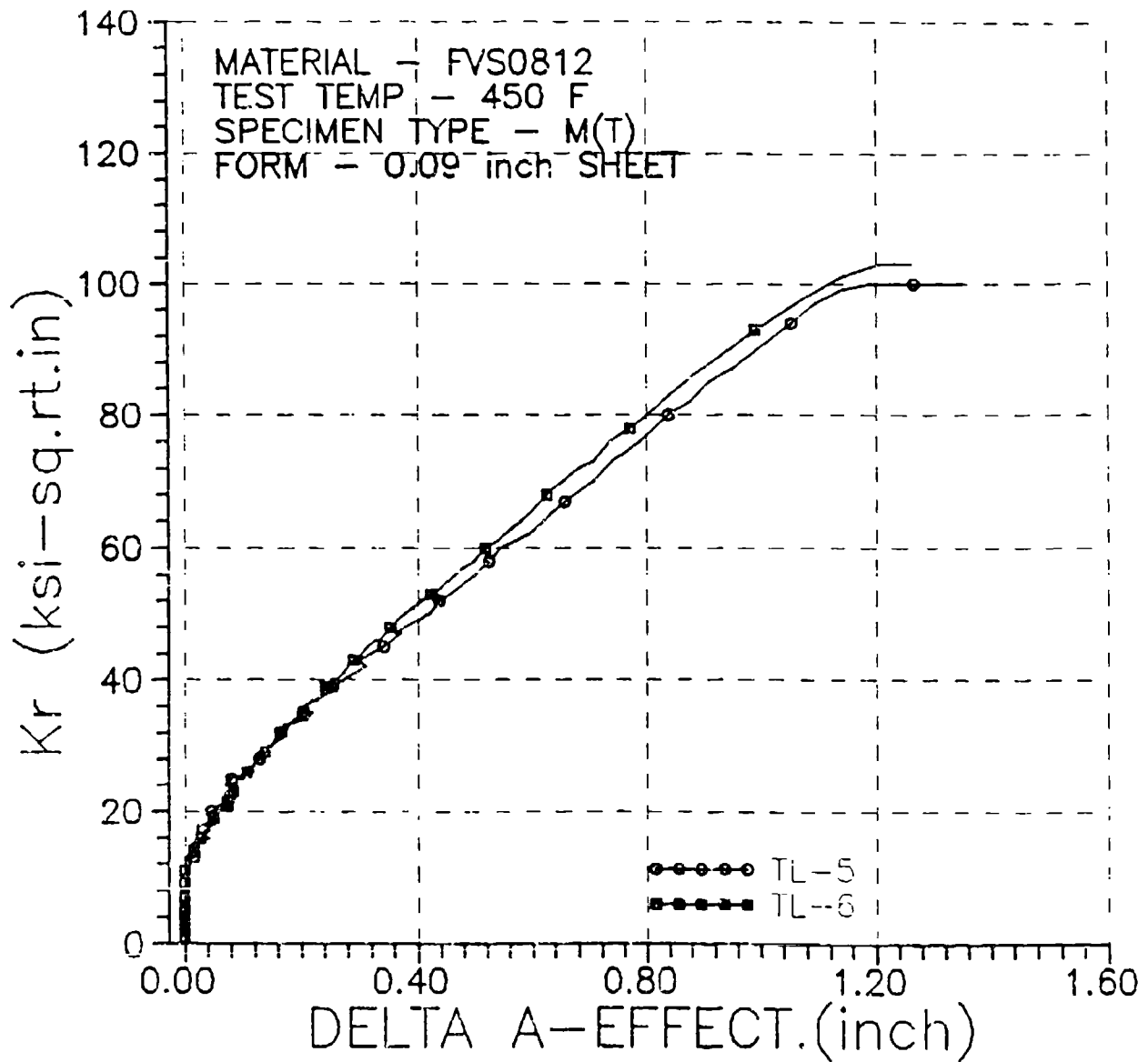


FIGURE A15. R-CURVE RESULTS OF 8009 SHEET
(T-L ORIENTATION, 450 F)
AIR FORCE.

R-CURVE TEST

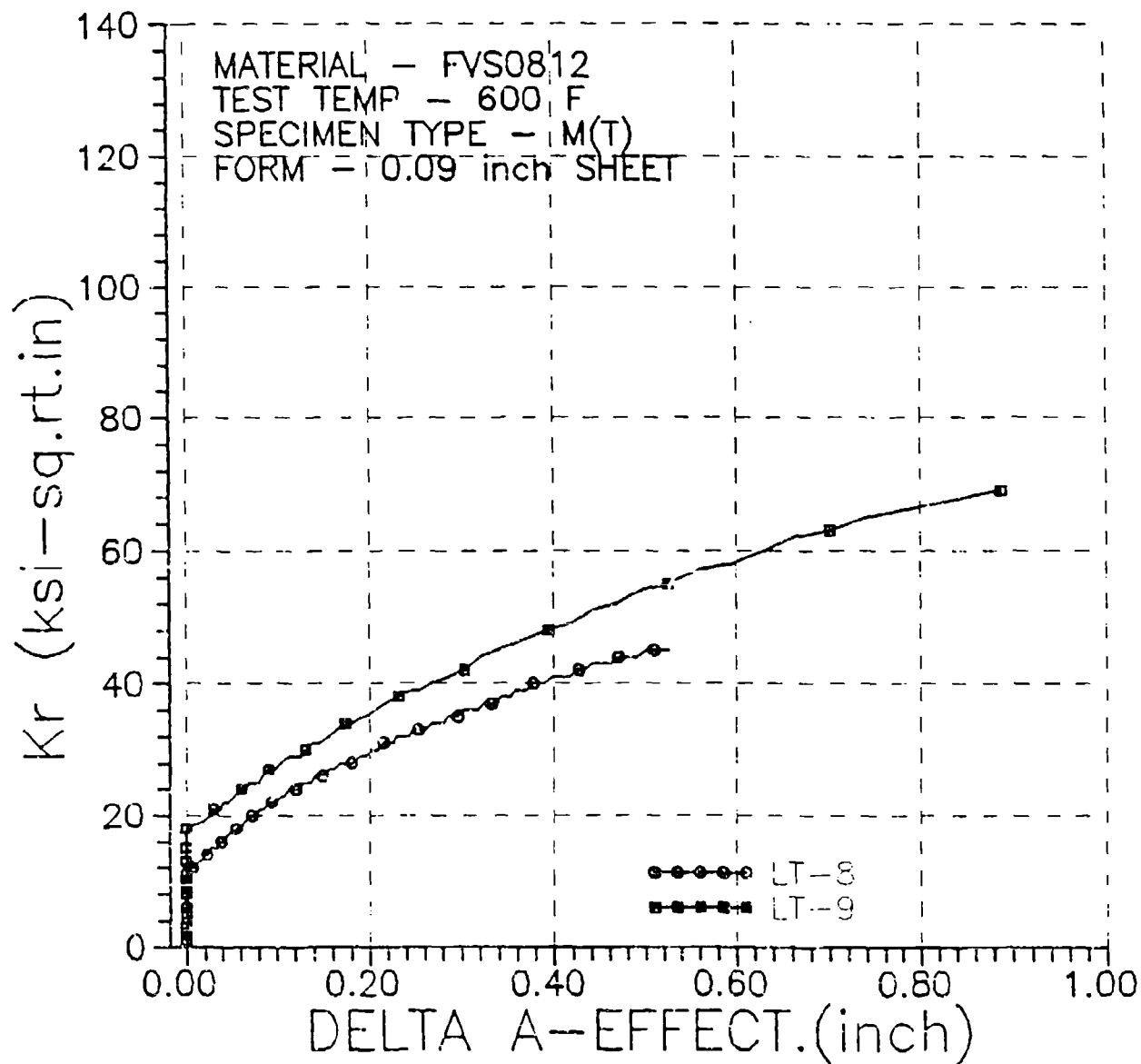


FIGURE A16. R-CURVE RESULTS OF 3009 SHEET
(L-T ORIENTATION, 600 F)
AIR FORCE.

R-CURVE TEST

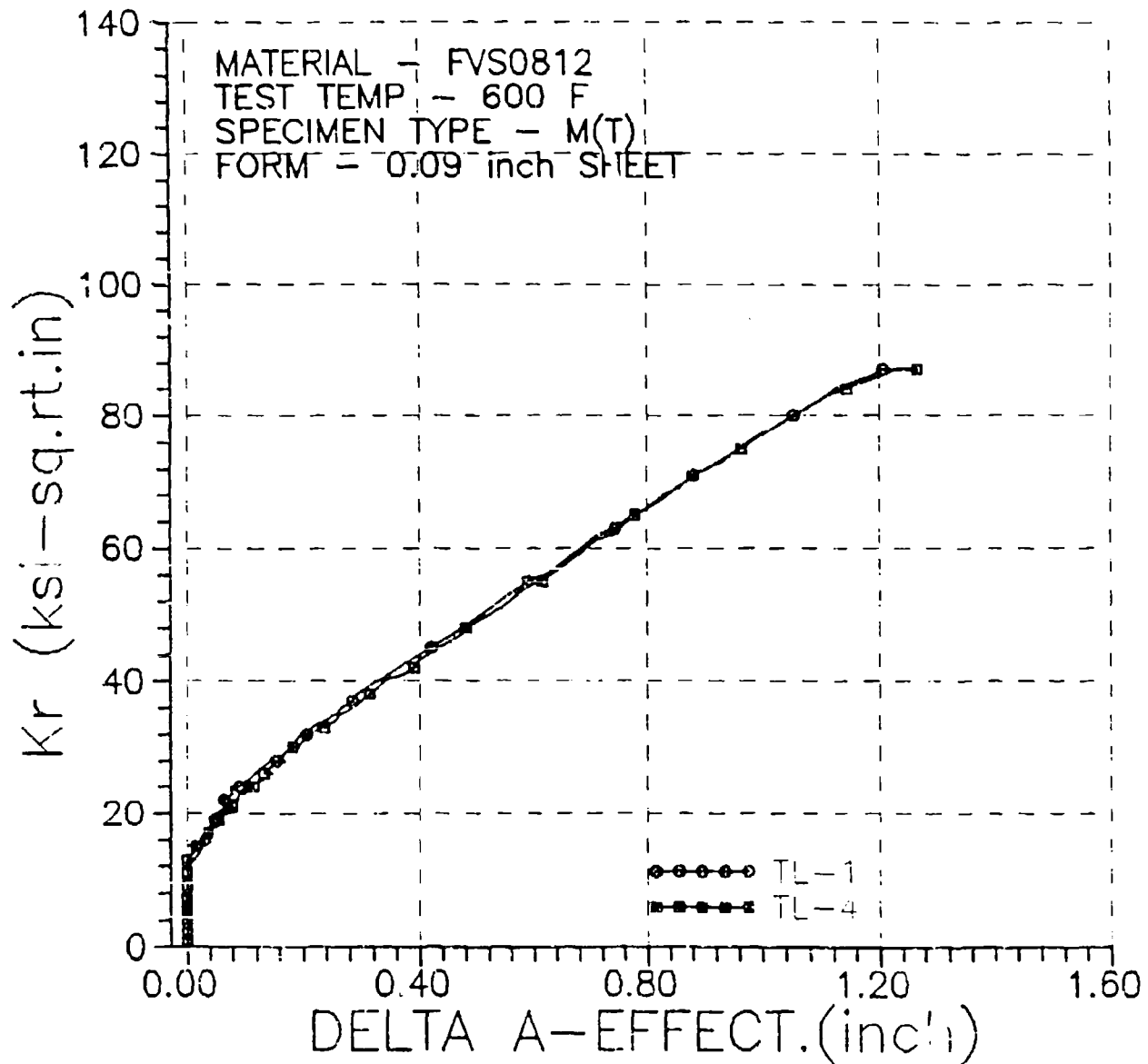


FIGURE A17. R-CURVE RESULTS OF 8009 SHEET
(T-L ORIENTATION, 600 F)
AIR FORCE.

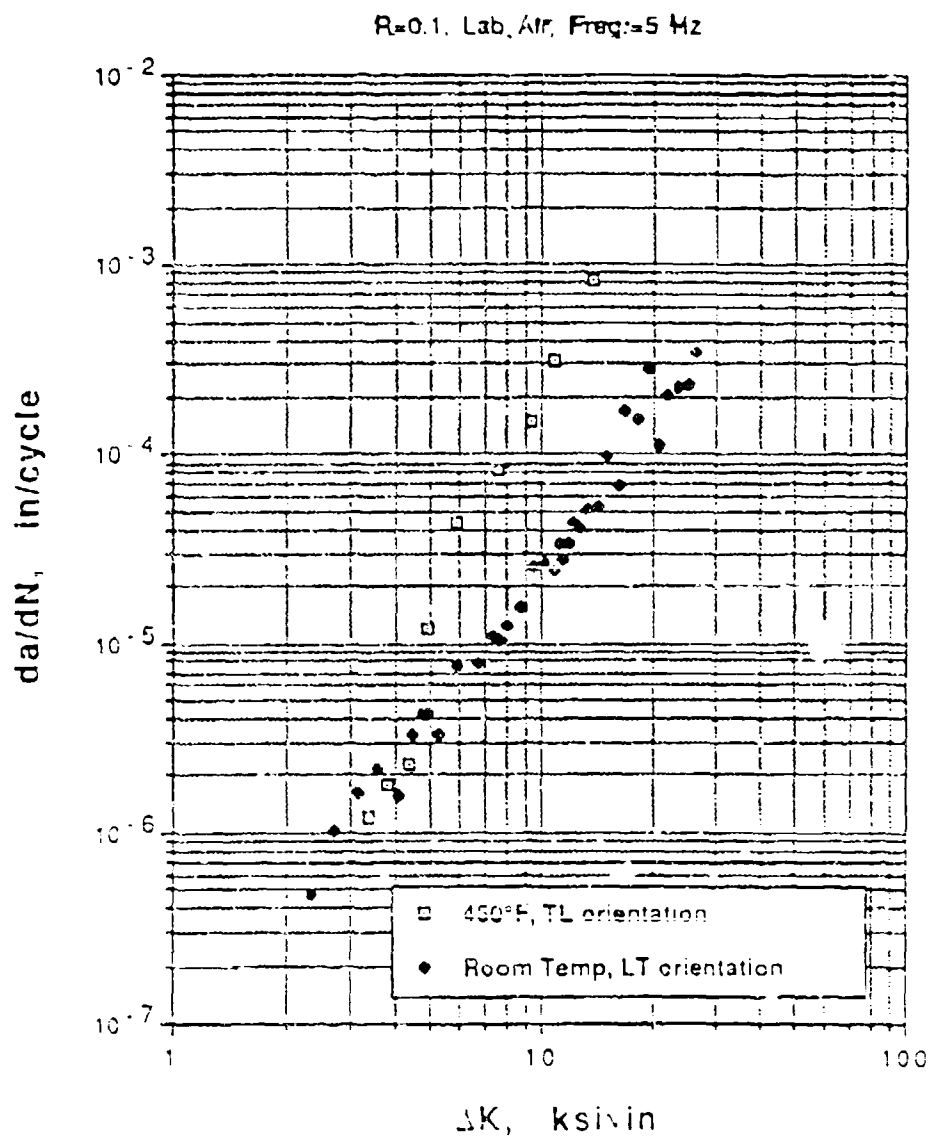


FIGURE A18. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE;
T-L ORIENTATION, 450 F), $R=0.1$, FREQ=5 HZ
GENERAL DYNAMICS, TX.

15LT

Lab Air
Room Temp5 Hz
R=0.1

dardN	ΔK
2.77E-05	11.39
1.04E-05	7.61
4.21E-06	4.70
4.76E-07	2.32
1.02E-06	2.71
1.61E-06	3.16
2.15E-06	3.58
1.58E-06	4.05
3.24E-06	4.43
4.31E-06	4.86
3.28E-06	5.20
7.56E-06	5.90
7.92E-06	6.66
1.10E-05	7.37
1.24E-05	8.09
1.54E-05	8.79
2.50E-05	9.47
2.50E-05	10.24
2.43E-05	10.82
3.37E-05	11.27
3.38E-05	11.72
4.33E-05	12.20
4.07E-05	12.68
5.21E-05	13.38
5.36E-05	14.16
9.83E-05	14.97
6.85E-05	16.11
1.69E-04	16.90
1.56E-04	18.19
2.89E-04	19.37
1.12E-04	20.99
2.06E-04	20.63
2.30E-04	23.38
2.54E-04	24.87
2.43E-04	26.47

11TL

R=0.1
Lab Air5 Hz
Tested at 450°F

dardN	ΔK
2.79E-05	11.64
6.46E-06	7.84
1.80E-06	4.90
1.19E-06	3.36
1.77E-06	3.83
2.32E-06	4.33
1.21E-05	4.86
4.41E-05	5.87
8.38E-05	7.66
1.50E-04	9.32
3.16E-04	10.87
8.21E-04	13.62

TABLE A62. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE;
T-L ORIENTATION, 450 F), R=0.1, FREQ=5 HZ
GENERAL DYNAMICS, TX.

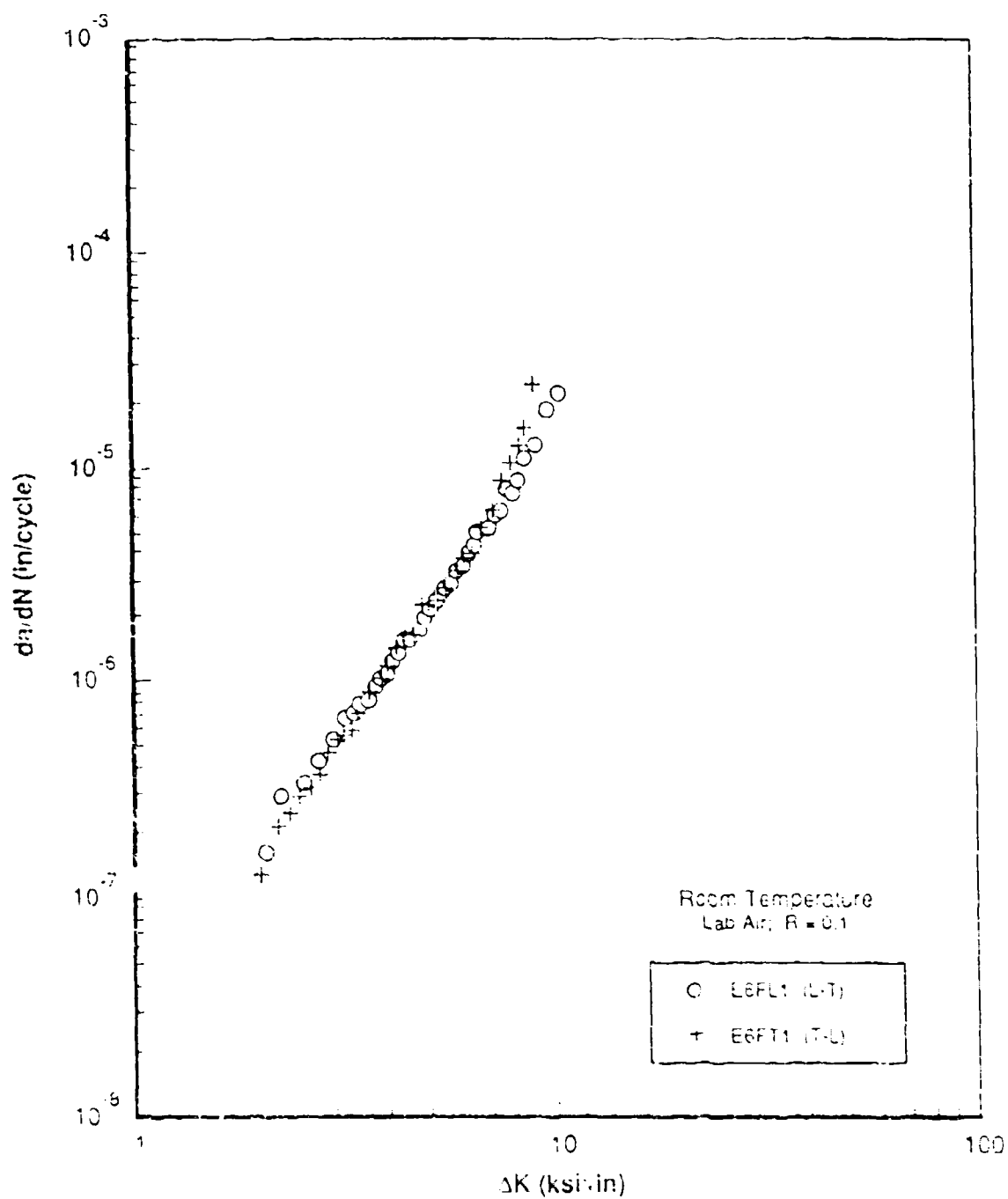


FIGURE A19. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T AND T-L ORIENTATIONS, ROOM TEMPERATURE)
R=0.1, NORTHROP.

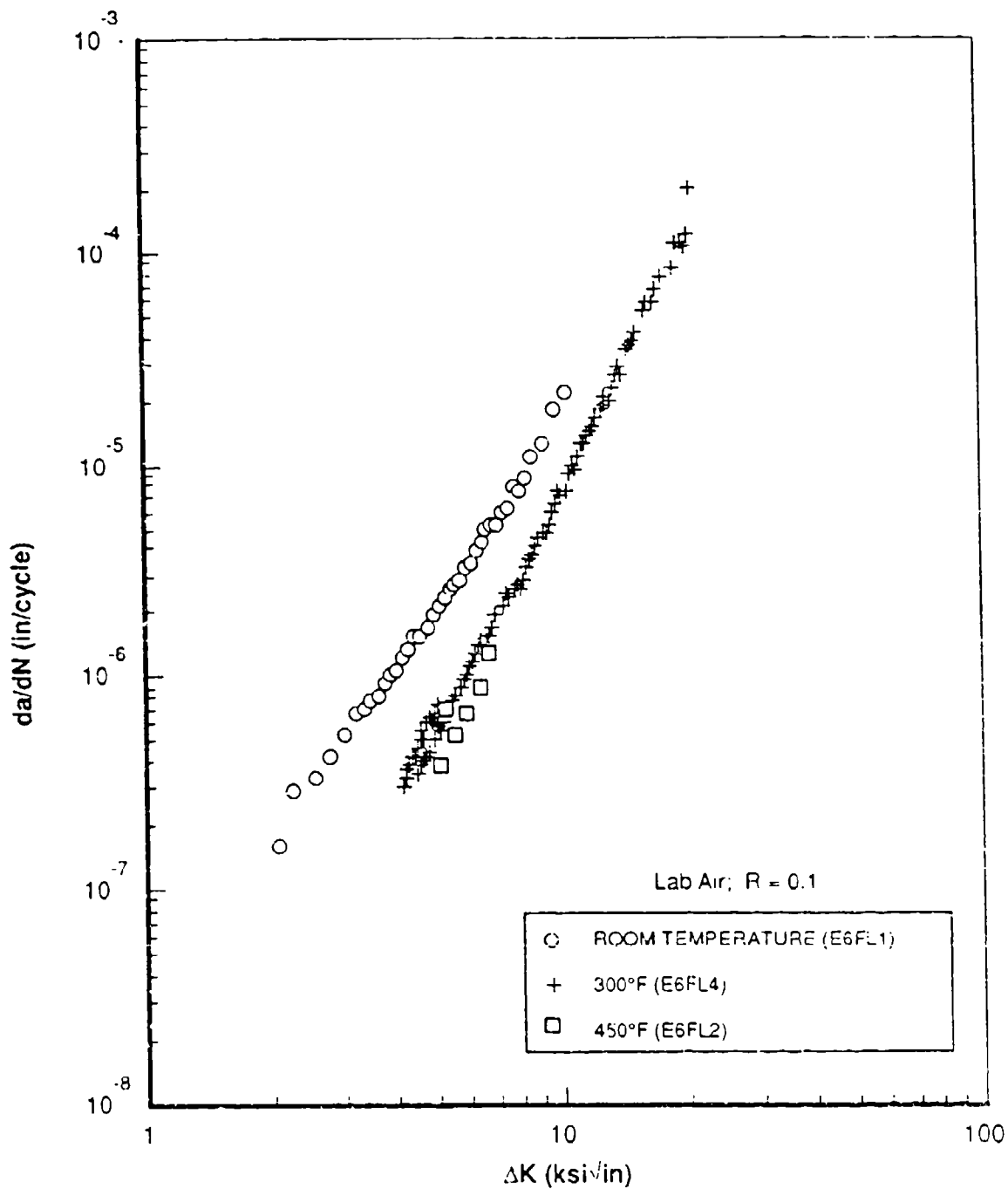


FIGURE A20. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET (L-T ORIENTATION, ROOM TEMPERATURE, 300 F, AND 450 F) R=0.1, NORTHROP.

CRACK GROWTH TEST OF 8009, .09" SHEET SPEC E6FL1
 M(T) SPECIMEN TYPE L-T ORIENTATION
 TEMP = 80 REL HUM = 55 % 07-NOV-91
 W = 3.001 IN B = .09 IN R = .1
 FREQUENCY = 10 HZ LAB. AIR ENVIRONMENT
 GRID SPACING = .05 IN FILE CODE: RK11800546.DDH
 YIELD STRESS = .64 KSI FITO CODE: RK11800546.DFO

SPECIMEN E6FL1				M(T) SPECIMEN TYPE		PAGE 2	
REF #	K-MAX	2A IN	2A/W	K-BAR	DELTA K-BAR	DA/DN IN/CYC	VALID PER ASTM
1	2.24	.2312	.077				
2	2.36	.2557	.0852	2.3	2.07	1.57051E-07	Y
3	2.62	.3142	.1047	2.49	2.24	2.92500E-07	Y
4	2.99	.4057	.1352	2.81	2.53	3.33942E-07	Y
5	3.14	.4462	.1487	3.07	2.76	4.21875E-07	Y
6	3.45	.5327	.1775	3.3	2.97	5.40625E-07	Y
7	3.63	.5847	.1948	3.34	3.19	6.86667E-07	Y
8	3.79	.6302	.21	3.71	3.34	7.10937E-07	Y
9	3.92	.6712	.2237	3.86	3.47	7.59259E-07	Y
10	4.08	.7177	.2392	4	3.6	8.01723E-07	Y
11	4.25	.7702	.2566	4.16	3.75	9.37501E-07	Y
12	4.4	.8172	.2723	4.32	3.89	1.02174E-06	Y
13	4.53	.8572	.2856	4.46	4.02	1.05263E-06	Y
14	4.67	.9017	.3005	4.6	4.14	1.23611E-06	Y
15	4.81	.9467	.3155	4.74	4.27	1.32353E-06	Y
16	4.98	.9967	.3321	4.89	4.41	1.56250E-06	Y
17	5.12	1.0397	.3465	5.05	4.54	1.53571E-06	Y
18	5.41	1.1282	.3759	5.26	4.74	1.70192E-06	Y
19	5.57	1.1752	.3916	5.49	4.94	1.95834E-06	Y
20	5.73	1.2222	.4073	5.65	5.08	2.13636E-06	Y
21	5.89	1.2697	.4231	5.81	5.23	2.37500E-06	Y
22	6.06	1.3157	.4384	5.98	5.38	2.55556E-06	Y
23	6.23	1.3632	.4542	6.14	5.53	2.63888E-06	Y
24	6.42	1.4132	.4709	6.32	5.69	2.77778E-06	Y
25	6.62	1.4657	.4884	6.52	5.87	3.28125E-06	Y
26	6.81	1.5127	.5041	6.71	6.04	3.35714E-06	Y
27	7.04	1.5682	.5226	6.92	6.23	3.94429E-06	Y
28	7.26	1.6187	.5394	7.15	6.43	4.20835E-06	Y
29	7.47	1.6667	.5554	7.36	6.63	4.79999E-06	Y
30	7.71	1.7172	.5722	7.59	6.83	5.04999E-06	Y
31	7.91	1.7592	.5862	7.81	7.03	5.25001E-06	Y
32	8.15	1.8062	.6019	8.03	7.23	5.87501E-06	Y
33	8.42	1.8562	.6185	8.28	7.46	6.25001E-06	Y
34	8.68	1.9027	.634	8.55	7.69	7.74997E-06	Y
35	8.98	1.9477	.649	8.81	7.93	7.50001E-06	Y
36	9.27	1.9992	.6662	9.11	8.2	8.58333E-06	Y
37	9.72	2.0652	.6882	9.49	8.54	1.10000E-05	Y
38	10.5	2.1662	.7218	10.1	9.09	1.26250E-05	Y
39	11.12	2.2367	.7453	10.8	9.72	1.76251E-05	Y
40	12.02	2.3247	.7746	11.56	10.4	2.20000E-05	Y

TABLE A63. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
 (L-T ORIENTATION, ROOM TEMPERATURE) R=0.1
 SPECIMEN # E6FL1, NORTHROP.

CRACK GROWTH TEST OF 8009 .09" SHEET SPEC E6FT1

N(T) SPECIMEN TYPE T-L ORIENTATION

TEMP = 77 REL HUM = 43 % 26-NOV-71

W = 3.001 IN B = .091 IN R = .1

FREQUENCY = 10 HZ LAB. AIR ENVIRONMENT

GRID SPACING = .05 IN FILE CODE: RK11800567.DDN

YIELD STRESS = 62 KSI FITO CODE: RK11800567.DFO

SPECIMEN E6FT1			N(T) SPECIMEN TYPE			PAGE 2	
REF #	K-HAI	2A IN	2A/W	K-BAR	DELTA K-BAR	DA/DN IN/CYC	VALID PER ASTM
1	2.19	.2774	.0924				
2	2.29	.3034	.1011	2.24	2.01	1.30000E-07	Y
3	2.57	.3784	.1261	2.43	2.19	2.08333E-07	Y
4	2.67	.4094	.1364	2.62	2.36	2.38462E-07	Y
5	2.85	.4609	.1536	2.76	2.48	2.84111E-07	Y
6	3	.5074	.1691	2.92	2.63	3.27464E-07	Y
7	3.14	.5529	.1842	3.07	2.76	3.72951E-07	Y
8	3.29	.6029	.2009	3.21	2.89	4.62963E-07	Y
9	3.44	.6549	.2185	3.37	3.03	5.41667E-07	Y
10	3.58	.7019	.2339	3.51	3.16	5.59524E-07	Y
11	3.71	.7449	.2482	3.64	3.28	5.97222E-07	Y
12	3.84	.7904	.2634	3.77	3.39	7.10937E-07	Y
13	4.24	.9319	.3105	4.04	3.64	8.73457E-07	Y
14	4.37	.9769	.3255	4.31	3.83	1.02273E-06	Y
15	4.51	1.0239	.3412	4.44	4	1.17500E-06	Y
16	4.78	1.1164	.372	4.64	4.18	1.40152E-06	Y
17	4.92	1.1644	.388	4.85	4.37	1.60000E-06	Y
18	5.31	1.2899	.4298	5.11	4.6	1.90893E-06	Y
19	5.51	1.3514	.4503	5.41	4.87	2.19643E-06	Y
20	5.69	1.4029	.4685	5.6	5.04	2.27083E-06	Y
21	5.95	1.4809	.4935	5.82	5.24	2.34375E-06	Y
22	6.39	1.6019	.5338	6.17	5.53	2.75300E-06	Y
23	6.65	1.6639	.5551	6.52	5.87	3.20001E-06	Y
24	6.9	1.7234	.5749	6.77	6.09	3.71375E-06	Y
25	7.31	1.8189	.6061	7.1	6.39	3.89383E-06	Y
26	7.67	1.8919	.6304	7.49	6.74	5.21428E-06	Y
27	8.06	1.9659	.6551	7.87	7.08	6.16667E-06	Y
28	8.36	2.0504	.6832	8.31	7.48	8.44997E-06	Y
29	8.96	2.1119	.7037	8.76	7.83	1.02501E-05	Y
30	9.3	2.1804	.7199	9.13	8.22	1.21250E-05	Y
31	9.76	2.2204	.7399	9.53	8.53	1.55000E-05	Y
32	10.16	2.2674	.7555	9.96	8.96	2.35000E-05	Y

TABLE A64. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(T-L ORIENTATION, ROOM TEMPERATURE) R=0.1
SPECIMEN # E6FT1, NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id. E6FL4-a
Contract # W801778N
Material 8009 SHEET
Temperature (F) 300
Environment

Geometry
Orientation L-T
Yield (ksi) 48.4
Modulus 10.4

Specimen Dimensions (in)

Thickness 0.092
Width 1.500
Height 0.000

Notch depth 0.314
Gage length 0.200
Alpha ratio 1.000

Precrack Parameters

Pmax (lbs) 1500.0
Final a (in) 0.327

Stress ratio (R) 0.10
Kmax 5.68

Test Parameters

Initial a (in) 0.410
K-gradient 3.00

Initial K 4.60
Stress ratio (R) 0.10

K Coeff

EvB/P Coeff
-1.617860
22.795000
-61.236481
37.816212
40.309029
-41.208481

Analysis Codes
KRC 2 0

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
0.60	0.410	0.384	-.026	1.000
0.62	0.421	0.395	-.026	1.000
0.66	0.444	0.425	-.019	1.000
0.67	0.453	0.439	-.014	1.000
0.69	0.468	0.460	-.008	1.000
0.69	0.468	0.462	-.006	1.000
0.72	0.481	0.480	-.001	1.000
0.76	0.506	0.512	0.006	1.000
0.81	0.540	0.559	0.019	1.000
0.87	0.571	0.602	0.031	1.000

Comments

Date of test: 12-3-91

**TABLE A65. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 300 F) R=0.1
SPECIMEN # E6FL4, NORTHROP.**

Pmax (lbs)	E6B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi/in)
	0.61	0.4123	23936				
1129	0.62	0.4190	42830	0.0140	39680	3.535E-07	4.44
1141	0.63	0.4263	63615	0.0135	35517	3.805E-07	4.53
1153	0.64	0.4325	78347	0.0124	30340	4.075E-07	4.62
1165	0.65	0.4387	93955	0.0130	30419	4.275E-07	4.71
1176	0.66	0.4455	108766	0.0122	27018	4.533E-07	4.80
1189	0.67	0.4509	120973	0.0122	24255	5.050E-07	4.89
1201	0.68	0.4577	133021	0.0134	23456	5.734E-07	4.98
1213	0.69	0.4644	144429	0.0125	22023	5.679E-07	5.08
1225	0.70	0.4702	155044	0.0113	18536	6.109E-07	5.17
1237	0.71	0.4757	162965	0.0110	15651	7.046E-07	5.26
1249	0.72	0.4813	170695	0.0119	16591	7.171E-07	5.36
1262	0.73	0.4876	179556	0.0128	16640	7.702E-07	5.45
1274	0.74	0.4941	187335	0.0117	14345	8.171E-07	5.55
1288	0.75	0.4993	193900	0.0117	13129	8.879E-07	5.66
1301	0.76	0.5057	200464	0.0127	13128	9.707E-07	5.76
1316	0.77	0.5121	207028	0.0127	12483	1.020E-06	5.87
1329	0.78	0.5185	212946	0.0117	10504	1.110E-06	5.97
1342	0.79	0.5237	217532	0.0106	9209	1.155E-06	6.08
1356	0.79	0.5291	222155	0.0122	9597	1.269E-06	6.19
1370	0.81	0.5359	227129	0.0131	9199	1.419E-06	6.30
1385	0.82	0.5422	231354	0.0120	8066	1.492E-06	6.42
1400	0.83	0.5479	235195	0.0116	7682	1.506E-06	6.53
1414	0.84	0.5537	239036	0.0117	7499	1.565E-06	6.65
1430	0.85	0.5597	242694	0.0127	7499	1.692E-06	6.78
1445	0.86	0.5664	246535	0.0131	6777	1.938E-06	6.90
	0.87	0.5728	249471				
	0.88	0.5782	252020				
1493	0.89	0.5840	255141	0.0127	5916	2.150E-06	7.29
1508	0.90	0.5909	257937	0.0119	4937	2.404E-06	7.41
1523	0.91	0.5959	260078	0.0097	4223	2.309E-06	7.54
1539	0.92	0.6006	262160	0.0116	4598	2.525E-06	7.68
1555	0.93	0.6075	264676	0.0137	5135	2.663E-06	7.81
1573	0.95	0.6143	267294	0.0126	4817	2.617E-06	7.96
1591	0.96	0.6201	269494	0.0118	4112	2.960E-06	8.12
1609	0.97	0.6261	271407	0.0122	3697	3.305E-06	8.26
1625	0.98	0.6323	273191	0.0118	3304	3.578E-06	8.41
1643	0.99	0.6379	274711	0.0112	2996	3.725E-06	8.56
1660	1.00	0.6435	276187	0.0114	2806	4.046E-06	8.71
1676	1.01	0.6492	277516	0.0113	2495	4.520E-06	8.85
1695	1.02	0.6548	278682	0.0120	2603	4.621E-06	9.02
1713	1.03	0.6613	280119	0.0129	2758	4.665E-06	9.18
1733	1.05	0.6676	281440	0.0125	2373	5.252E-06	9.35
1752	1.06	0.6737	282492	0.0117	2023	5.793E-06	9.52
1772	1.07	0.6794	283463	0.0119	1805	6.583E-06	9.70
1791	1.08	0.6856	284297	0.0124	1704	7.274E-06	9.87
1811	1.09	0.6917	285168	0.0124	1739	7.101E-06	10.06
1831	1.11	0.6980	286037	0.0122	1622	7.528E-06	10.25

**TABLE A65. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 300 F) R=0.1
SPECIMEN # E6FL4, NORTHROP. (continued)**

Prin. (lbs)	E6B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)
1852	1.12	0.7040	286789	0.0123	1385	8.850E-06	10.44
1871	1.13	0.7102	287422	0.0114	1154	9.875E-06	10.61
1889	1.14	0.7154	287943	0.0096	1025	9.394E-06	10.79
1909	1.15	0.7199	288447	0.0107	1000	1.071E-05	10.97
1926	1.16	0.7261	288943	0.0115	950	1.210E-05	11.14
1949	1.18	0.7314	289397	0.0121	993	1.224E-05	11.36
1970	1.19	0.7382	289935	0.0136	1013	1.341E-05	11.56
1991	1.21	0.7449	290410	0.0117	844	1.390E-05	11.77
2017	1.22	0.7499	290779	0.0123	824	1.487E-05	12.02
2036	1.23	0.7572	291234	0.0131	802	1.631E-05	12.22
2061	1.24	0.7630	291581	0.0116	654	1.775E-05	12.46
2081	1.26	0.7688	291887	0.0111	542	2.043E-05	12.67
2096	1.27	0.7741	292122	0.0075	391	1.915E-05	12.82
2121	1.27	0.7763	292278	0.0098	503	1.948E-05	13.07
2143	1.29	0.7839	292625	0.0168	746	2.248E-05	13.29
2172	1.31	0.7930	293024	0.0165	638	2.580E-05	13.59
2197	1.33	0.8003	293263	0.0109	382	2.839E-05	13.86
2221	1.34	0.8039	293406	0.0088	335	2.611E-05	14.12
2246	1.35	0.8091	293598	0.0138	409	3.375E-05	14.38
2268	1.37	0.8177	293815	0.0145	410	3.548E-05	14.62
2298	1.38	0.8236	294008	0.0121	323	3.763E-05	14.95
2325	1.40	0.8298	294138	0.0132	327	4.025E-05	15.24
	1.42	0.8368	294335				
	1.43	0.8422	294465				
2400	1.43	0.8437	294550	0.0120	233	5.177E-05	16.08
2419	1.46	0.8542	294697	0.0178	316	5.634E-05	16.30
2457	1.48	0.8615	294865	0.0145	260	5.585E-05	16.74
2482	1.50	0.8687	294957	0.0116	175	6.620E-05	17.03
2517	1.51	0.8731	295040	0.0131	176	7.471E-05	17.45
	1.53	0.8819	295133				
	1.56	0.8932	295275				
2629	1.58	0.8977	295361	0.0140	168	8.328E-05	18.80
2652	1.60	0.9072	295443	0.0154	144	1.066E-04	19.09
2685	1.62	0.9130	295505	0.0112	101	1.105E-04	19.52
2711	1.63	0.9183	295544	0.0104	99	1.056E-04	19.85
2744	1.65	0.9234	295604	0.0142	120	1.189E-04	20.28
2783	1.67	0.9325	295664	0.0207	104	1.998E-04	20.60
	1.71	0.9441	295707				

**TABLE A65. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 300 F) R=0.1
SPECIMEN # E6FL4, NORTHROP. (continued)**

CRACK GROWTH TEST OF 8009 SHEET

SPEC E6FL2

M(T) SPECIMEN TYPE

L-T ORIENTATION

TEMP = 450

REL HUM = 1%

12-18-91

W = 2.999 IN

B = .093 IN

R = .1

FREQUENCY = 10 HZ

ENVIRONMENT

GRID SPACING = 1 IN

FILE CODE: RK1:D00048.DDN

YIELD STRESS = 35 KSI

FIT0 CODE: RK1:D00048.DF0

SPECIMEN E6FL2				M(T) SPECIMEN TYPE		PAGE 2	
REF #	K-MAX	2A IN	2A/W	K-BAR	DELTA K-BAR	DA/DN IN/CYC	VALID PER ASTM
1	5.54	.738	.2461				
2	5.75	.788	.2628	5.64	5.08	3.89931E-07	Y
3	5.91	.824	.2748	5.93	5.25	7.08382E-07	Y
4	6.29	.914	.3048	6.1	5.49	5.40138E-07	Y
5	6.75	1.02	.3401	6.52	5.87	6.64477E-07	Y
6	7.38	1.162	.3875	7.06	6.36	8.97121E-07	Y
7	7.57	1.204	.4015	7.48	6.73	1.28307E-06	Y

TABLE A66. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 450 F) R=0.1
SPECIMEN # E6FL2, NORTHROP.

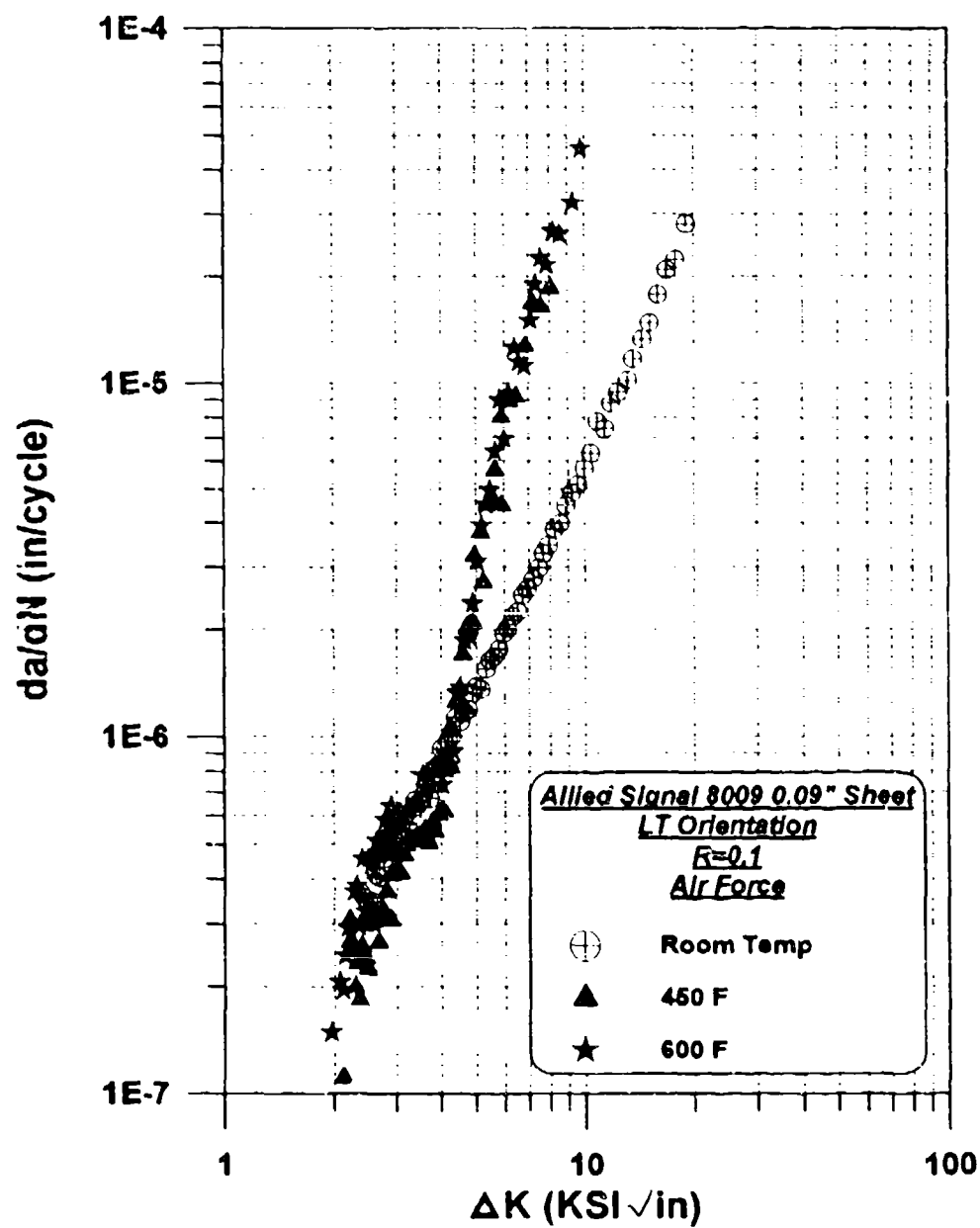


FIGURE A21. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET (L-T ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F) R=0.1, AIR FORCE

R-0.1
L-T Orientation
Air Force

Room Temperature		450 F		600 F	
Delta K	da/dN	Delta K	da/dN	Delta K	da/dN
2.38	3.61E-07	5.9	4.49E-06	1.97	1.49E-07
2.44	3.53E-07	5.6	4.65E-06	2.07	2.06E-07
2.5	3.44E-07	5.23	2.71E-06	2.11	1.95E-07
2.56	3.45E-07	4.9	2.10E-06	2.15	2.44E-07
2.62	4.10E-07	4.6	1.20E-06	2.19	2.92E-07
2.68	4.04E-07	4.26	8.19E-07	2.23	2.53E-07
2.75	4.55E-07	4.07	6.17E-07	2.27	3.69E-07
2.81	4.75E-07	3.77	5.75E-07	2.31	3.61E-07
2.87	4.80E-07	3.54	5.16E-07	2.35	2.94E-07
2.94	5.55E-07	3.35	6.34E-07	2.4	4.53E-07
3.01	4.77E-07	3.14	4.63E-07	2.45	3.23E-07
3.08	5.47E-07	3.05	5.59E-07	2.49	4.53E-07
3.15	6.00E-07	2.96	5.02E-07	2.54	4.36E-07
3.23	5.47E-07	2.89	3.06E-07	2.58	4.62E-07
3.3	6.00E-07	2.76	4.79E-07	2.63	5.11E-07
3.38	6.63E-07	2.67	2.66E-07	2.68	4.66E-07
3.46	6.58E-07	2.58	3.04E-07	2.73	5.12E-07
3.54	6.88E-07	2.49	2.24E-07	2.78	5.85E-07
3.62	7.17E-07	2.42	2.96E-07	2.83	5.32E-07
3.71	6.71E-07	2.35	1.84E-07	2.89	6.38E-07
3.8	7.70E-07	2.27	2.50E-07	2.94	5.85E-07
3.89	8.32E-07	2.21	3.07E-07	3	5.97E-07
3.98	9.26E-07	2.12	1.11E-07	3.06	6.04E-07
4.08	9.24E-07	2.22	2.68E-07	3.12	5.97E-07
4.18	9.66E-07	2.29	1.99E-07	3.19	6.20E-07
4.29	1.00E-06	2.32	2.32E-07	3.25	6.26E-07
4.39	1.13E-06	2.4	2.58E-07	3.38	6.54E-07
4.51	1.10E-06	2.45	2.41E-07	3.45	6.56E-07
4.63	1.17E-06	2.53	2.98E-07	3.53	7.77E-07
4.75	1.19E-06	2.59	3.21E-07	3.6	7.18E-07
4.88	1.32E-06	2.65	3.13E-07	3.68	7.76E-07
5.01	1.38E-06	2.75	3.25E-07	3.75	8.10E-07
5.15	1.36E-06	2.81	3.67E-07	3.85	8.25E-07
5.3	1.55E-06	2.89	4.08E-07	3.93	8.07E-07
5.45	1.64E-06	2.97	4.17E-07	4.02	7.32E-07
5.61	1.60E-06	3.07	4.14E-07	4.12	8.94E-07
5.77	1.76E-06	3.17	4.97E-07	4.22	8.32E-07
5.95	1.95E-06	3.26	5.11E-07	4.32	9.08E-07
6.13	2.02E-06	3.36	5.18E-07	4.43	1.33E-06
6.32	2.18E-06	3.46	5.22E-07	4.54	1.37E-06
6.52	2.25E-06	3.59	5.47E-07	4.65	1.86E-06
6.73	2.50E-06	3.69	5.03E-07	4.77	1.91E-06
6.95	2.60E-06	3.83	5.42E-07	4.9	2.36E-06
7.18	2.78E-06	3.94	6.06E-07	5.04	3.12E-06
7.43	2.98E-06	4.07	8.00E-07	5.18	3.93E-06
7.69	3.28E-06	4.24	1.05E-06	5.33	4.50E-06
7.96	3.46E-06	4.4	1.25E-06	5.48	4.98E-06
8.25	3.84E-06	4.58	1.70E-06	5.65	6.41E-06
8.56	3.98E-06	4.75	2.04E-06	5.82	8.99E-06
8.88	4.49E-06	4.95	3.21E-06	6.01	6.95E-06
9.23	4.86E-06	5.14	3.75E-06	6.2	9.37E-06
9.53	5.15E-06	5.38	4.52E-06	6.39	1.26E-05
9.98	5.71E-06	5.63	5.67E-06	6.6	1.15E-05
10.41	6.33E-06	5.89	8.01E-06	6.93	1.12E-05
10.86	7.79E-06	6.19	8.88E-06	7.07	1.50E-05
11.34	7.45E-06	6.48	9.16E-06	7.32	1.90E-05
11.86	8.76E-06	6.86	1.27E-05	7.59	2.25E-05
12.42	9.46E-06	7.2	1.68E-05	7.88	2.16E-05
13.2	1.02E-05	7.59	1.64E-05	8.2	2.67E-05
13.67	1.17E-05	8.06	1.85E-05	8.55	2.63E-05
14.36	1.33E-05	7.2	1.68E-05	9.31	3.23E-05
15.16	1.48E-05	7.59	1.64E-05	9.77	4.57E-05
16	1.78E-05	8.06	1.85E-05		
16.93	2.09E-05				
17.96	2.23E-05				
19.15	2.81E-05				

TABLE A67. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F)
R=0.1, AIR FORCE

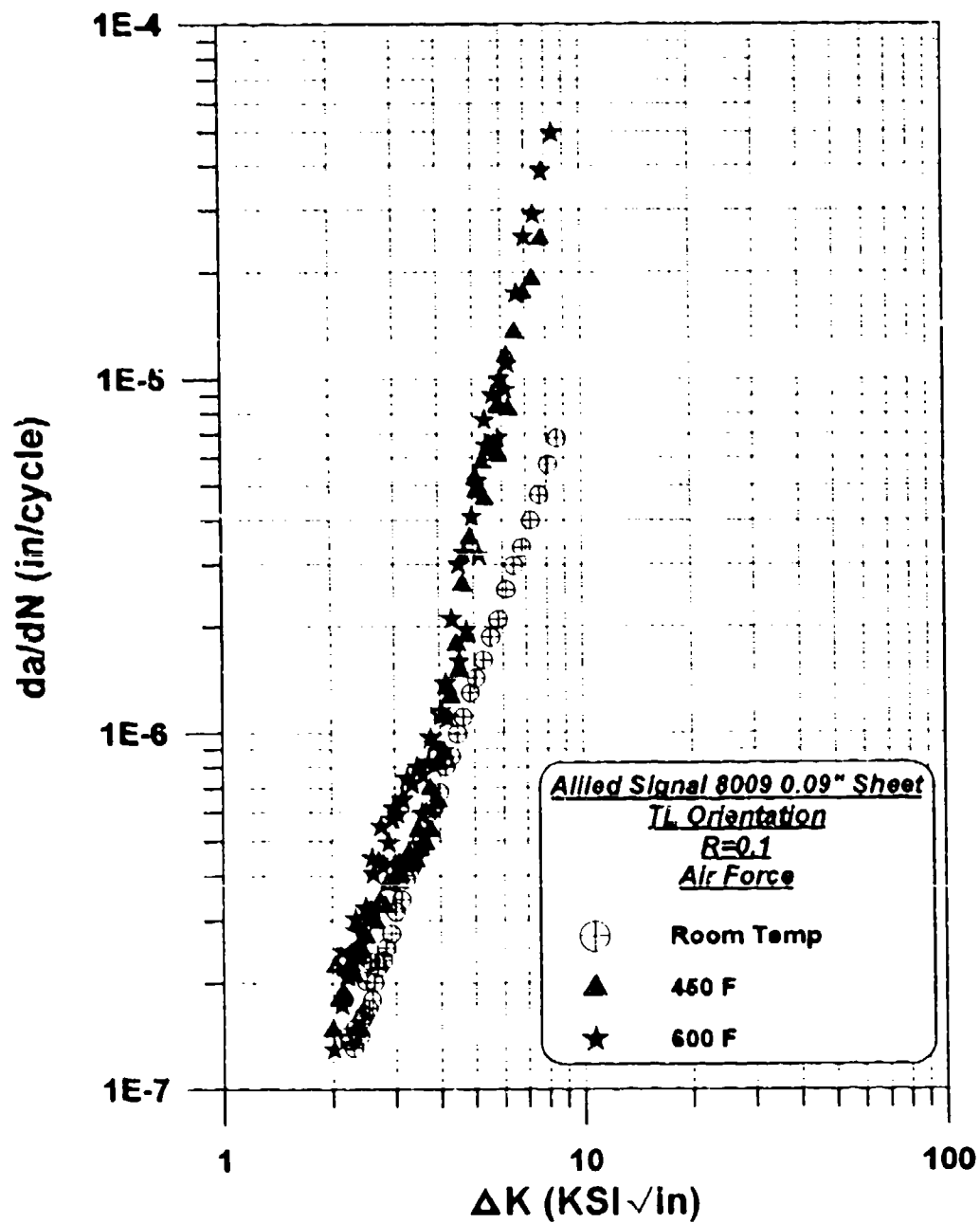


FIGURE A22. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET (T-L ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F) R=0.1, AIR FORCE.

Allied Signal 8009 0.09" Sheet

R=0.1

T-L Orientation

Air Force

Room Temperature		450 F		600 F	
Delta K	da/dN	Delta K	da/dN	Delta K	da/dN
2.21	1.42E-07	6.28	8.19E-06	6.16	9.34E-06
2.23	1.37E-07	5.89	6.04E-06	5.86	6.77E-06
2.28	1.31E-07	5.4	4.57E-06	5.44	6.49E-06
2.3	1.42E-07	5.1	4.80E-06	5.18	3.19E-06
2.33	1.45E-07	4.77	1.88E-06	4.75	1.95E-06
2.37	1.42E-07	4.53	1.49E-06	4.54	1.59E-06
2.4	1.57E-07	4.2	1.34E-06	4.2	1.10E-06
2.43	1.62E-07	3.95	8.19E-07	4.02	1.15E-06
2.47	2.0E-07	3.76	6.97E-07	3.77	9.65E-07
2.51	1.69E-07	3.47	5.32E-07	3.56	5.94E-07
2.55	2.30E-07	3.26	4.61E-07	3.34	7.16E-07
2.57	1.79E-07	3.06	4.31E-07	3.14	6.47E-07
2.61	2.01E-07	2.89	3.88E-07	2.96	6.15E-07
2.67	2.01E-07	2.71	3.34E-07	2.73	5.48E-07
2.70	2.32E-07	2.54	2.96E-07	2.58	4.46E-07
2.82	2.51E-07	2.37	2.52E-07	2.41	2.60E-07
2.92	2.75E-07	2.25	2.24E-07	2.32	3.03E-07
3	3.18E-07	2.11	1.79E-07	2.14	2.45E-07
3.1	3.42E-07	2	1.47E-07	2.02	1.30E-07
3.21	3.90E-07	2.04	2.23E-07	2.12	1.73E-07
3.32	4.24E-07	2.09	1.80E-07	2.2	2.06E-07
3.43	4.67E-07	2.15	1.86E-07	2.27	2.52E-07
3.54	4.99E-07	2.2	2.18E-07	2.32	2.81E-07
3.68	5.93E-07	2.27	2.11E-07	2.39	2.77E-07
3.83	6.17E-07	2.34	2.34E-07	2.47	3.25E-07
3.97	6.81E-07	2.39	2.44E-07	2.53	3.16E-07
4.13	8.03E-07	2.46	2.68E-07	2.6	4.05E-07
4.28	8.58E-07	2.56	3.18E-07	2.69	4.39E-07
4.47	9.91E-07	2.63	2.98E-07	2.78	4.28E-07
4.65	1.11E-06	2.71	3.36E-07	2.87	4.93E-07
4.85	1.30E-06	2.8	3.29E-07	2.95	5.73E-07
5.05	1.43E-06	2.89	3.78E-07	3.04	5.92E-07
5.31	1.61E-06	2.97	4.23E-07	3.13	6.53E-07
5.56	1.87E-06	3.08	3.96E-07	3.23	7.43E-07
5.85	2.10E-06	3.19	4.40E-07	3.34	7.21E-07
6.14	2.54E-06	3.28	4.27E-07	3.45	8.00E-07
6.46	2.98E-06	3.41	4.38E-07	3.58	7.62E-07
6.8	3.35E-06	3.51	4.73E-07	3.71	8.26E-07
7.21	3.99E-06	3.65	4.30E-07	3.86	9.24E-07
7.63	4.69E-06	3.76	5.34E-07	4.04	1.12E-06
8.11	5.74E-06	3.93	6.40E-07	4.15	1.38E-06
8.59	6.78E-06	4.11	8.73E-07	4.34	2.10E-06
		4.28	1.28E-06	4.54	3.00E-06
		4.45	1.77E-06	4.7	3.22E-06
		4.64	2.62E-06	4.95	4.07E-06
		4.87	3.55E-06	5.15	5.15E-06
		5.07	5.21E-06	5.41	7.63E-06
		5.32	5.81E-06	5.68	9.02E-06
		5.6	6.34E-06	5.95	9.99E-06
		5.88	8.30E-06	6.26	1.10E-05
		6.22	1.16E-05	6.64	1.74E-05
		6.55	1.35E-05	7	2.51E-05
		6.94	1.74E-05	7.45	2.90E-05
		7.36	1.90E-05	7.86	3.85E-05
		7.83	2.47E-05	8.42	4.93E-05

TABLE A68. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 SHEET
(T-L ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F)
R=0.1, AIR FORCE

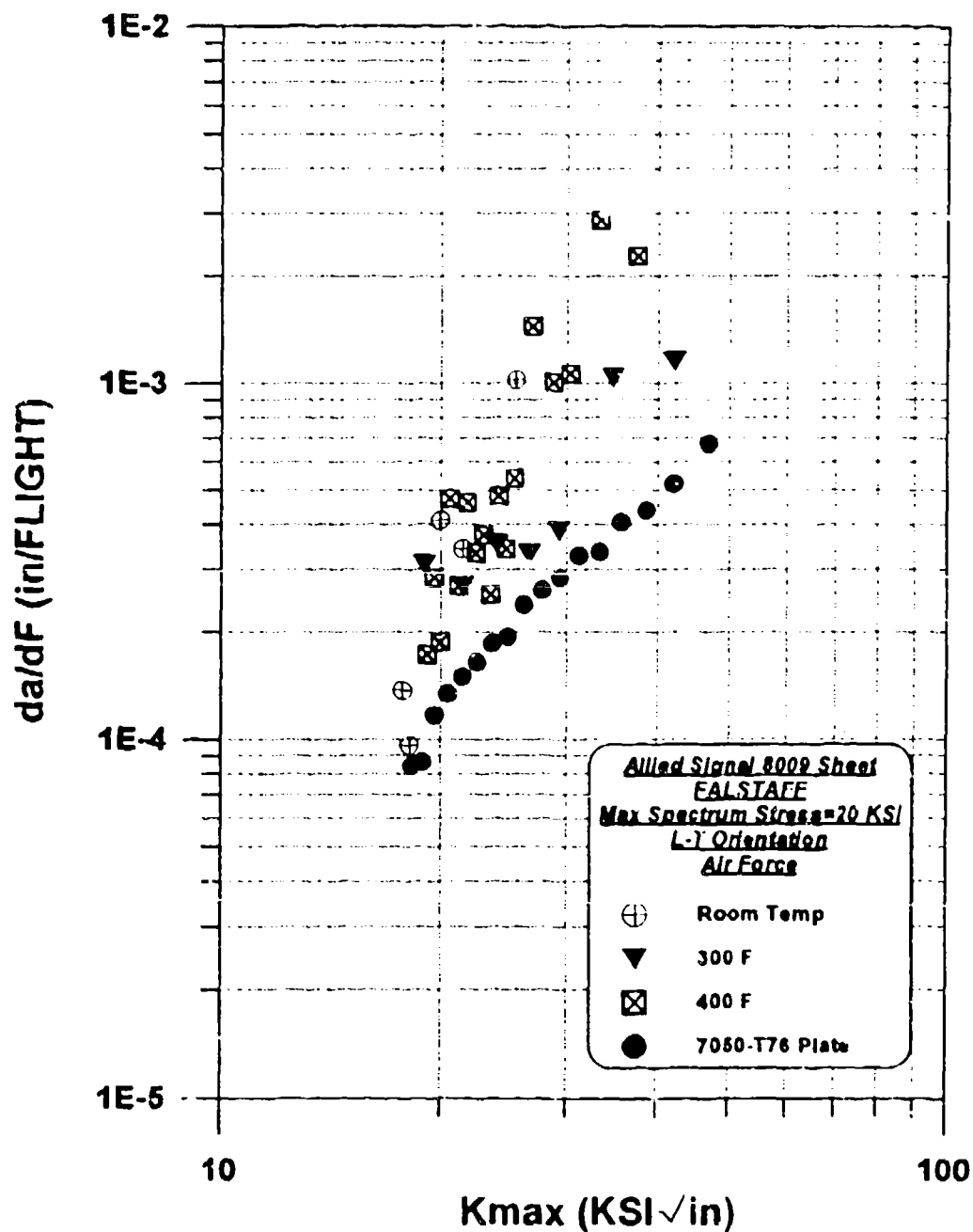


FIGURE A23. COMPARISON OF 8009 SHEET AND 7050-T76 PLATE FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION). AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: SF2
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: FALSTAFF
 SPECIMEN THICKNESS= 0.09075 IN.
 SPECIMEN WIDTH= 4.0015 IN.
 P_{max}= 7266 LBS

TOTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.4542		
501	0.523	1.38E-04	17.69
1001	0.5711	9.62E-05	18.14
1501	0.7764	4.11E-04	19.96
2001	0.9471	3.41E-04	21.40
2501	1.4583	1.02E-03	25.42

TABLE A69. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
 (L-T ORIENTATION, ROOM TEMPERATURE) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: 300 F
 SPECIMEN NUMBER: SF4
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: FALSTAFF
 SPECIMEN THICKNESS= 0.0955 IN.
 SPECIMEN WIDTH= 3.9995 IN.
 Pmax= 7639 LBS

OTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.4824		
501	0.6373	3.10E-04	18.99
1001	0.7719	2.69E-04	21.45
1501	0.9489	3.54E-04	23.94
2001	1.1143	3.31E-04	26.56
2501	1.3066	3.85E-04	29.25
3001	1.8259	1.04E-03	34.71
3301	2.1726	1.16E-03	42.14

TABLE A70. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
 (L-T ORIENTATION, 300 F) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: 400 F
 SPECIMEN NUMBER: SF5
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: FALSTAFF
 SPECIMEN THICKNESS= 0.093 IN.
 SPECIMEN WIDTH= 3.997 IN.
 Pmax= 7434 LBS

TOTAL FLIGHTS	CRACK LENGTH	K MAX	da/dF
0	0.5608		1.73E-04
100	0.5781	19.15	2.84E-04
200	0.6065	19.56	1.87E-04
300	0.6252	19.96	4.72E-04
400	0.6724	20.52	2.69E-04
500	0.6993	21.14	4.61E-04
600	0.7454	21.74	3.32E-04
700	0.7786	22.38	3.75E-04
800	0.8161	22.95	2.55E-04
900	0.8416	23.44	4.81E-04
1000	0.8897	24.02	3.41E-04
1100	0.9238	24.65	5.39E-04
1200	0.9777	25.33	1.45E-03
1300	1.1224	26.84	1.01E-03
1400	1.2229	28.68	1.06E-03
1500	1.3292	30.24	2.86E-03
1600	1.6153	33.24	2.27E-03
1700	1.8427	37.37	

TABLE A71. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
 (L-T ORIENTATION, 400 F) AIR FORCE.

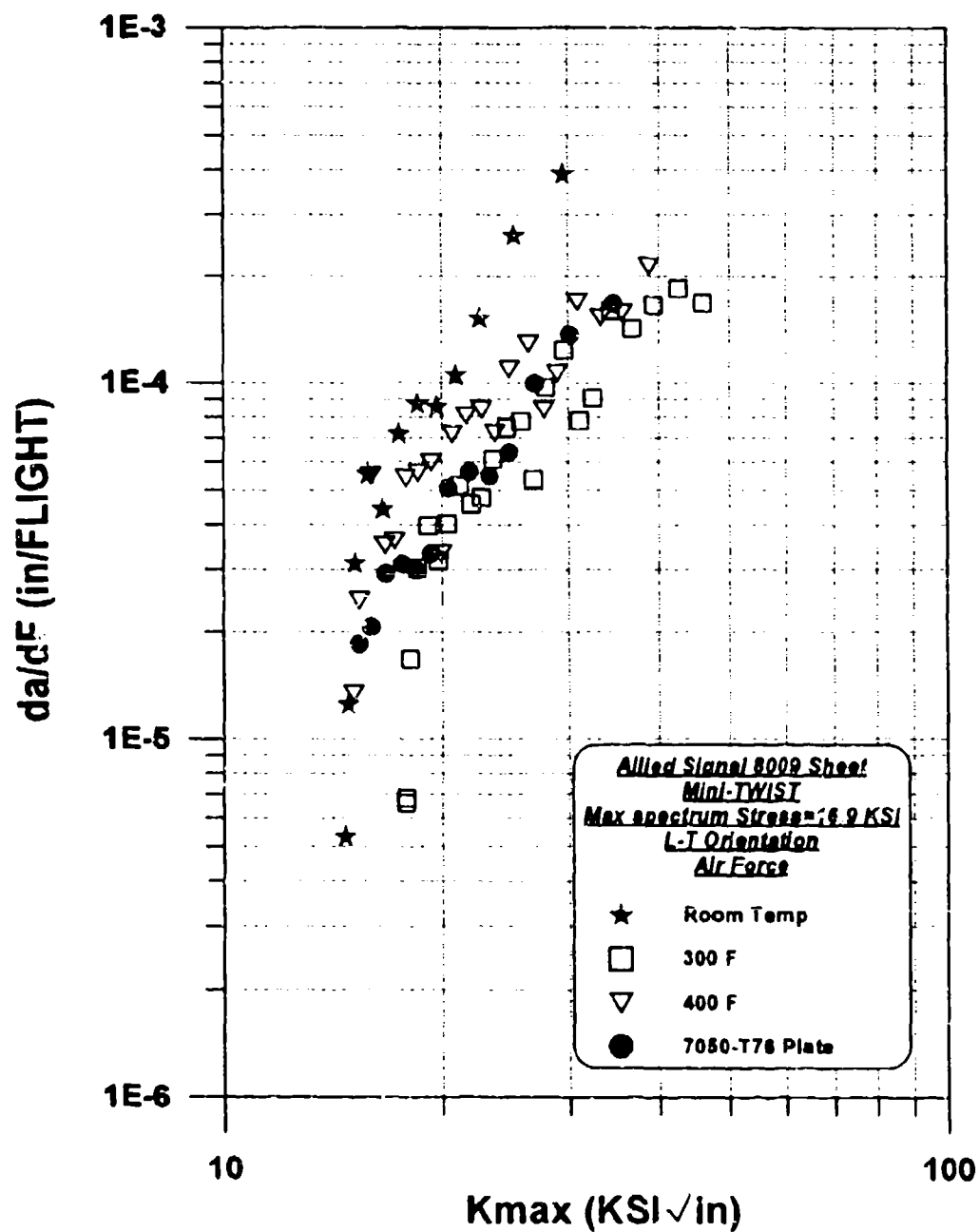


FIGURE A24. COMPARISON OF 8009 SHEET AND 7050-T76 PLATE MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION). AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: SF-8
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: MINITWIST
 SPECIMEN THICKNESS= 0.092 IN.
 SPECIMEN WIDTH= 4 IN.
 Pmax= 6219 LBS

OTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.4691		
1001	0.4744	5.30E-06	14.67
2001	0.4869	1.25E-05	14.82
3001	0.5181	3.12E-05	15.16
4001	0.5734	5.53E-05	15.83
5001	0.6176	4.42E-05	16.57
6001	0.6893	7.17E-05	17.41
7001	0.7763	8.70E-05	18.52
8001	0.8619	8.56E-05	19.68
9001	0.9667	1.05E-04	20.93
10001	1.1187	1.52E-04	22.58
11001	1.3798	2.61E-04	25.21
12001	1.7683	3.89E-04	29.44

TABLE A72. MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
 (L-T ORIENTATION, ROOM TEMPERATURE) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: 300 F
 SPECIMEN NUMBER: SF6
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: MINITWIST
 SPECIMEN THICKNESS= 0.0955 IN.
 SPECIMEN WIDTH= 3.9995 IN.
 Pmax= 7639 LBS

OTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.4932		
501	0.4965	6.60E-06	17.80
1001	0.4999	6.80E-06	17.86
2001	0.5167	1.68E-05	18.05
3001	0.547	3.03E-05	18.48
4001	0.5869	3.99E-05	19.11
5001	0.6187	3.18E-05	19.74
6001	0.659	4.03E-05	20.36
7001	0.7105	5.15E-05	21.13
8001	0.7562	4.57E-05	21.92
9001	0.8038	4.76E-05	22.67
10001	0.8648	6.10E-05	23.53
11001	0.9394	7.46E-05	24.58
12001	1.0173	7.79E-05	25.75
13001	1.0707	5.34E-05	26.74
14001	1.1678	9.71E-05	27.88
15001	1.2914	1.24E-04	29.54
16001	1.3697	7.83E-05	31.06
17001	1.4606	9.09E-05	32.35
18001	1.6207	1.60E-04	34.31
19001	1.7631	1.42E-04	36.75
20001	1.929	1.66E-04	39.37
21001	2.1141	1.85E-04	42.57
22001	2.2824	1.68E-04	46.10

TABLE A73. MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
 (L-T ORIENTATION, 300 F) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE: 400 F
 TITLE: SF9
 SPECIMEN NUMBER: 8009
 MATERIAL TYPE: L-T
 ORIENTATION: MINITWIST
 SPECTRUM TYPE: 0.092 IN.
 SPECIMEN THICKNESS= 4.0005 IN.
 SPECIMEN WIDTH= 6220 LBS
 Pmax=

TOTAL FLIGHTS	CRACK LENGTH	da/df	K MAX
0	0.4905		15.08
1000	0.5039	1.34E-05	15.38
2000	0.5285	2.46E-05	15.98
3000	0.5833	5.48E-05	16.65
4000	0.6184	3.51E-05	16.65
5000	0.6544	3.60E-05	17.17
6000	0.7083	5.39E-05	17.80
7000	0.7641	5.58E-05	18.56
8000	0.8237	5.96E-05	19.34
9000	0.8569	3.32E-05	19.96
10000	0.9285	7.16E-05	20.65
11000	1.0093	8.08E-05	21.64
12000	1.093	8.37E-05	22.69
13000	1.1651	7.21E-05	23.68
14000	1.2743	1.09E-04	24.83
15000	1.4031	1.29E-04	26.35
16000	1.4868	8.37E-05	27.73
17000	1.5931	1.06E-04	28.98
18000	1.7633	1.70E-04	30.86
19000	1.9167	1.53E-04	33.17
20000	2.0749	1.58E-04	35.55
21000	2.2889	2.14E-04	38.66

TABLE A74. MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
 (L-T ORIENTATION, 400 F) AIR FORCE.

APPENDIX B

**8009 EXTRUSION
1" X 4" X 48 "**

TABLE B1

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	RT	LONG	66.5	56.9	15.7		11.2
			66.9	58.0	16.4		11.1
			66.9	57.2	15.0		11.3
MCDONNELL DOUGLAS	RT	LONG	63.9	56.6	13.8	48.9	8.6
			63.7	56.5	15.2	57.5	9.1
			62.5	54.9	13.6	56.2	9.4
MCDONNELL DOUGLAS, CA	RT	LONG	63.0	53.2	12.0	49.0	11.8
			63.5	54.3	13.0	50.0	11.8
			63.0	53.7	13.0	57.0	11.7
AIR FORCE	RT	LONG	74.1	64.7	13.5	49.9	
			73.8	63.4	13.3	48.6	
			73.8	63.2	14.3	54.0	
NASA-LANGLEY	RT	LONG	65.5	57.4	13.0		
			64.9	56.9	12.5		
			65.3				
NORTHROP	RT	LONG	65.3	54.5	14.3	53.9	13.0
			66.0	56.4	13.8	51.7	13.9
			65.0	54.9	14.4	53.7	12.7
AVERAGE			66.3	57.2	13.9	52.5	11.3
STANDARD DEVIATION			3.7	3.4	1.2	3.3	1.6

TABLE B2

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	RT	L TRANS	66.6	55.4	12.1		11.4
			66.3	54.7	11.4		11.6
			66.0	55.2	12.1		11.5
MCDONNELL DOUGLAS	RT	L TRANS	64.9	56.4	12.1	40.0	8.4
			64.7	56.0	12.5	41.2	8.5
			65.5	57.0	10.8	36.2	8.1
MCDONNELL DOUGLAS, CA	RT	L TRANS	64.0	52.6	8.0	33.0	11.8
			63.9	51.6	9.0	28.0	11.9
			64.6	52.6	10.0	35.0	12.0
AIR FORCE	RT	L TRANS	74.6	61.3	11.9	29.3	
			75.1	62.5	9.1	28.0	
			74.4	61.6	9.2	27.9	
NASA-LANGLEY	RT	L TRANS	65.9	56.4	9.5		
			65.8	56.0	8.0		
			65.9	56.1			
NORTHROP	RT	L TRANS	67.3	56.3	9.5	30.6	12.5
			66.7	54.7	8.7	27.6	13.1
			66.6	54.6	8.9	27.1	13.3
		AVERAGE	67.1	56.2	10.2	32.0	11.2
		STANDARD DEVIATION	3.6	3.0	1.6	5.0	1.8

TABLE B3

TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NASA-LANGLEY	300	LONG	55.5	47.6	10.0		
			56.5	49.7	8.0		
			56.1	49.6	9.0		
		AVERAGE	56.0	49.0	9.0		
		STANDARD DEVIATION	0.5	1.2	1.0		

TABLE B4

TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NASA-LANGLEY	300	L TRANS	56.4	47.6	4.0		
			57.2		5.0		
			56.8	48.4	5.5		
		AVERAGE	56.8	48.0	4.8		
		STANDARD DEVIATION	0.4	0.6	0.8		

TABLE B5

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	450	LONG	45.3	41.8	10.7		
			46.0	41.5	11.5		
			46.6	41.6	11.4		
MCDONNELL DOUGLAS	450	LONG	43.4	40.0	9.1	37.8	
			43.6	39.2	9.2	37.8	
			44.0	39.1	8.7	35.9	
MCDONNELL DOUGLAS, CA	450	LONG	43.8	40.8	11.0	37.0	11.1
			44.7	40.4	10.0	25.0	9.1
			45.0	42.4	11.0	44.0	
AIR FORCE	450	LONG	45.6	45.0	6.6	13.1	
			45.0	41.9	9.4	29.0	
NASA-LANGLEY	450	LONG	48.2	43.4	20.0		
			47.5	41.9	18.0		
ARMY	450	LONG	42.8	41.5	13.8	34.0	
			44.2		8.0	16.0	
			44.5		11.7	40.0	
AVERAGE			45.0	41.5	11.3	31.8	10.1
STANDARD DEVIATION			1.5	1.6	3.5	10.0	1.4

TABLE B6

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	450	L TRANS	44.6 45.3 45.0	40.9 42.0 41.6	7.2 7.2 8.9		
MCDONNELL DOUGLAS	450	L TRANS	44.1 44.7 43.3	39.2 37.9 38.7	6.1 6.6 6.9	18.9 22.5 14.6	
MCDONNELL DOUGLAS, CA	450	L TRANS	44.4 43.5 44.8	39.5 38.7 38.6	5.0 6.0 6.0	15.0 15.0 16.0	10.1 10.4 10.3
AIR FORCE	450	L TRANS	47.7	43.1	4.8	11.6	
NASA-LANGLEY	450	L TRANS	47.9 48.3 49.4	41.4 41.9 40.5	6.0 7.0 5.0		
ARMY	450	L TRANS	45.2 46.4 46.5	40.2 41.5 42.3	5.3 3.1 5.0	11.6 12.9 14.0	
		AVERAGE	45.7	40.5	6.0	15.2	10.3
		STANDARD DEVIATION	1.8	1.6	1.3	3.4	0.2

TABLE B7

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	600	LONG	34.7	33.4	14.6		
			34.1	32.9	13.9		
			34.3	32.5	14.2		
MCDONNELL DOUGLAS	600	LONG	32.9	28.7	12.3	44.3	
			33.8	29.6	12.9	47.4	
			32.2	28.0	12.6	46.6	
ARMY	600	LONG	27.1	25.9	19.8	46.0	7.4
			29.9	27.8	14.3	22.0	7.7
			33.6		5.6	18.0	9.1
		AVERAGE	32.5	29.9	13.4	37.4	8.1
		STANDARD DEVIATION	2.5	2.8	3.7	13.6	0.9

TABLE B8

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	600	L TRANS	34.7	31.7	9.3		
			36.7	34.0	10.0		
			33.6	31.7	10.0		
MCDONNELL DOUGLAS	600	L TRANS	33.0	27.2	8.5	23.2	
			33.1	27.8	10.5	26.6	
AIR FORCE	600	L TRANS	34.9	33.6	6.4	10.8	
			36.1	34.8	5.7	14.5	
ARMY	600	L TRANS	31.2	30.5	6.2	22.0	8.8
			31.2	31.1	4.6	15.6	9.8
			31.0	30.3	3.5	18.0	8.4
		AVERAGE	33.6	31.3	7.5	18.7	9.0
		STANDARD DEVIATION	2.0	2.5	2.5	5.5	0.7

TABLE B9

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
(100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	LONG	44.1	40.5	8.8	34.1	10.9
			44.1	40.7	9.0	30.7	11.3
			44.2	40.4	9.5	30.6	11.1
		AVERAGE	44.1	40.5	9.1	31.8	11.1
		STANDARD DEVIATION	0.1	0.2	0.4	2.0	0.2

TABLE B10

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
(100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	L TRANS	44.3	40.2	5.0	13.9	10.7
			44.8	40.8	5.0	13.1	10.8
			44.7	40.8	4.5	12.8	11.0
		AVERAGE	44.6	40.6	4.8	13.3	10.8
		STANDARD DEVIATION	0.3	0.3	0.3	0.6	0.2

TABLE B11

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
(100 HR EXPOSURE @ 600F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	600	LONG	34.2	33.1	10.4	32.0	10.2
			33.9	32.5			10.9
			34.3	32.7	11.0	31.3	10.6
		AVERAGE	34.1	32.8	10.7	31.7	10.6
		STANDARD DEVIATION	0.2	0.3	0.4	0.5	0.4

TABLE B12

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
(100 HR EXPOSURE @ 600F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	600	L TRANS	33.7	32.1	6.1	11.9	10.1
			33.6	32.0	6.2	12.3	10.4
			33.9	32.2	6.3	14.1	10.2
		AVERAGE	33.7	32.1	6.2	12.8	10.2
		STANDARD DEVIATION	0.2	0.1	0.1	1.2	0.2

TABLE B13

TENSILE RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	-320	LONG	98.2	79.0	0.7		
			96.9	79.4			
			87.4	79.1			
		AVERAGE	94.2	79.2	0.7		
		STANDARD DEVIATION	5.9	0.2			

TABLE B14

COMPRESSION RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	RT	LONG	69.2	
			71.3	
			68.6	
MCDONNELL DOUGLAS, CA	RT	LONG	52.1	12.5
			51.7	13.1
			51.7	12.4
NASA-LANGLEY	RT	LONG	57.2	12.8
			57.2	12.9
			55.8	13.2
NORTHROP	RT	LONG	54.8	13.0
			54.8	13.0
AVERAGE			58.6	12.9
STANDARD DEVIATION			7.4	0.3

TABLE B15

COMPRESSION RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	RT	L TRANS	69.9	
			69.0	
			68.6	
NASA-LANGLEY	RT	L TRANS	58.4	12.8
			59.4	12.9
			58.7	12.9
NORTHROP	RT	L TRANS	56.2	13.0
			57.9	13.0
AVERAGE			62.3	12.9
STANDARD DEVIATION			5.8	0.1

TABLE B16

COMPRESSION RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL	450	LONG	53.8	
DOUGLAS			53.6	
			53.8	
MCDONNELL	450	LONG	37.2	10.4
DOUGLAS, CA			38.1	10.6
NASA-LANGLEY	450	LONG	39.1	11.3
			39.2	11.1
			38.8	11.3
		AVERAGE	44.2	10.9
		STANDARD DEVIATION	7.9	0.4

TABLE B17

COMPRESSION RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL	450	L TRANS	55.2	
DOUGLAS			56.0	
			57.0	
NASA-LANGLEY	450	L TRANS	41.6	11.1
			41.6	11.1
			41.5	11.1
		AVERAGE	49.3	11.1
		STANDARD DEVIATION	8.0	0.0

TABLE B18

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL	600	LONG	43.6	
DOUGLAS			43.6	
			45.2	
		AVERAGE	44.2	
		STANDARD DEVIATION	0.9	

TABLE B19

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL	600	L TRANS	48.2	
DOUGLAS			48.2	
		AVERAGE	48.2	
		STANDARD DEVIATION	0.0	

TABLE B20

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
NASA-LANGLEY	300	LONG	46.3	11.6
			45.6	12.8
			45.8	12.1
		AVERAGE	45.9	12.2
		STANDARD DEVIATION	0.4	0.6

TABLE B21

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
NASA-LANGLEY	300	L TRANS	48.2	12.5
			51.2	9.8
			49.8	11.8
		AVERAGE	49.7	11.4
		STANDARD DEVIATION	1.5	1.4

TABLE B22

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	LONG	1.5	123.2 126.7 122.0	110.7 113.8 111.7
MCDONNELL DOUGLAS, CA	RT	LONG	1.5	94.0 87.6 95.4	84.0 83.1 84.7
NASA-LANGLEY	RT	LONG	1.5	103.2 101.2	93.4 91.1
AVERAGE				106.6	96.6
STANDARD DEVIATION				15.1	13.3

TABLE B23

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	L TRANS	1.5	121.3 122.2	113.3 114.3
AVERAGE				121.7	113.8
STANDARD DEVIATION				0.6	0.7

TABLE B24

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	450	LONG	1.5	85.4	82.1
DOUGLAS				91.6	89.0
				91.3	87.8
			AVERAGE	89.5	86.3
			STANDARD DEVIATION	3.5	3.7

TABLE B25

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	450	L TRANS	1.5	86.0	81.6
DOUGLAS				91.9	82.7
				81.7	80.6
			AVERAGE	86.5	81.6
			STANDARD DEVIATION	5.1	1.0

TABLE B26

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	600	LONG	1.5	78.5	72.4
DOUGLAS				78.2	72.4
				76.1	69.4
			AVERAGE	77.6	71.4
			STANDARD DEVIATION	1.3	1.8

TABLE B27

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	600	L TRANS	1.5	78.2	67.3
DOUGLAS				72.2	65.3
				75.5	66.8
			AVERAGE	75.3	66.5
			STANDARD DEVIATION	3.0	1.1

TABLE B28

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	LONG	2.0	157.2 160.6 159.3	148.0 138.8 138.8
MCDONNELL DOUGLAS, CA	RT	LONG	2.0	118.8 121.8 120.0	95.5 95.9 97.3
NASA-LANGLEY	RT	LONG	2.0	124.7 125.8	99.5 107.7
AVERAGE				136.0	115.2
STANDARD DEVIATION				19.2	22.6

TABLE B29

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	L TRANS	2.0	157.9 154.7	135.7 134.7
AVERAGE				156.3	135.2
STANDARD DEVIATION				2.3	0.7

TABLE B30

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	450	LONG	2.0	116.1	107.1
DOUGLAS				113.6	101.0
				122.7	105.1
			AVERAGE	117.5	104.4
			STANDARD DEVIATION	4.7	3.1

TABLE B31

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	450	L TRANS	2.0	116.2	106.1
DOUGLAS				108.1	95.9
			AVERAGE	112.2	101.0
			STANDARD DEVIATION	5.8	7.2

TABLE B32

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	600	LONG	2.0	97.9	85.7
DOUGLAS				96.8	85.7
				98.0	84.7
AVERAGE				97.6	85.4
STANDARD DEVIATION				0.7	0.6

TABLE B33

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL	600	L TRANS	2.0	99.0	88.8
DOUGLAS				96.8	96.2
AVERAGE				97.9	92.5
STANDARD DEVIATION				1.5	5.3

TABLE B34

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	K _{IC} (KSI in ^{-0.5})	K _q (KSI in ^{-0.5})	COMMENT
MCDONNELL DOUGLAS	RT	L-T		22.3	(1)
MCDONNELL DOUGLAS, CA	RT	L-T		32.2 22.8	(1) (2)
NORTHROP	RT	L-T		28.5	(2)
ARMY	RT	L-T	12.3 15.6 12.7	11.8	VALID (2) VALID VALID
		AVERAGE	13.5	23.5	
		STANDARD DEVIATION	1.8	7.7	

- (1): INVALID DUE TO VIOLATION OF ASTM E399 PRECRACK LENGTH REQUIREMENTS
(2): INVALID DUE TO $P_{max}/P_Q > 1.1$

TABLE B35

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{-0.5})	Kq (KSI in ^{-0.5})	COMMENT
MCDONNELL DOUGLAS	450	L-T	20.6	17.4	(1)
NORTHROP	450	L-T		15.5	(2), (3)
AVERAGE			20.6	16.5	
STANDARD DEVIATION				1.3	

- (1): INVALID DUE TO VIOLATION OF ASTM E399 PRECRACK LENGTH REQ
 (2): INVALID DUE TO $P_{max}/P_q > 1.1$
 (3): 100 HR EXPOSURE @ 450F PRIOR TO TEST

TABLE B36

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{-0.5})	Kq (KSI in ^{-0.5})	COMMENT
MCDONNELL DOUGLAS	600	L-T		22.2 24.9	(1), (2) (2)
NORTHROP	600	L-T		15.3	(3), (4)
AVERAGE				20.8	
STANDARD DEVIATION				5.0	

- (1): INVALID DUE TO VIOLATION OF ASTM E399 PRECRACK LENGTH REQ
 (2): INVALID DUE TO $a \text{ \& } B < 2.5(Kq/Y_S)^2$
 (3): INVALID DUE TO $P_{max}/P_q > 1.1$
 (4): 100 HR EXPOSURE @ 600F PRIOR TO TEST

TABLE B37

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	K _{IC} (KSI in ^{0.5})	K _q (KSI in ^{0.5})	COMMENT
MCDONNELL	RT	T-L	12.8		VALID
DOUGLAS, CA			16.1		VALID
NORTHROP	RT	T-L	13.8		VALID
		AVERAGE	14.2		
		STANDARD DEVIATION	1.7		

TABLE B38

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
NORTHROP	450	T-L		12.0	(1), (2)
AVERAGE				12.0	
STANDARD DEVIATION					

- (1): INVALID DUE TO $P_{max}/P_q > 1.1$
 (2): 100 HR EXPOSURE @ 450F PRIOR TO TEST

TABLE B39

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
NORTHROP	600	T-L		9.8	(1), (2)
AVERAGE				9.8	
STANDARD DEVIATION					

- (1): INVALID DUE TO $P_{max}/P_q > 1.1$
 (2): 100 HR EXPOSURE @ 600F PRIOR TO TEST

TABLE B40

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	RT	LONG	35.0	3,000,000	*
			42.0	3,000,000	*
			44.0	984,890	
			45.0	688,650	
			50.0	69,890	
ARMY	RT	LONG	39.0	14,710,000	*
			40.0	15,186,000	*
			40.5	15,446,000	*
			41.0	1,206,000	
			41.3	234,000	
			42.5	217,000	
			45.0	133,000	
			50.0	385,000	

(*): RUN OUT

TABLE B41

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
ARMY	450	LONG	32.0	1,071,000	#
			32.0	604,000	#
			34.0	6,800,000	
			34.0	769,000	#
			35.0	2,809,000	
			38.0	962,000	
			41.0	18,000	

(#): FAILED IN THREADS

TABLE B42

FATIGUE RESULTS WITH $R=0.1$ AND $K_t=3.0$ FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	RT	LONG	17.0	3,000,000	*
			18.0	3,000,000	*
			19.0	2,332,730	
			20.0	266,810	
			25.0	63,200	

(*): RUN OUT

TABLE B43

FATIGUE RESULTS WITH R=0.1 AND K_t=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
(100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	450	LONG	30.0	1,000,000	*
			33.0	372,251	
			35.0	275,057	
			40.0	84,878	
			45.0	36,260	

(*): RUN OUT

TABLE B44

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
(100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	450	LONG	15.0	1,000,000	*
			16.0	1,000,000	*
			17.0	181,530	
			18.0	273,750	
			20.0	108,460	

(*): RUN OUT

TABLE B45

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
ARMY	600	LONG	27.0	5,652,000
			27.0	10,401,000
			29.0	4,875,000
			29.0	679,000 #
			31.0	2,481,000
			33.0	997,000
			35.0	1,580,000
			35.0	1,649,000

(#): FAILED IN THREADS

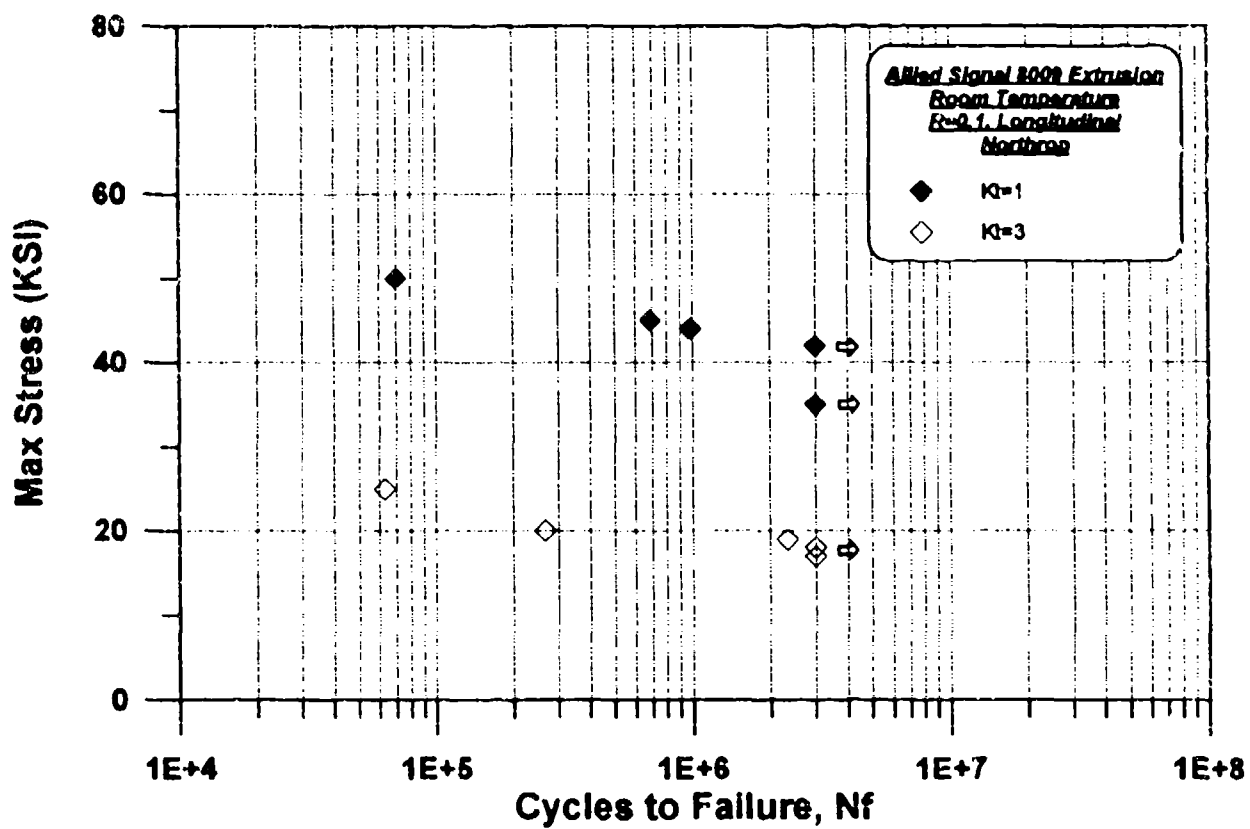


FIGURE B1. FATIGUE RESULTS OF 8009 EXTRUSION
 (LONGITUDINAL ORIENTATION) NORTHROP.

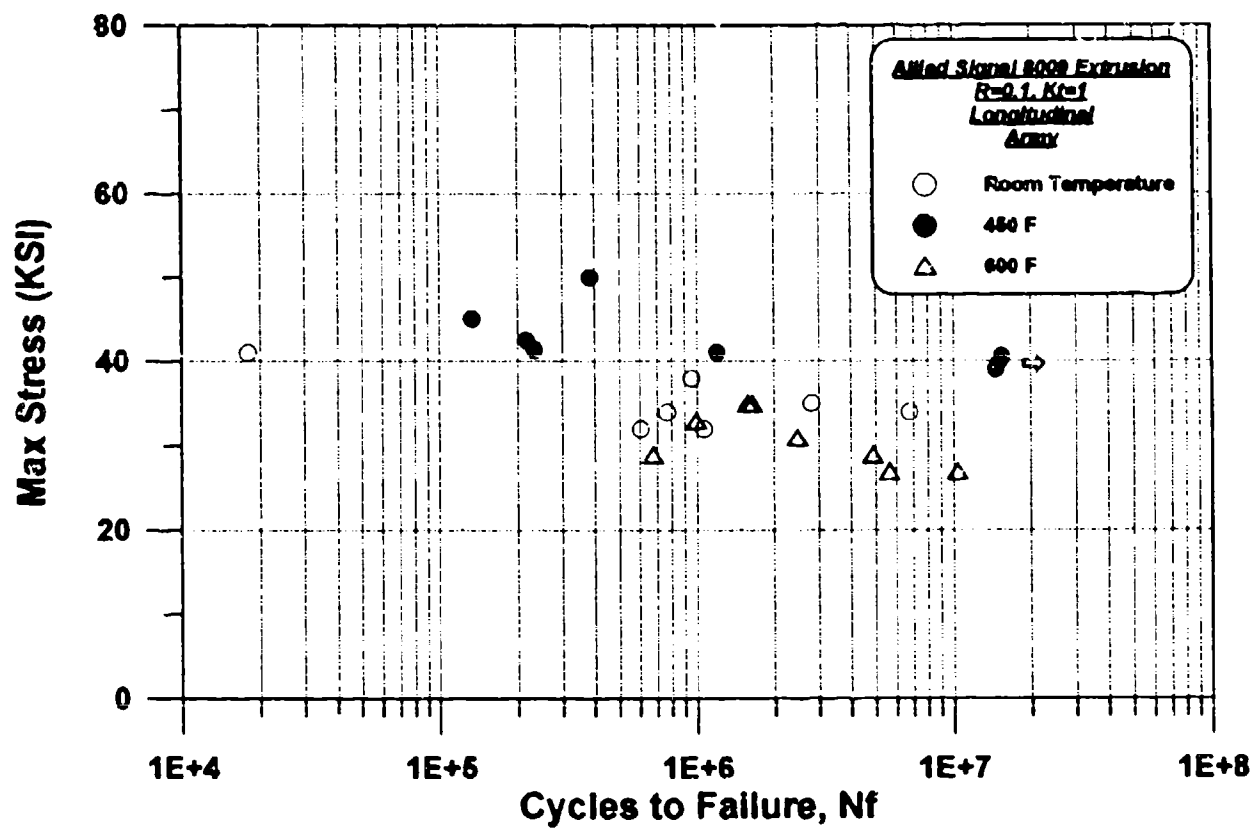


FIGURE B2. FATIGUE RESULTS OF 8009 EXTRUSION
(LONGITUDINAL ORIENTATION) ARMY.

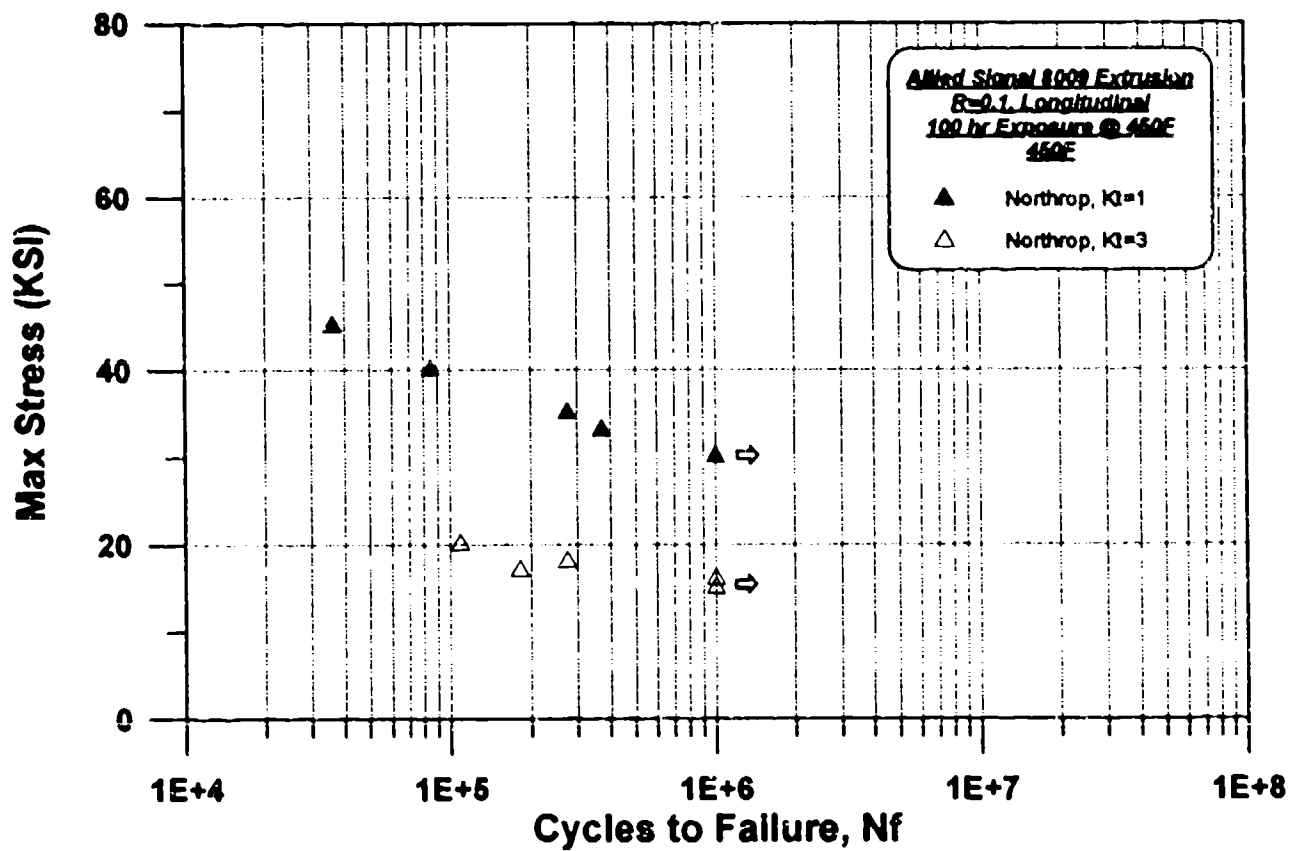


FIGURE B3. FATIGUE RESULTS OF 8009 EXTRUSION
(LONGITUDINAL ORIENTATION, 100 HR EXPOSURE)
NORTHROP.

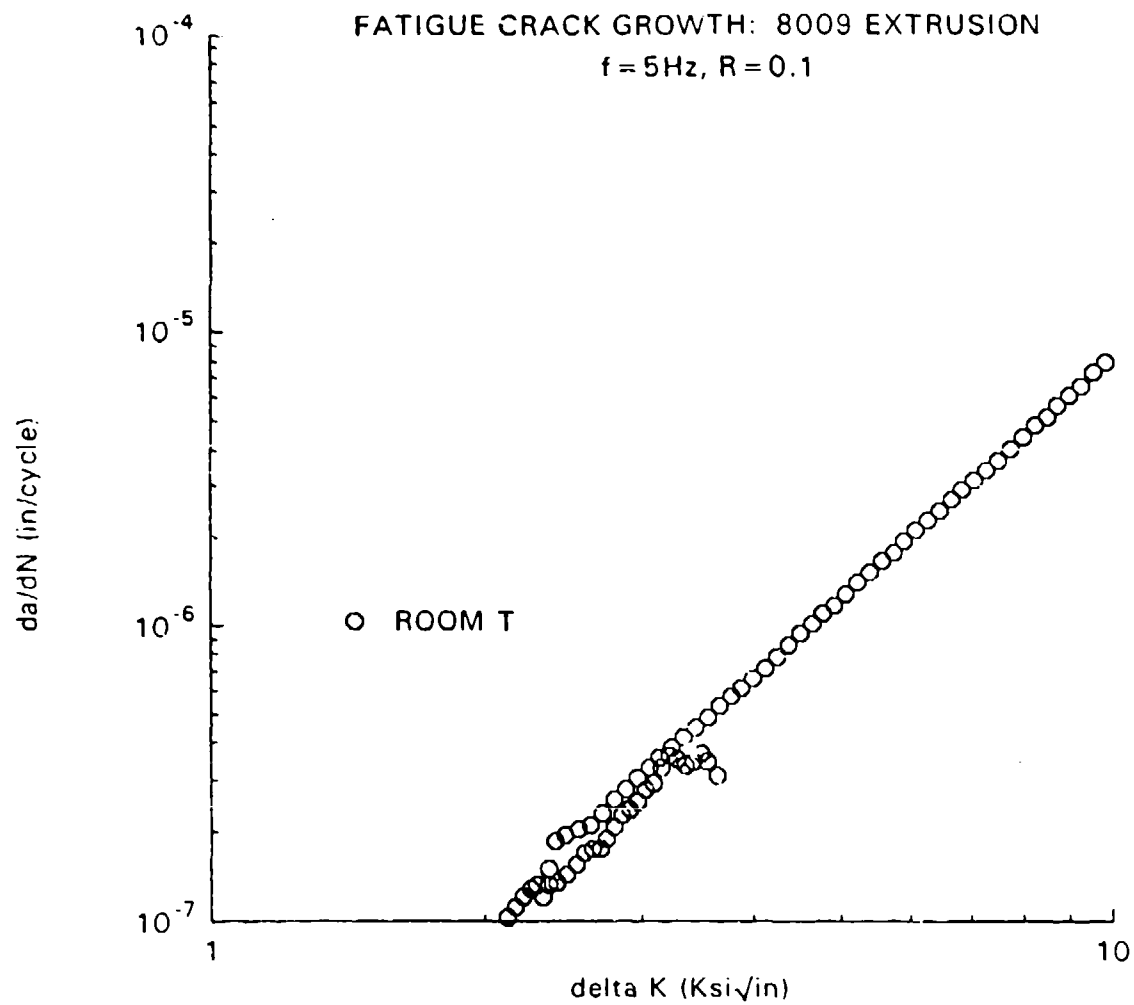


FIGURE B4. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMPERATURE) NASA-LANGLEY.

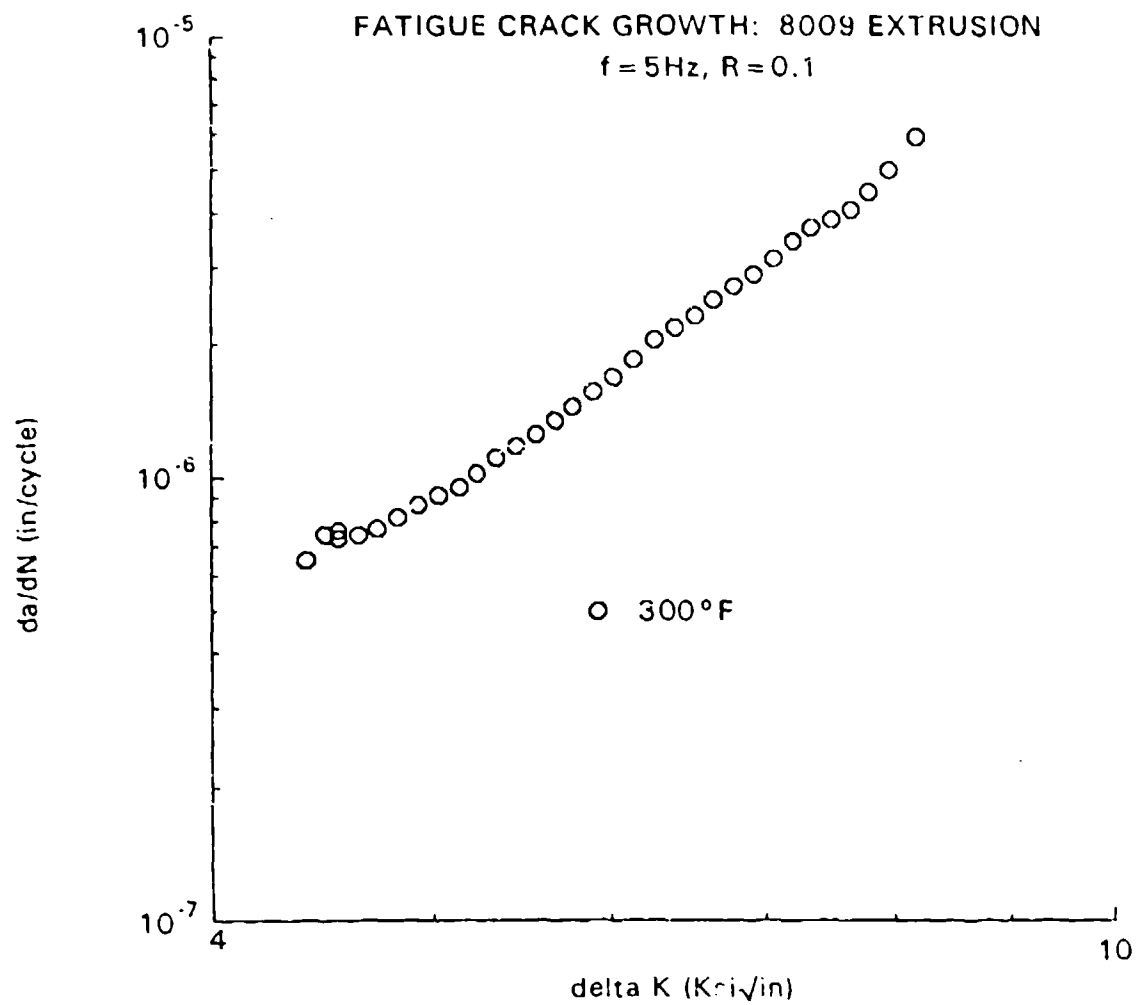


FIGURE B5. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, 300 F) NASA-LANGLEY.

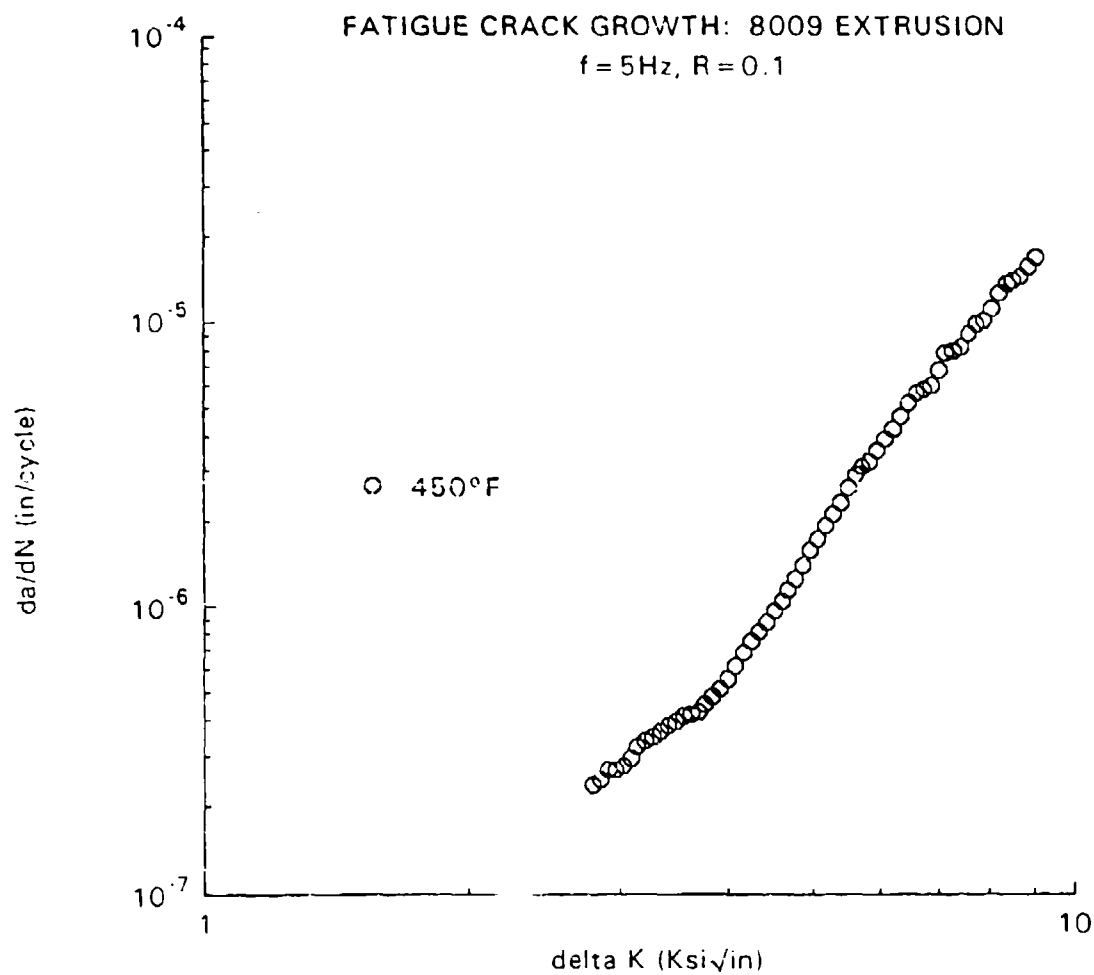


FIGURE B6. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, 450 F) NASA-LANGLEY.

450 F da/dN	450 F delta K	300 F da/dN	300 F delta K	room T da/dN	room T delta K
1.70E-05	9.10	5.89E-06	8.19	3.08E-07	3.64
1.57E-05	8.91	4.93E-06	7.97	3.43E-07	3.56
1.46E-05	8.73	4.40E-06	7.81	3.66E-07	3.49
1.41E-05	8.56	4.02E-06	7.66	3.46E-07	3.42
1.36E-05	8.39	3.84E-06	7.50	3.35E-07	3.35
1.26E-05	8.23	3.69E-06	7.36	3.51E-07	3.29
1.11E-05	8.07	3.41E-06	7.21	3.58E-07	3.22
1.02E-05	7.91	3.12E-06	7.07	3.27E-07	3.16
9.88E-06	7.75	2.89E-06	6.93	2.91E-07	3.09
9.10E-06	7.60	2.71E-06	6.79	2.78E-07	3.03
8.21E-06	7.45	2.52E-06	6.66	2.54E-07	2.97
7.91E-06	7.30	2.31E-06	6.52	2.36E-07	2.91
7.82E-06	7.15	2.17E-06	6.39	2.26E-07	2.85
6.86E-06	7.01	2.05E-06	6.27	2.07E-07	2.80
6.1E-06	6.87	1.84E-06	6.14	1.89E-07	2.74
5.83E-06	6.74	1.70E-06	6.02	1.74E-07	2.69
5.63E-06	6.60	1.58E-06	5.90	1.76E-07	2.63
5.22E-06	6.47	1.45E-06	5.78	1.69E-07	2.58
4.70E-06	6.34	1.34E-06	5.67	1.54E-07	2.53
4.24E-06	6.22	1.25E-06	5.56	1.44E-07	2.47
3.95E-06	6.09	1.18E-06	5.45	1.35E-07	2.41
3.55E-06	5.98	1.11E-06	5.34	1.32E-07	2.35
3.24E-06	5.85	1.02E-06	5.23	1.32E-07	2.29
3.12E-06	5.74	9.54E-07	5.13	1.30E-07	2.25
2.93E-06	5.63	9.12E-07	5.03	1.21E-07	2.20
2.63E-06	5.51	8.64E-07	4.93	1.11E-07	2.16
2.31E-06	5.41	8.17E-07	4.83	1.03E-07	2.12
2.12E-06	5.30	7.69E-07	4.73	1.20E-07	2.32
1.94E-06	5.19	7.41E-07	4.64	1.51E-07	2.35
1.74E-06	5.09	7.30E-07	4.55	1.85E-07	2.40
1.58E-06	4.99	7.59E-07	4.55	1.95E-07	2.46
1.40E-06	4.89	7.40E-07	4.48	2.04E-07	2.54
1.25E-06	4.80	6.52E-07	4.40	2.12E-07	2.62
1.14E-06	4.70			2.29E-07	2.70
1.05E-06	4.61			2.57E-07	2.79
9.61E-07	4.52			2.79E-07	2.87
8.76E-07	4.43			3.02E-07	2.96
8.12E-07	4.34			3.28E-07	3.06
7.54E-07	4.25			3.55E-07	3.15
6.85E-07	4.17			3.86E-07	3.25
6.17E-07	4.08			4.15E-07	3.34
5.58E-07	4.00			4.44E-07	3.45
5.14E-07	3.92			4.85E-07	3.55
4.82E-07	3.85			5.28E-07	3.66
4.53E-07	3.77			5.71E-07	3.77
4.25E-07	3.70			6.10E-07	3.89
4.18E-07	3.62			6.56E-07	4.00
4.13E-07	3.55			7.12E-07	4.12
3.95E-07	3.48			7.76E-07	4.25
3.86E-07	3.41			8.57E-07	4.38
3.68E-07	3.34			9.39E-07	4.51
3.46E-07	3.28			1.01E-06	4.66
3.39E-07	3.21			1.09E-06	4.80
3.22E-07	3.15			1.17E-06	4.94
2.96E-07	3.09			1.28E-06	5.09
2.79E-07	3.02			1.39E-06	5.24
2.71E-07	2.96			1.52E-06	5.41
2.69E-07	2.91			1.65E-06	5.57
2.51E-07	2.85			1.77E-06	5.74
2.38E-07	2.79			1.92E-06	5.92
				2.11E-06	6.10
				2.28E-06	6.28
				2.49E-06	6.47
				2.70E-06	6.66
				2.91E-06	6.87
				3.14E-06	7.07
				3.45E-06	7.29
				3.71E-06	7.52
				4.01E-06	7.75
				4.46E-06	7.99
				4.84E-06	8.24
				5.20E-06	8.48
				5.66E-06	8.73
				6.08E-06	8.99
				6.60E-06	9.26
				7.35E-06	9.55
				8.01E-06	9.84
				8.68E-06	10.15

TABLE B45. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMP, 300 F, AND 450 F) NASA-LANGLEY.

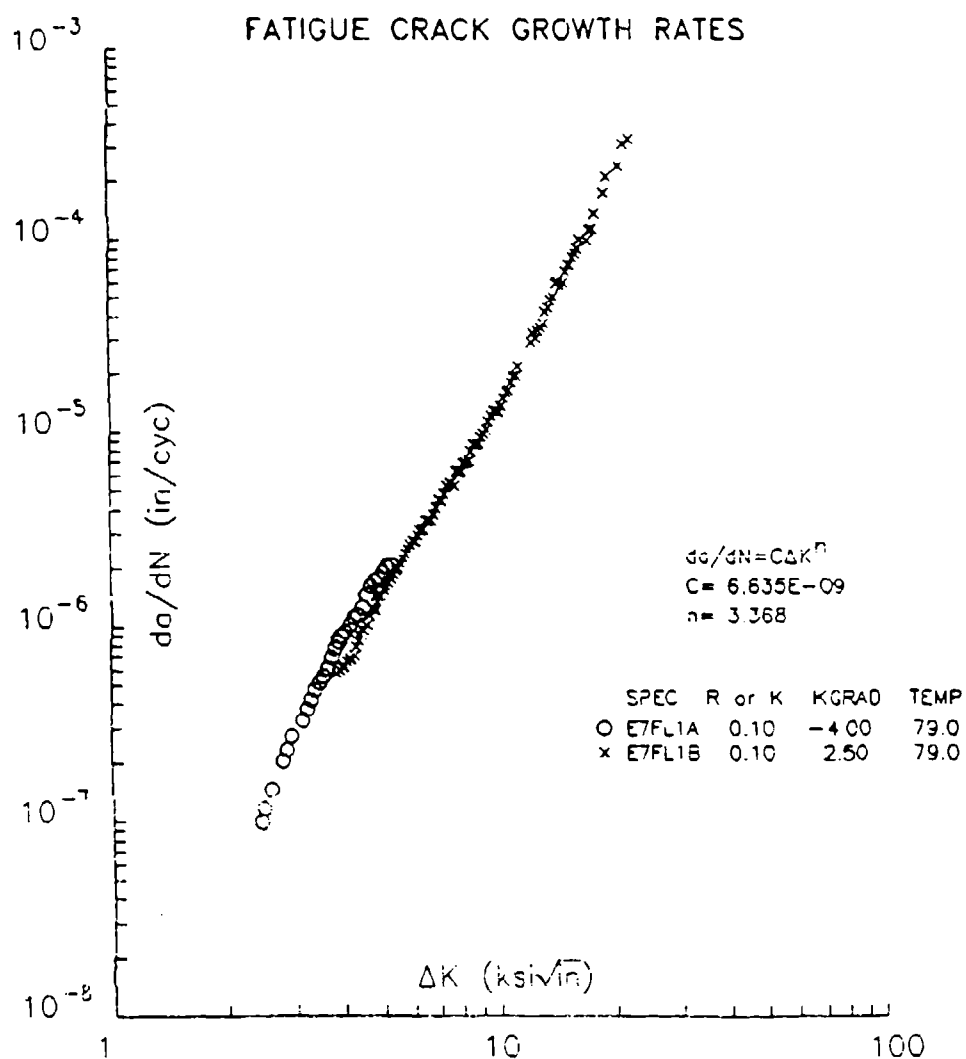


FIGURE B7. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMPERATURE) NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen ID: E7FL1A
Contract #: WNH705CN
Material: 8009 Bar
Temperature (F): 79
Environment: Lab. air

Geometry: C(T)
Orientation: L-T
Yield (ksi): 55.0
Modulus: 12.7

Specimen Dimensions (in)

Thickness: 0.249
Width: 2.008
Height: 1.200

Notch depth: 0.430
Gage length: 1.000
Alpha ratio: 1.250

Precrack Parameters

Phax (lbf): 432.0
Final a (in): 0.499

Stress ratio (R): 0.10
Kmax: 6.00

Test Parameters

Initial a (in): 0.499
K-gradient: -4.00

Initial K: 6.00
Stress ratio (R): 0.10

K Coeff: 0.886200
EvB/P Coeff: 1.000980
4.640000
-4.669510
-13.320000
-18.460100
14.720000
-236.824997
-5.600000
1214.880000
0.000000
-2143.570100

Analysis Codes
MRP: 2 0

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
20.53	0.491	0.494	0.003	1.000
24.62	0.595	0.584	-0.012	1.000
25.36	0.612	0.599	-0.013	1.000
26.75	0.642	0.619	-0.022	1.000
27.02	0.647	0.630	-0.017	1.000
28.35	0.674	0.650	-0.024	1.000
30.21	0.708	0.680	-0.028	1.000
33.01	0.755	0.737	-0.018	1.000
48.94	0.952	0.950	-0.002	1.000
50.98	0.971	0.969	-0.002	1.000
55.84	1.013	0.996	-0.016	1.000
60.03	1.051	1.044	-0.007	1.000
67.38	1.094	1.091	-0.003	1.000
71.37	1.129	1.125	-0.004	1.000

Specimen ID: E7FL1A

Page: 1

Phax (lbf)	EvB/P	a (in)	N (K)	Δa (in)	ΔN (K)	Δa/ΔN (in/cyc)	ΔK (ksi-in)
420	20.71	0.4963	3309	0.0156	75.9	2.073E-06	5.29
403	21.24	0.5053	7610	0.0125	6103	2.041E-06	5.13
391	21.27	0.5119	10827	0.0115	5990	1.916E-06	5.01
378	21.49	0.5178	13713	0.0119	6782	1.760E-06	4.89
367	21.70	0.5233	16817	0.0124	7169	1.725E-06	4.78
347	21.94	0.5297	20494	0.0116	7120	1.631E-06	4.67
355	22.17	0.5357	23986	0.0116	7974	1.458E-06	4.55
344	22.39	0.5413	27614	0.0116	9554	1.252E-06	4.45
333	22.62	0.5473	31960	0.0124	10825	1.150E-06	4.34
323	22.86	0.5533	37168	0.0126	11200	1.122E-06	4.24
312	23.12	0.5598	42785	0.0118	11635	1.014E-06	4.14
302	23.37	0.5659	48368	0.0119	12723	9.372E-07	4.03
293	23.60	0.5716	54401	0.0120	13378	9.006E-07	3.94
284	23.86	0.5778	61091	0.0120	14265	8.382E-07	3.85
275	24.11	0.5836	67779	0.0126	16306	7.702E-07	3.75
266	24.37	0.5897	75356	0.0123	17719	6.920E-07	3.66
258	24.65	0.5962	84085	0.0116	18932	6.089E-07	3.58
250	24.91	0.6020	93074	0.0120	21493	5.585E-07	3.49
242	25.16	0.6077	103066	0.0122	23370	5.214E-07	3.41
234	25.45	0.6140	114567	0.0118	24947	4.735E-07	3.33
227	25.72	0.6199	126436	0.0120	28660	4.204E-07	3.25
220	25.99	0.6258	139514	0.0122	32502	3.766E-07	3.17
213	26.28	0.6320	155096	0.0120	36658	3.281E-07	3.10
206	26.57	0.6381	172016	0.0120			
	26.86	0.6440	191754				
	27.10	0.6489	215598				
188	27.45	0.6560	239024	0.0128	46894	2.737E-07	2.99
182	27.74	0.6618	262493	0.0119	50806	2.736E-07	2.81
176	28.05	0.6678	289810	0.0123	60178	2.046E-07	2.75
	28.37	0.6741	322671				
	28.64	0.6792	367640				
160	29.03	0.6866	413087	0.0133	91528	1.453E-07	2.56
155	29.35	0.6924	459167	0.0118	101006	1.165E-07	2.49
150	29.67	0.6983	514292	0.0114	114742	9.933E-08	2.43
	29.97	0.7038	573910				

TABLE B46. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FL1A, NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	E7FL18	Geometry	C/T:
Contract #	WHP705CH	Orientation	L T
Material	6009 Bar	Yield (ksi)	55.0
Temperature (F)	79	Modulus	12.7
Environment	Lab. Air		

Specimen Dimensions (in)

Thickness	0.249	Notch depth	0.430
Width	2.028	Gage length	1.020
Height	1.200	Alpha ratio	1.250

PreCrack Parameters

Pmax (lbs)	432.0	Stress ratio (R)	0.10
Final a (in)	0.499	Kmax	6.00

Test Parameters

Initial a (in)	0.708	Initial K	4.00
K-gradient	2.50	Stress ratio (R)	0.10

K Coeff	E-B/P Coeff	Analysis Codes
0.886000	1.030960	KRP 2 0
4.640000	-4.665310	
-13.320000	18.463100	
14.720000	-236.824997	
-5.600000	1214.880000	
0.000000	-2143.570100	

Specimen Id. E7FL18

Page 1

Power (lbs)	E-B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi/in)
225	31.01	0.7221	25349				
226	31.37	0.7284	36270	0.0123	21419	5.730E-07	3.79
228	31.73	0.7343	46768	0.0122	20432	5.991E-07	3.85
230	32.10	0.7406	56702	0.0120	19471	6.146E-07	3.90
231	32.45	0.7463	66239	0.0118	18775	6.273E-07	3.96
233	32.83	0.7524	75479	0.0124	18075	6.628E-07	4.02
235	33.22	0.7587	84914	0.0123	18287	6.747E-07	4.08
237	33.61	0.7647	93765	0.0121	17772	6.800E-07	4.15
238	34.00	0.7708	102685	0.0122	17064	7.140E-07	4.21
240	34.40	0.7769	110829	0.0117	14917	7.486E-07	4.27
242	34.77	0.7825	117602	0.0114	13487	8.485E-07	4.34
243	35.17	0.7883	124316	0.0120	13249	9.021E-07	4.40
245	35.58	0.7944	130851	0.0123	12784	9.660E-07	4.47
247	36.02	0.8007	137100	0.0122	11995	1.019E-06	4.54
249	36.44	0.8067	142846	0.0128	11229	1.137E-06	4.61
251	36.92	0.8135	148329	0.0126	10281	1.226E-06	4.68
252	37.34	0.8193	153127	0.0116	9489	1.219E-06	4.75
254	37.77	0.8250	157818	0.0120	8936	1.342E-06	4.83
256	38.24	0.8313	162063	0.0112	7833	1.432E-06	4.89
258	38.61	0.8362	165652	0.0115	7947	1.442E-06	4.97
259	39.11	0.8427	170011	0.0134	8685	1.546E-06	5.04
261	39.66	0.8497	174337	0.0123	7586	1.616E-06	5.12
263	40.08	0.8550	177597	0.0111	6625	1.672E-06	5.20
265	40.54	0.8607	180962	0.0120	6825	1.760E-06	5.28
267	41.06	0.8670	184422	0.0127	6783	1.872E-06	5.36
269	41.59	0.8734	187742	0.0125	6354	1.963E-06	5.44
270	42.10	0.8795	190776	0.0115	5749	2.007E-06	5.52
272	42.58	0.8850	193491	0.0117	5529	2.102E-06	5.61
274	43.12	0.8911	196325	0.0119	5310	2.236E-06	5.69
276	43.62	0.8968	198802	0.0117	4942	2.358E-06	5.77
278	44.16	0.9028	201267	0.0125	5075	2.464E-06	5.86
279	44.76	0.9093	203877	0.0129	4913	2.602E-06	5.95
281	45.34	0.9156	206187	0.0118	4322	2.736E-06	6.04
283	45.87	0.9212	208198	0.0114	4162	2.734E-06	6.13
285	46.43	0.9270	210350	0.0119	4059	2.938E-06	6.22
287	47.03	0.9331	212257	0.0114	3679	3.103E-06	6.31
288	47.55	0.9384	214026	0.0114	3645	3.137E-06	6.41
290	48.18	0.9445	215902	0.0133	3795	3.493E-06	6.51
292	48.91	0.9516	217824	0.0130	3742	3.470E-06	6.61
294	49.52	0.9575	219644	0.0117	3346	3.484E-06	6.72
296	50.14	0.9633	221169	0.0118	3143	3.750E-06	6.82
298	50.79	0.9693	222786	0.0127	3127	4.081E-06	6.92
300	51.53	0.9760	224276	0.0123	2758	4.475E-06	7.02
302	52.16	0.9816	225544	0.0113	2571	4.392E-06	7.13
304	52.81	0.9873	226847	0.0124	2602	4.782E-06	7.25
306	53.60	0.9941	228146	0.0136	2650	5.233E-06	7.36
308	54.41	1.0009	229447	0.0172	3142	5.460E-06	7.52
309	55.67	1.0112	231289	0.0119	2167	5.444E-06	7.60
309	55.85	1.0112	231614	0.0058	1099	5.260E-06	7.74

TABLE B47. FATIGUE CRACK GROWTH RATE RESULTS FOR 6009 EXTRUSION
(L-T ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FL18, NORTHROP.

Specimen Id. E7FL1B					Page 2		
Pass (1/cr)	E/B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi√in)
310	56.39	1.0170	232388	0.0107	1710	6.239E-06	7.81
312	57.20	1.0233	231324	0.0120	1910	6.267E-06	7.91
314	57.93	1.0290	234298	0.0121	1947	6.236E-06	8.04
315	58.78	1.0355	235271	0.0126	1829	6.864E-06	8.16
317	59.60	1.0415	236127	0.0117	1677	6.967E-06	8.28
319	60.37	1.0472	236948	0.0116	1634	7.080E-06	8.41
321	61.20	1.0531	237761	0.0124	1571	7.875E-06	8.53
322	62.11	1.0595	238519	0.0128	1492	8.571E-06	8.67
324	63.04	1.0659	239253	0.0117	1368	8.533E-06	8.79
326	63.82	1.0712	239886	0.0113	1298	8.678E-06	8.93
327	64.72	1.0772	240551	0.0122	1274	9.364E-06	9.06
329	65.68	1.0834	241186	0.0124	1274	9.713E-06	9.20
310	66.65	1.0895	241825	0.0119	1169	1.020E-05	9.34
312	67.57	1.0953	242354	0.0120	1048	1.124E-05	9.48
314	68.59	1.1015	242893	0.0121	1010	1.200E-05	9.62
315	69.56	1.1074	243564	0.0123	965	1.277E-05	9.78
317	70.67	1.1135	243888	0.0123	975	1.261E-05	9.92
318	71.58	1.1197	244338	0.0117	931	1.262E-05	10.08
340	72.73	1.1256	244789	0.0126	932	1.349E-05	10.23
342	73.93	1.1322	245270	0.0124	833	1.489E-05	10.38
343	75.00	1.1380	245621	0.0116	725	1.491E-05	10.55
345	76.10	1.1438	245999	0.0131	811	1.621E-05	10.72
346	77.52	1.1512	246432	0.0127	710	1.785E-05	10.87
347	78.58	1.1565	246709	0.0105	552	1.904E-05	11.04
349	79.62	1.1617	246985	0.0114	588	1.937E-05	11.20
350	80.90	1.1679	247297	0.0125	577	2.161E-05	11.36
	82.22	1.1741	247561				
	83.12	1.1783	247789				
	84.52	1.1847	248113				
	86.53	1.1936	248555				
357	87.56	1.1981	248736	0.0113	389	2.905E-05	12.29
358	89.18	1.2049	248944	0.0130	399	3.257E-05	12.46
359	90.67	1.2115	249135	0.0116	383	3.043E-05	12.65
360	92.03	1.2166	249327	0.0120	358	3.350E-05	12.85
361	93.68	1.2231	249494	0.0116	334	3.457E-05	13.02
362	95.00	1.2282	249661	0.0113	310	3.649E-05	13.23
363	96.65	1.2344	249803	0.0124	298	4.172E-05	13.42
364	98.35	1.2406	249959	0.0141	324	4.351E-05	13.66
365	100.55	1.2485	250127	0.0131	273	4.796E-05	13.86
366	102.06	1.2537	250232	0.0100	200	4.981E-05	14.11
367	103.44	1.2584	250327	0.0118	201	5.673E-05	14.29
368	105.58	1.2655	250433	0.0127	213	5.971E-05	14.48
369	107.32	1.2711	250540	0.0121	213	5.675E-05	14.73
370	109.36	1.2776	250646	0.0125	212	5.885E-05	14.94
371	111.34	1.2836	250752	0.0126	187	6.715E-05	15.19
371	113.51	1.2901	250833	0.0119	164	7.267E-05	15.41
372	115.37	1.2955	250916	0.0120	164	7.331E-05	15.66
372	117.71	1.3022	250997	0.0121	152	7.972E-05	15.87
373	119.69	1.3076	251068	0.0127	152	8.345E-05	16.15
373	122.40	1.3149	251150	0.0134	151	8.889E-05	16.39
374	124.77	1.3211	251219	0.0125	127	9.892E-05	16.67
	127.29	1.3274	251276				
	129.86	1.3337	251334				
375	131.96	1.3387	251392	0.0113	115	9.814E-05	17.45
375	134.66	1.3450	251449	0.0128	115	1.113E-04	17.70
375	137.56	1.3516	251537	0.0130	116	1.120E-04	17.98
375	140.49	1.3580	251585	0.0138	102	1.357E-04	18.30
	144.00	1.3654	251609				
	146.47	1.3705	251642				
375	149.46	1.3765	251689	0.0170	99	1.724E-04	19.26
375	155.22	1.3875	251740	0.0191	91	2.090E-04	19.60
	159.65	1.3955	251780				
	164.90	1.4047	251820				
374	168.52	1.4108	251860	0.0195	82	2.394E-04	21.05
373	176.99	1.4242	251902	0.0299	96	3.132E-04	21.45
371	188.21	1.4407	251955	0.0371	113	3.299E-04	22.58
	203.87	1.4613	252014				

TABLE B47. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FL1B, NORTHROP. (continued)

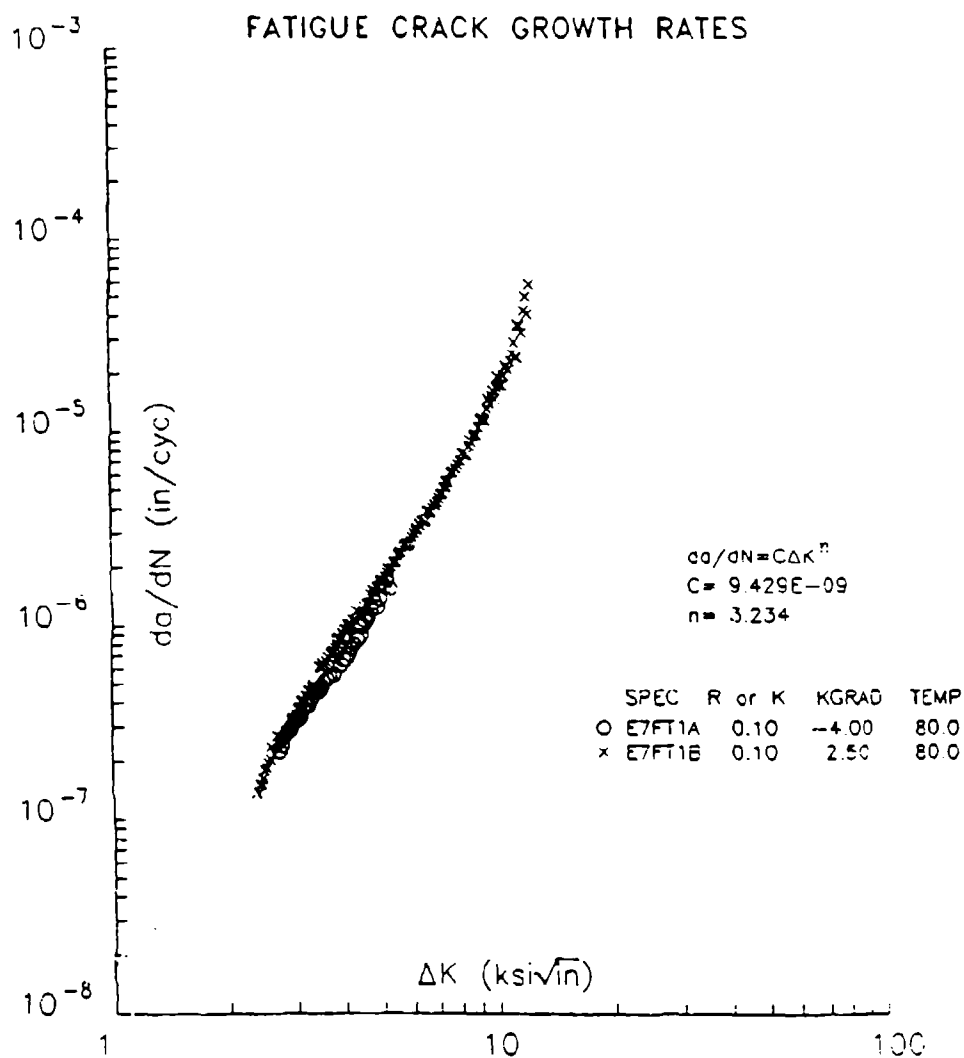


FIGURE B8. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE) NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id. E7FT1A
Contract # MNH702(X)
Material 8009 Extr.
Temperature (F) 80
Environment Lab. air

Geometry C(T)
Orientation T-L
Yield (ksi) 55.0
Modulus 12.8

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.414
Width	2.062	Gage-length	1.000
Height	1.200	Alpha ratio	1.250

Pretack Parameters

Pmax (lbs)	430.0	Stress ratio (R)	0.10
Final a (in)	0.503	Kmax	6.01

Test Parameters

Initial a (in)	0.503	Initial K	6.00
K-gradient	-4.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff	Analysis Codes
0.836000	1.000980	KRF 2 0
4.640000	-4.669510	
-13.320000	18.460100	
14.720000	-236.824997	
-5.600000	1214.380000	
0.000000	-2145.570100	

Specimen Id. E7FT1A

Page 1

Pmax (lbs)	EvB/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi/in)
414	21.10	0.5057	1113	0.0090	5820	1.547E-06	5.25
406	21.22	0.5090	3952	0.0095	5536	1.717E-06	5.18
395	21.43	0.5147	6933	0.0095	5335	1.372E-06	5.07
387	21.57	0.5186	9490	0.0084	5166	1.625E-06	5.00
379	21.74	0.5231	12268	0.0084	5264	1.385E-06	4.92
370	21.89	0.5270	14656	0.0073	6566	1.241E-06	4.82
363	22.02	0.5304	17532	0.0081	6919	1.322E-06	4.76
355	22.20	0.5351	21223	0.0091	6234	1.229E-06	4.68
347	22.37	0.5395	24451	0.0077	6529	1.104E-06	4.61
341	22.50	0.5428	27507	0.0072	7205	1.080E-06	4.54
334	22.66	0.5467	30971	0.0078	7620	1.045E-06	4.47
327	22.81	0.5506	34711	0.0080	8033	9.972E-07	4.40
320	22.98	0.5547	38591	0.0080	8968	8.720E-07	4.33
313	23.13	0.5586	42744	0.0078	10021	8.302E-07	4.26
306	23.29	0.5625	47559	0.0081	10363	8.020E-07	4.19
299	23.44	0.5669	52765	0.0083	10308	7.607E-07	4.12
294	23.64	0.5708	57922	0.0078	10818	7.074E-07	4.06
287	23.80	0.5743	63073	0.0077	11828	6.641E-07	3.99
281	23.96	0.5785	68735	0.0079	12726	6.599E-07	3.93
276	24.14	0.5827	74901	0.0084	12840	6.260E-07	3.87
270	24.32	0.5869	81481	0.0080			
260	24.49	0.5907	87761				
252	24.65	0.5921	99753				
243	24.82	0.5989	111862	0.0104	19133	5.555E-07	3.71
239	25.02	0.6028	118891	0.0079	14441	5.426E-07	3.62
242	25.20	0.6068	126303	0.0082	15714	5.312E-07	3.57
237	25.39	0.6111	134605	0.0085	16624	5.101E-07	3.51
232	25.58	0.6152	142927	0.0076	16005	4.773E-07	3.43
228	25.74	0.6193	150609	0.0076	16649	4.562E-07	3.40
223	25.94	0.6229	159376	0.0082	17935	4.592E-07	3.35
218	26.12	0.6270	168542	0.0085	18717	4.531E-07	3.29
213	26.34	0.6314	178163	0.0081	19175	4.204E-07	3.24
209	26.51	0.6351	187717	0.0076	19466	3.981E-07	3.19
205	26.70	0.6389	197643	0.0081	20539	3.922E-07	3.14
200	26.90	0.6431	208216	0.0079	20996	3.743E-07	3.09
196	27.08	0.6463	218644	0.0077	22298	3.477E-07	3.04
192	27.29	0.6508	230614	0.0083	25354	3.268E-07	2.98
188	27.50	0.6551	243993	0.0081	26427	3.237E-07	2.94
184	27.71	0.6594	257041	0.0081	26105	3.118E-07	2.90
180	27.91	0.6632	270103	0.0077	26365	2.892E-07	2.85
177	28.11	0.6671	282705	0.0075	26456	2.807E-07	2.81
173	28.32	0.6707	296759	0.0076	28410	2.667E-07	2.76
169	28.50	0.6747	312316	0.0083	34592	2.410E-07	2.72
	28.73	0.6790	321350	0.0081	36086	2.255E-07	2.68
	28.92	0.6828	342403				

TABLE B48. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1A, NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	E7FT1B	Geometry	C-T
Contract #	WRIGHTON	Orientation	T-L
Material	8009 E.C.	Yield (ksi)	55.0
Temperature (F)	80	Modulus	12.1
Environment	Lab. air		

Specimen Dimensions (in)

Thickness	0.250	Notch depth	0.414
Width	2.002	Gage length	1.000
Height	1.200	Alpha ratio	1.250

Pre-crack Parameters

Pre. (lbs)	420.0	Stress ratio (R)	0.10
Final a (in)	0.503	Ins	1.00

Test Parameters

Initial a (in)	0.710	Initial K	2.80
R-gradient	2.50	Stress ratio (R)	0.10

I Coeff	E.E.I Coeff	Analysis Coeff
0.925000	1.000000	1.00
4.540000	-4.567513	
-11.320000	18.480100	
14.720000	-236.324887	
-5.600000	1214.830000	
0.000000	-2143.570100	

Specimen Id. E7FT1B

Page 1

Pha. (lbs)	E/B/P	a (in)	N (X1)	ΔP (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔP (ksi/in)
142	30.47	0.7107	752				
143	30.57	0.7124	14456	0.0060	42875	1.375E-07	2.16
143	30.81	0.7167	44723	0.0084	55509	1.513E-07	2.32
144	31.05	0.7208	72004	0.0084	55019	1.521E-07	2.41
145	31.30	0.7251	99747	0.0087	52348	1.545E-07	2.43
146	31.56	0.7295	124851	0.0088	47788	1.791E-07	2.46
146	31.81	0.7337	147534	0.0082	44532	1.857E-07	2.46
147	32.06	0.7379	169382	0.0088	45457	1.942E-07	2.51
148	32.35	0.7425	192891	0.0088	42970	2.054E-07	2.54
149	32.60	0.7466	212272	0.0069	28976	2.375E-07	2.59
	32.77	0.7493	221343				
	32.86	0.7522	225549				
151	33.40	0.7573	230460	0.0052	19310	2.694E-07	2.65
151	33.60	0.7624	244850	0.0078	32057	2.308E-07	2.67
152	33.99	0.7670	263557	0.0081	34208	2.475E-07	2.70
153	34.15	0.7700	279067	0.0076	29265	2.599E-07	2.72
154	34.29	0.7743	292922	0.0078	29012	2.698E-07	2.75
155	34.66	0.7787	308079	0.0087	20988	2.824E-07	2.76
155	34.97	0.7833	323709	0.0086	29415	2.908E-07	2.81
156	35.24	0.7872	337494	0.0081	26941	2.006E-07	2.84
157	35.52	0.7914	350651	0.0081	25100	2.241E-07	2.87
158	35.80	0.7954	362594	0.0077	23081	3.331E-07	2.90
159	36.06	0.7991	373732	0.0077	23152	3.241E-07	2.91
159	36.34	0.8031	386453	0.0084	24409	2.431E-07	2.96
160	36.62	0.8074	398141	0.0082	22422	3.876E-07	2.99
161	36.93	0.8113	408377	0.0080	21244	3.751E-07	3.02
161	37.22	0.8154	419385	0.0078	19602	4.000E-07	3.05
162	37.51	0.8192	429479	0.0075	18478	4.086E-07	3.08
163	37.79	0.8230	437863	0.0076	18787	4.021E-07	3.11
164	38.07	0.8267	447266	0.0081	18629	4.291E-07	3.14
164	38.29	0.8310	456691	0.0084	18492	4.544E-07	3.17
165	38.71	0.8352	465760	0.0080	17238	4.636E-07	3.20
165	39.01	0.8391	473979	0.0083	17257	4.801E-07	3.22
167	39.35	0.8424	482017	0.0082	16405	4.976E-07	3.27
	39.65	0.8472	490382				
	39.78	0.8489	505614				
169	40.30	0.8553	521901	0.0107	22775	4.697E-07	3.16
170	40.64	0.8595	528383	0.0076	12449	6.210E-07	3.40
171	40.92	0.8631	534401	0.0077	12517	6.128E-07	3.44
171	41.23	0.8672	540904	0.0081	12752	6.364E-07	3.47
172	41.61	0.8712	547152	0.0080	12775	6.271E-07	3.50
172	41.95	0.8752	553699	0.0081	12353	6.575E-07	3.54
174	42.30	0.8793	559510	0.0079	11493	6.874E-07	3.57
174	42.64	0.8834	565102	0.0077	11345	6.812E-07	3.61
175	42.98	0.8871	570874	0.0078	10947	7.108E-07	3.64
177	43.32	0.8910	576153	0.0080	10912	7.274E-07	3.68
177	43.63	0.8951	581857	0.0082	11124	7.402E-07	3.72

**TABLE B49. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1B, NORTHROP.**

Pass (100)	S.R.F. (100)	A (in)	N (100)	Δ (in)	ΔP (100)	ΔP/Δ (100/100)	ΔP/Δ (100/100)
171	44.04	0.9272	517172	0.0012	10645	7.444E-07	3.74
171	44.43	0.9012	517171	0.0043	10610	7.410E-07	3.74
174	44.30	0.9072	517111	0.0040	9424	6.340E-07	3.11
180	45.17	0.9113	402127	0.0082	9431	6.362E-07	3.17
181	45.37	0.9154	404943	0.0082	9499	6.594E-07	3.21
182	45.98	0.9194	411425	0.0081	9094	6.077E-07	3.05
182	46.34	0.9237	416037	0.0081	8401	6.454E-07	3.44
183	46.74	0.9274	420157	0.0077	7948	6.413E-07	4.01
184	47.12	0.9314	424005	0.0074	7545	1.004E-06	4.07
185	47.49	0.9352	427791	0.0073	7714	9.441E-07	4.11
185	47.86	0.9388	431722	0.0071	7453	1.025E-06	4.15
186	48.23	0.9430	435420	0.0045	7311	1.071E-06	4.14
187	48.73	0.9473	439320	0.0084	8071	1.045E-06	4.24
187	49.14	0.9514	443031	0.0041	4737	1.147E-06	4.21
188	49.63	0.9554	446829	0.0075	4377	1.126E-06	4.32
189	49.94	0.9590	448174	0.0074	4670	1.109E-06	4.37
189	50.39	0.9629	451253	0.0071	4471	1.181E-06	4.41
191	50.91	0.9668	454505	0.0083	4439	1.247E-06	4.45
192	51.39	0.9712	457993	0.0087	4825	1.287E-06	4.50
192	51.79	0.9753	461311	0.0083	4411	1.216E-06	4.55
193	52.23	0.9795	464829	0.0077	5082	1.354E-06	4.59
194	52.67	0.9833	468014	0.0075	5193	1.444E-06	4.64
194	53.07	0.9870	471524	0.0081	5311	1.525E-06	4.68
195	53.41	0.9914	474825	0.0083	5445	1.550E-06	4.73
195	53.81	0.9953	478989	0.0081	5438	1.491E-06	4.78
196	54.07	0.9995	483761	0.0085	5430	1.562E-06	4.81
197	54.73	1.0038	488419	0.0073	4967	1.527E-06	4.88
198	55.10	1.0074	492723	0.0073	4733	1.675E-06	4.93
199	55.54	1.0074	497152	0.0084	4970	1.399E-06	4.98
200	56.08	1.0117	501938	0.0083	4958	1.705E-06	5.03
200	56.40	1.0158	506993	0.0073	4412	1.775E-06	5.08
201	57.13	1.0200	512010	0.0073	4009	1.762E-06	5.13
202	57.81	1.0237	517120	0.0075	3953	1.940E-06	5.17
202	58.10	1.0275	522112	0.0080	4117	1.929E-06	5.22
203	58.43	1.0312	527183	0.0073	4124	1.933E-06	5.28
204	59.17	1.0354	532112	0.0082	3843	1.087E-06	5.34
204	59.71	1.0394	537179	0.0080	3778	2.107E-06	5.39
205	60.23	1.0432	542189	0.0082	3867	2.124E-06	5.44
205	60.91	1.0474	547346	0.0082	3624	2.264E-06	5.59
207	61.41	1.0517	552154	0.0077	3244	2.351E-06	5.55
207	61.97	1.0556	557109	0.0080	3337	2.387E-06	5.61
208	62.52	1.0593	562131	0.0081	3218	2.489E-06	5.66
209	63.13	1.0636	567176	0.0073	3049	2.561E-06	5.71
210	63.71	1.0675	572200	0.0073	3021	2.579E-06	5.78
210	64.31	1.0714	577197	0.0072	2785	2.577E-06	5.83
211	64.99	1.0753	582105	0.0073	2999	2.621E-06	5.88
212	65.41	1.0786	587196	0.0091	3170	2.711E-06	5.94
212	66.11	1.0831	592161	0.0081	3077	2.817E-06	6.01
213	66.74	1.0877	597172	0.0081	3178	2.879E-06	6.08
214	67.40	1.0918	602159	0.0075	3444	2.080E-06	6.14
214	68.14	1.0957	607159	0.0075	3129	3.140E-06	6.20
215	68.73	1.0994	612117	0.0074	2435	3.375E-06	6.26
216	69.36	1.1031	617087	0.0082	2532	3.245E-06	6.32
216	70.11	1.1075	622052	0.0082	2294	3.404E-06	6.39
217	70.76	1.1113	627020	0.0082	2200	3.471E-06	6.45
218	71.52	1.1157	632047	0.0080	2311	3.449E-06	6.52
218	72.16	1.1192	637120	0.0080	2064	3.374E-06	6.58
219	72.94	1.1236	642107	0.0080	1961	3.971E-06	6.65
220	73.60	1.1275	647196	0.0076	2162	3.840E-06	6.71
220	74.32	1.1312	652103	0.0083	2166	4.027E-06	6.78
221	75.14	1.1356	657147	0.0087	2037	4.153E-06	6.85
222	75.96	1.1399	662184	0.0085	1934	4.164E-06	6.92
222	76.76	1.1441	667184	0.0081	1777	4.237E-06	7.00
223	77.52	1.1483	672120	0.0076	1708	4.523E-06	7.07
223	78.36	1.1517	677161	0.0084	1766	4.746E-06	7.14
224	79.15	1.1561	682192	0.0076	1777	4.812E-06	7.21
225	79.95	1.1601	687124	0.0079	1538	5.125E-06	7.28
225	80.70	1.1647	692196	0.0077	1406	5.501E-06	7.35
226	81.59	1.1691	697124	0.0074	1418	5.117E-06	7.42
226	82.34	1.1734	702102	0.0081	1532	5.472E-06	7.50
227	83.13	1.1777	707144	0.0089	1447	6.092E-06	7.58
227	84.11	1.1820	712149	0.0073	1290	4.041E-06	7.66
228	85.13	1.1861	717174	0.0075	1220	5.134E-06	7.73
228	85.97	1.1901	722177	0.0074	1163	4.404E-06	7.80
229	86.85	1.1941	727137	0.0072	1124	4.411E-06	7.88
229	87.69	1.1981	732162	0.0077	1147	5.703E-06	7.95
230	88.54	1.1991	737198	0.0080	1134	7.073E-06	8.03
230	89.52	1.2031	742127	0.0082	1091	7.539E-06	8.11
231	90.47	1.2069	747175	0.0084	1115	7.712E-06	8.20
231	91.52	1.2112	752143	0.0080	1074	7.437E-06	8.28
232	92.58	1.2153	757124	0.0076	1013	7.521E-06	8.36
232	93.58	1.2193	762175	0.0082	992	8.215E-06	8.45
233	94.58	1.2231	767124	0.0085	951	9.994E-06	8.54
233	95.76	1.2276	772141	0.0085	925	8.771E-06	8.63
234	96.47	1.2317	777196	0.0081	867	9.341E-06	8.71
234	97.37	1.2357	782170	0.0081	848	8.814E-06	8.80
235	98.08	1.2391	787173	0.0082	848	9.510E-06	8.89
235	100.25	1.2431	792119	0.0081	744	1.044E-05	8.98
235	101.77	1.2471	797141	0.0074	667	1.142E-05	9.07
236	102.49	1.2517	802142	0.0074	657	1.144E-05	9.16
236	103.61	1.2557	807193	0.0080	724	1.157E-05	9.25
237	104.32	1.2597	812144	0.0084	721	1.111E-05	9.35
237	106.15	1.2631	817181	0.0081	644	1.299E-05	9.42
237	107.40	1.2671	822170	0.0094	515	1.477E-05	9.54
238	108.74	1.2711	827175	0.0079	514	1.191E-05	9.64
238	109.19	1.2751	832170	0.0083	592	1.703E-05	9.74
239	111.20	1.2791	837117	0.0081	497	1.401E-05	9.82
239	112.79	1.2831	842117	0.0081	412	1.441E-05	9.92
239	113.92	1.2871	847117	0.0080	507	1.412E-05	10.04
239	114.93	1.2911	852117	0.0081	490	1.417E-05	10.12

TABLE B49. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1B, NORTHROP. (continued)

Specimen Id. E7FT1B					Page 4		
Pmax (lbs)	EID/P	a (in)	N (X1)	da (in)	ΔN (X1)	Δa/ΔN (in/cyc)	Δa (in/cyc)
239	118.22	1.2999	753193	0.0067	390	1.714E-05	10.21
240	119.48	1.3034	753411	0.0079	451	1.714E-05	10.23
240	121.14	1.3079	753631	0.0091	474	1.926E-05	10.24
240	122.90	1.3125	753855	0.0087	402	2.168E-05	10.25
240	124.47	1.3164	754062	0.0076	354	2.137E-05	10.26
240	125.85	1.3201	754239	0.0076	347	2.067E-05	10.27
241	127.48	1.3242	754429	0.0085	347	2.305E-05	10.28
241	129.28	1.3286	754603	0.0097	387	2.512E-05	11.00
241	131.49	1.3339	754816	0.0095	332	2.862E-05	11.10
241	133.30	1.3381	754941	0.0062	255	2.417E-05	11.22
241	134.13	1.3401	760071	0.0063	259	2.421E-05	11.30
241	136.05	1.3444	760200	0.0087	245	3.555E-05	11.44
241	138.00	1.3488	760316	0.0073	209	3.483E-05	11.54
241	139.34	1.3517	760410	0.0082	256	3.208E-05	11.63
241	141.90	1.3570	760572	0.0141	323	4.214E-05	11.95
241	144.07	1.3623	760743	0.0101	207	4.363E-05	11.95
241	146.71	1.3671	760777	0.0031	71	4.024E-05	12.21
241	147.62	1.3690	760823	0.0067	117	5.590E-05	12.21
	150.09	1.3738	760892				

TABLE B49. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1B, NORTHROP. (continued)

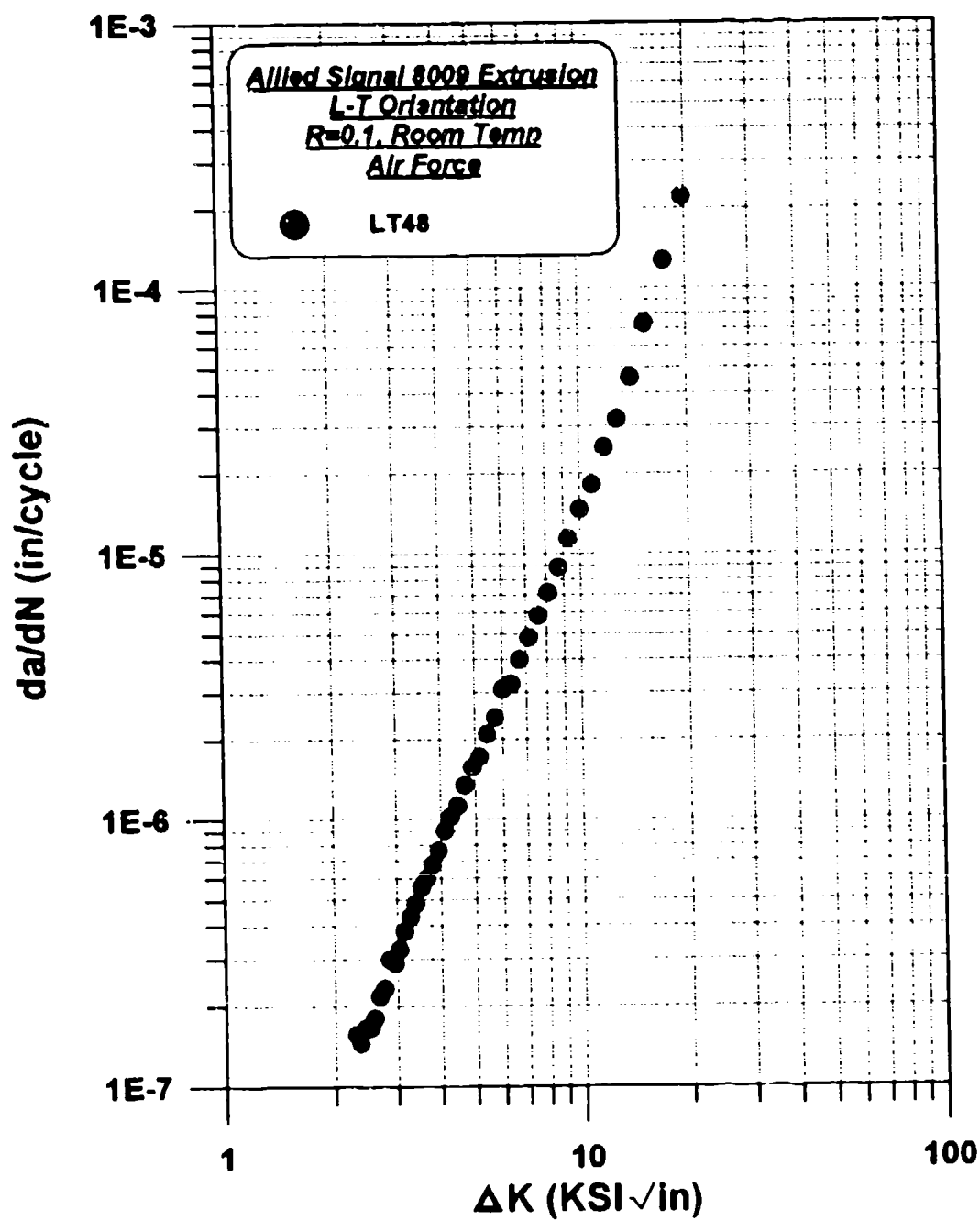


FIGURE B9. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (L-T ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE.

Alled Signal 8009 Extrusion
 R=0.1
 L-T Orientation
 Air Force
 Room Temperature

Specimen # LT48	
Delta K	da/dN
2.29	1.57E-07
2.35	1.46E-07
2.43	1.66E-07
2.51	1.67E-07
2.58	1.81E-07
2.67	2.19E-07
2.75	2.33E-07
2.85	3.01E-07
2.95	2.92E-07
3.04	3.28E-07
3.14	3.82E-07
3.26	4.32E-07
3.38	4.83E-07
3.5	5.56E-07
3.63	5.98E-07
3.77	6.73E-07
3.93	7.60E-07
4.1	9.07E-07
4.27	1.02E-06
4.46	1.12E-06
4.67	1.34E-06
4.91	1.58E-06
5.15	1.72E-06
5.42	2.10E-06
5.7	2.42E-06
6	3.10E-06
6.36	3.25E-06
6.72	4.01E-06
7.14	4.83E-06
7.58	5.84E-06
8.1	7.14E-06
8.66	8.90E-06
9.26	1.14E-05
10	1.47E-05
10.83	1.81E-05
11.75	2.50E-05
12.77	3.19E-05
13.95	4.58E-05
15.36	7.31E-05
17.43	1.28E-04
19.76	2.21E-04

TABLE B50. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (L-T ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE.

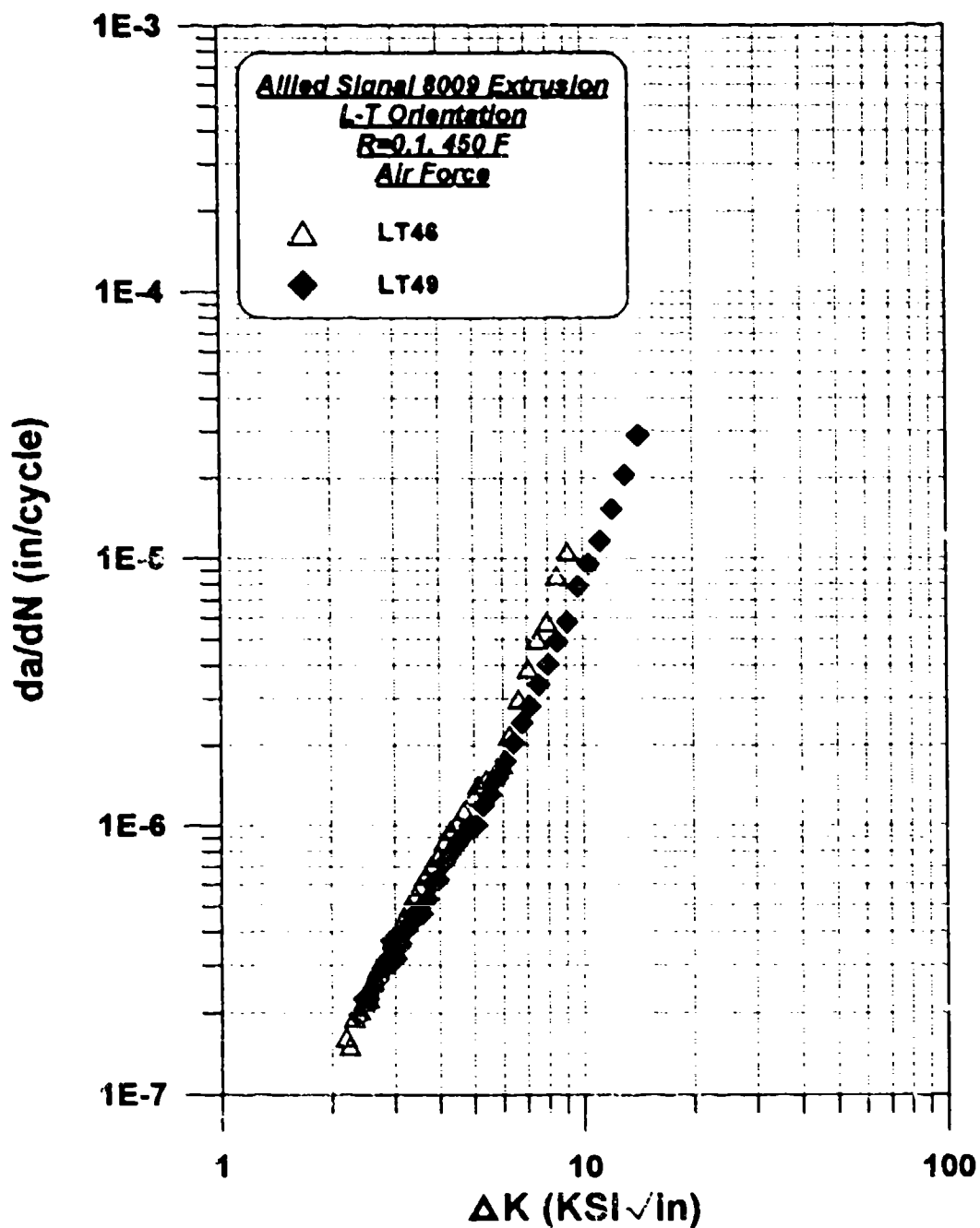


FIGURE B10. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (L-T ORIENTATION, 450 F, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion
 R=0.1
 L-T Orientation
 Air Force
 450 F

Specimen # LT46		Specimen # LT49	
Delta K	da/dN	Delta K	da/dN
2.19	1.63E-07	2.37	1.95E-07
2.24	1.51E-07	2.45	2.26E-07
2.31	1.92E-07	2.53	2.26E-07
2.39	2.04E-07	2.6	2.45E-07
2.45	2.22E-07	2.68	2.67E-07
2.53	2.27E-07	2.76	2.92E-07
2.6	2.65E-07	2.84	3.13E-07
2.69	2.95E-07	2.93	3.70E-07
2.79	3.03E-07	3.02	3.17E-07
2.97	3.70E-07	3.12	3.60E-07
2.96	3.76E-07	3.22	4.05E-07
3.07	4.15E-07	3.33	4.32E-07
3.17	4.50E-07	3.45	4.76E-07
3.28	4.93E-07	3.57	4.66E-07
3.4	5.47E-07	3.7	5.28E-07
3.52	5.91E-07	3.84	6.13E-07
3.65	6.46E-07	3.97	6.26E-07
3.79	7.05E-07	4.13	7.27E-07
3.95	7.61E-07	4.29	7.80E-07
4.12	8.71E-07	4.46	8.44E-07
4.29	9.57E-07	4.64	9.09E-07
4.47	1.03E-06	4.84	9.95E-07
4.67	1.13E-06	5.06	1.00E-06
4.99	1.29E-06	5.29	1.19E-06
5.12	1.43E-06	5.54	1.31E-06
5.38	1.50E-06	5.8	1.52E-06
5.66	1.55E-06	6.1	1.74E-06
5.95	1.71E-06	6.43	2.04E-06
6.27	2.20E-06	6.77	2.43E-06
6.63	2.99E-06	7.14	2.82E-06
7.04	3.87E-06	7.55	3.38E-06
7.46	4.97E-06	7.99	4.02E-06
7.95	5.79E-06	8.49	4.88E-06
8.48	8.59E-06	9.06	5.79E-06
9.07	1.06E-05	9.69	7.85E-06
		10.41	9.49E-06
		11.2	1.10E-05
		12.09	1.53E-05
		13.12	2.06E-05
		14.3	2.91E-05

TABLE B51. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (L-T ORIENTATION, 450 F, R=0.1) AIR FORCE

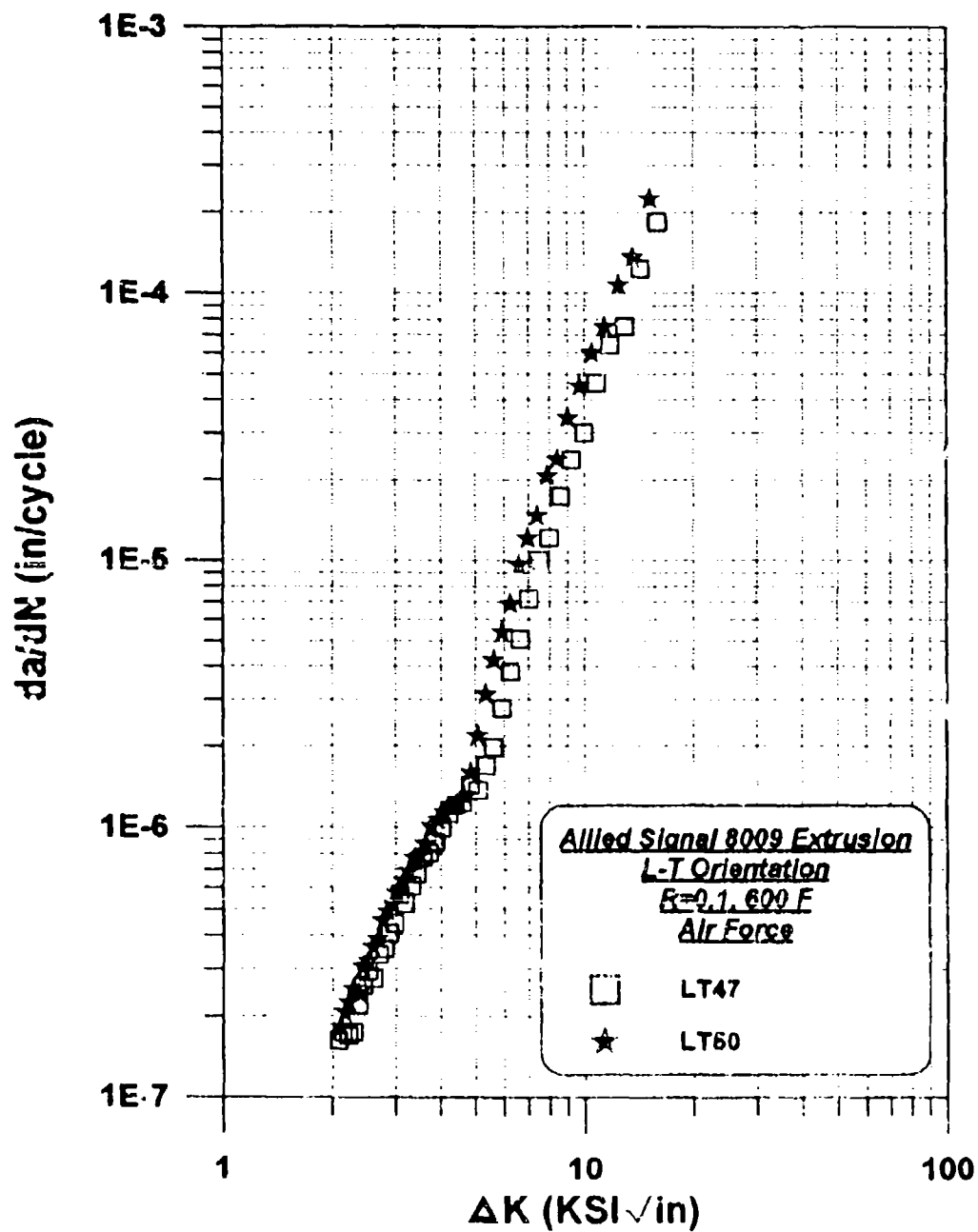


FIGURE B11. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (L-T ORIENTATION, 600 F, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion
 R=0.1
 L-T Orientation
 Air Force
 600 F

Specimen # LT47		Specimen # LT50	
Delta K	da/dN	Delta K	da/dN
2.09	1.63E-07	2.11	1.81E-07
2.15	1.75E-07	2.16	2.07E-07
2.22	1.70E-07	2.22	2.25E-07
2.29	1.74E-07	2.29	2.54E-07
2.36	2.21E-07	2.36	2.44E-07
2.43	2.61E-07	2.43	3.06E-07
2.51	2.94E-07	2.51	3.20E-07
2.6	2.78E-07	2.58	3.63E-07
2.69	3.40E-07	2.67	3.87E-07
2.78	3.56E-07	2.75	4.51E-07
2.87	4.05E-07	2.84	4.88E-07
2.97	4.41E-07	2.93	5.21E-07
3.08	5.64E-07	3.03	5.70E-07
3.19	5.23E-07	3.14	6.31E-07
3.31	6.05E-07	3.25	6.83E-07
3.43	6.69E-07	3.37	7.68E-07
3.56	7.75E-07	3.5	7.65E-07
3.7	8.04E-07	3.63	8.59E-07
3.86	8.79E-07	3.76	1.01E-06
4.02	9.96E-07	3.92	1.06E-06
4.2	1.12E-06	4.08	1.14E-06
4.4	1.21E-06	4.25	1.20E-06
4.6	1.23E-06	4.43	1.21E-06
4.82	1.43E-06	4.63	1.32E-06
5.06	1.37E-06	4.84	1.59E-06
5.33	1.69E-06	5.07	2.18E-06
5.61	1.98E-06	5.32	3.12E-06
5.91	2.78E-06	5.6	4.21E-06
6.26	3.81E-06	5.9	5.39E-06
6.63	5.07E-06	6.23	6.86E-06
7.03	7.17E-06	6.58	9.59E-06
7.51	1.00E-05	6.97	1.21E-05
8.02	1.22E-05	7.39	1.47E-05
8.6	1.74E-05	7.88	2.07E-05
9.24	2.38E-05	8.42	2.39E-05
9.96	3.01E-05	9	3.42E-05
10.79	4.62E-05	9.69	4.51E-05
11.76	6.41E-05	10.47	5.97E-05
12.93	7.51E-05	11.35	7.49E-05
14.28	1.23E-04	12.4	1.07E-04
15.09	1.63E-04	13.63	1.35E-04
		15.21	2.24E-04

TABLE B52. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (L-T ORIENTATION, 600 F, R=0.1) AIR FORCE.

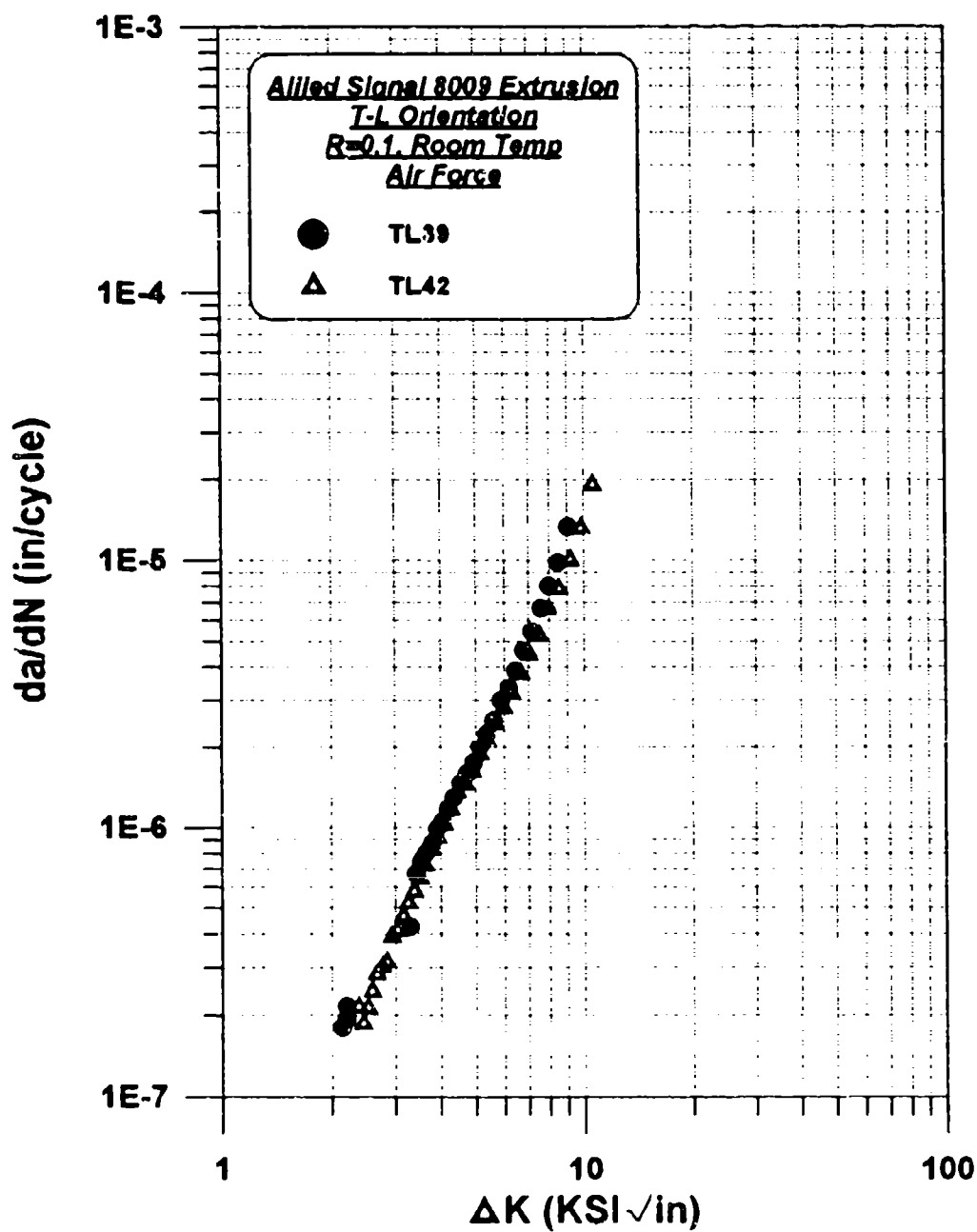


FIGURE B12. FATIGUE GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (T-L ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE

Allied Signal 8009 Extrusion
 R=0.1
 T-L Orientation
 Air Force
 Room Temperature

Specimen # TL39		Specimen # TL42	
Delta K	da/dN	Delta K	da/dN
2.14	1.81E-07	2.36	2.15E-07
2.2	1.95E-07	2.43	1.85E-07
2.2	2.17E-07	2.51	2.13E-07
3.24	4.26E-07	2.58	2.44E-07
3.29	4.26E-07	2.66	2.84E-07
3.41	6.70E-07	2.75	3.01E-07
3.52	7.37E-07	2.84	3.15E-07
3.65	8.05E-07	2.93	3.90E-07
3.78	8.70E-07	3.04	4.10E-07
3.91	9.89E-07	3.15	4.65E-07
4.05	1.05E-06	3.25	5.20E-07
4.19	1.17E-06	3.38	5.73E-07
4.35	1.30E-06	3.5	6.43E-07
4.54	1.46E-06	3.63	7.18E-07
4.72	1.59E-06	3.77	8.17E-07
4.93	1.76E-06	3.93	9.11E-07
5.13	2.02E-06	4.08	1.03E-06
5.35	2.24E-06	4.27	1.17E-06
5.6	2.52E-06	4.45	1.35E-06
5.87	3.00E-06	4.67	1.46E-06
6.17	3.34E-06	4.89	1.62E-06
6.45	3.88E-06	5.14	1.88E-06
6.79	4.61E-06	5.39	2.11E-06
7.16	5.44E-06	5.67	2.43E-06
7.6	6.63E-06	5.98	2.81E-06
8.02	8.01E-06	6.31	3.17E-06
8.5	9.80E-06	6.68	3.78E-06
9.05	1.33E-05	7.06	4.44E-06
		7.53	5.25E-06
		8.02	6.58E-06
		8.56	7.83E-06
		9.19	1.00E-05
		9.86	1.31E-05
		10.61	1.91E-05

TABLE B53. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (T-L ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE.

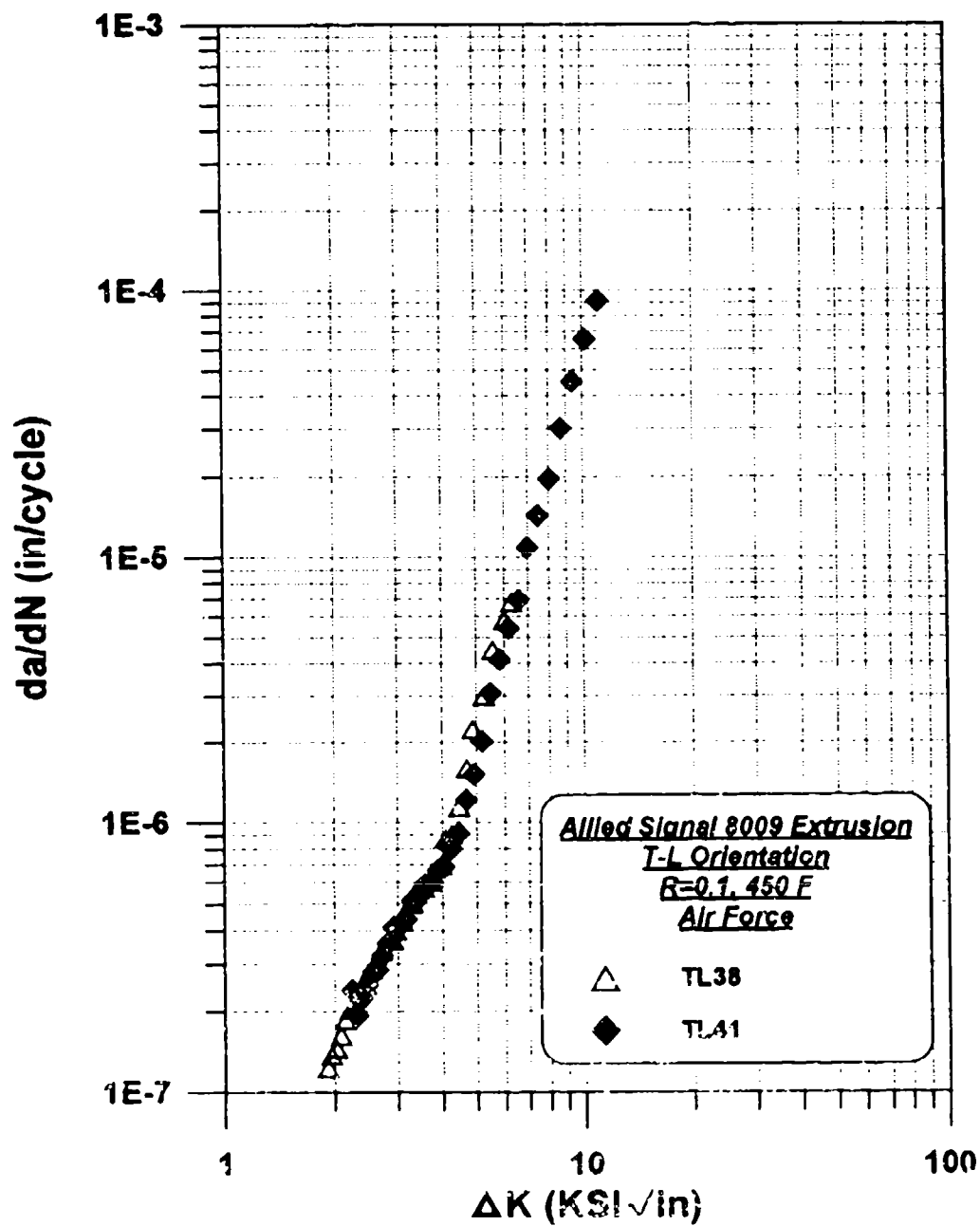


FIGURE B13. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (T-L ORIENTATION, 450 F, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion
 R=0.1
 T-L Orientation
 Air Force
 450 F

Specimen # TL38		Specimen # TL41	
Delta K	da/dN	Delta K	da/dN
1.91	1.23E-07	2.24	2.41E-07
1.96	1.37E-07	2.31	1.93E-07
2.02	1.46E-07	2.38	2.24E-07
2.08	1.62E-07	2.46	2.51E-07
2.15	1.86E-07	2.55	2.81E-07
2.21	2.05E-07	2.63	2.85E-07
2.29	2.10E-07	2.71	3.23E-07
2.36	2.45E-07	2.81	3.57E-07
2.44	2.53E-07	2.92	4.10E-07
2.52	2.87E-07	3.03	4.15E-07
2.61	3.09E-07	3.16	4.39E-07
2.7	3.36E-07	3.29	5.13E-07
2.9	3.68E-07	3.41	5.23E-07
2.95	3.98E-07	3.56	5.88E-07
3.08	4.33E-07	3.7	5.97E-07
3.14	4.70E-07	3.87	6.62E-07
3.28	5.04E-07	4.05	6.85E-07
3.39	5.64E-07	4.23	7.99E-07
3.54	5.72E-07	4.45	9.11E-07
3.71	6.05E-07	4.68	1.21E-06
3.97	6.96E-07	4.92	1.51E-06
4.08	8.70E-07	5.19	2.01E-06
4.25	9.05E-07	5.48	3.09E-06
4.47	1.14E-06	5.81	4.13E-06
4.7	1.59E-06	6.16	5.43E-06
4.88	2.24E-06	6.57	6.91E-06
5.24	3.00E-06	6.98	1.08E-05
5.55	4.48E-06	7.48	1.43E-05
6	5.80E-06	8.03	1.96E-05
6.28	6.80E-06	8.66	3.02E-05
		9.38	4.53E-05
		10.15	6.53E-05
		11.03	9.11E-05

TABLE B54. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (T-L ORIENTATION, 450 F, R=0.1) AIR FORCE

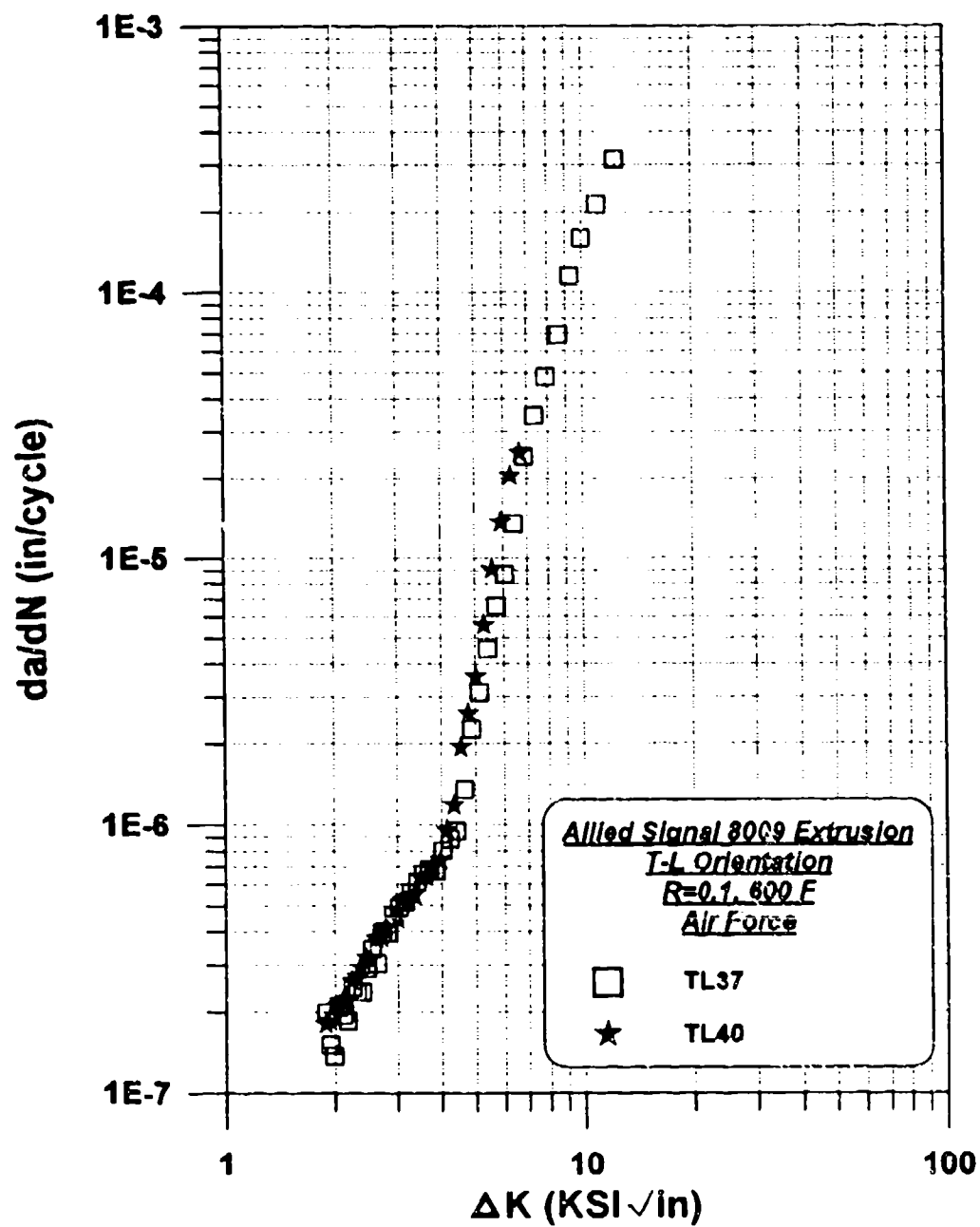


FIGURE B14. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (T-L ORIENTATION, 600 F, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion
 R=0.1
 T-L Orientation
 Air Force
 600 F

Specimen # TL37		Specimen # TL40	
Delta K	da/dN	Delta K	da/dN
1.89	2.00E-07	1.88	1.81E-07
1.94	1.51E-07	1.93	1.86E-07
1.99	1.37E-07	1.99	1.95E-07
2.05	2.09E-07	2.04	2.12E-07
2.11	1.95E-07	2.1	2.20E-07
2.17	1.86E-07	2.17	2.23E-07
2.24	2.48E-07	2.23	2.62E-07
2.31	2.39E-07	2.3	2.71E-07
2.39	2.39E-07	2.37	2.92E-07
2.46	2.91E-07	2.45	3.20E-07
2.54	3.45E-07	2.52	3.14E-07
2.63	3.04E-07	2.61	3.78E-07
2.71	3.97E-07	2.7	3.79E-07
2.81	3.96E-07	2.78	4.20E-07
2.92	4.59E-07	2.99	4.46E-07
3.03	4.90E-07	2.99	4.80E-07
3.14	5.14E-07	3.1	5.26E-07
3.26	5.56E-07	3.22	5.22E-07
3.41	6.13E-07	3.35	5.46E-07
3.54	6.55E-07	3.49	6.35E-07
3.69	6.81E-07	3.62	6.39E-07
3.86	6.71E-07	3.79	7.08E-07
4.02	8.00E-07	3.96	7.41E-07
4.21	8.93E-07	4.13	9.50E-07
4.41	9.45E-07	4.34	1.18E-06
4.63	1.35E-06	4.53	1.94E-06
4.87	2.28E-06	4.76	2.60E-06
5.12	3.13E-06	5.01	3.58E-06
5.42	4.55E-06	5.29	5.58E-06
5.73	6.58E-06	5.58	9.10E-06
6.06	8.69E-06	5.91	1.37E-05
6.42	1.35E-05	6.28	2.05E-05
6.85	2.42E-05	6.67	2.51E-05
7.34	3.46E-05		
7.92	4.81E-05		
8.57	6.92E-05		
9.26	1.15E-04		
9.98	1.60E-04		
11	2.13E-04		
12.35	3.16E-04		

TABLE B55. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (T-L ORIENTATION, 600 F, R=0.1) AIR FORCE.

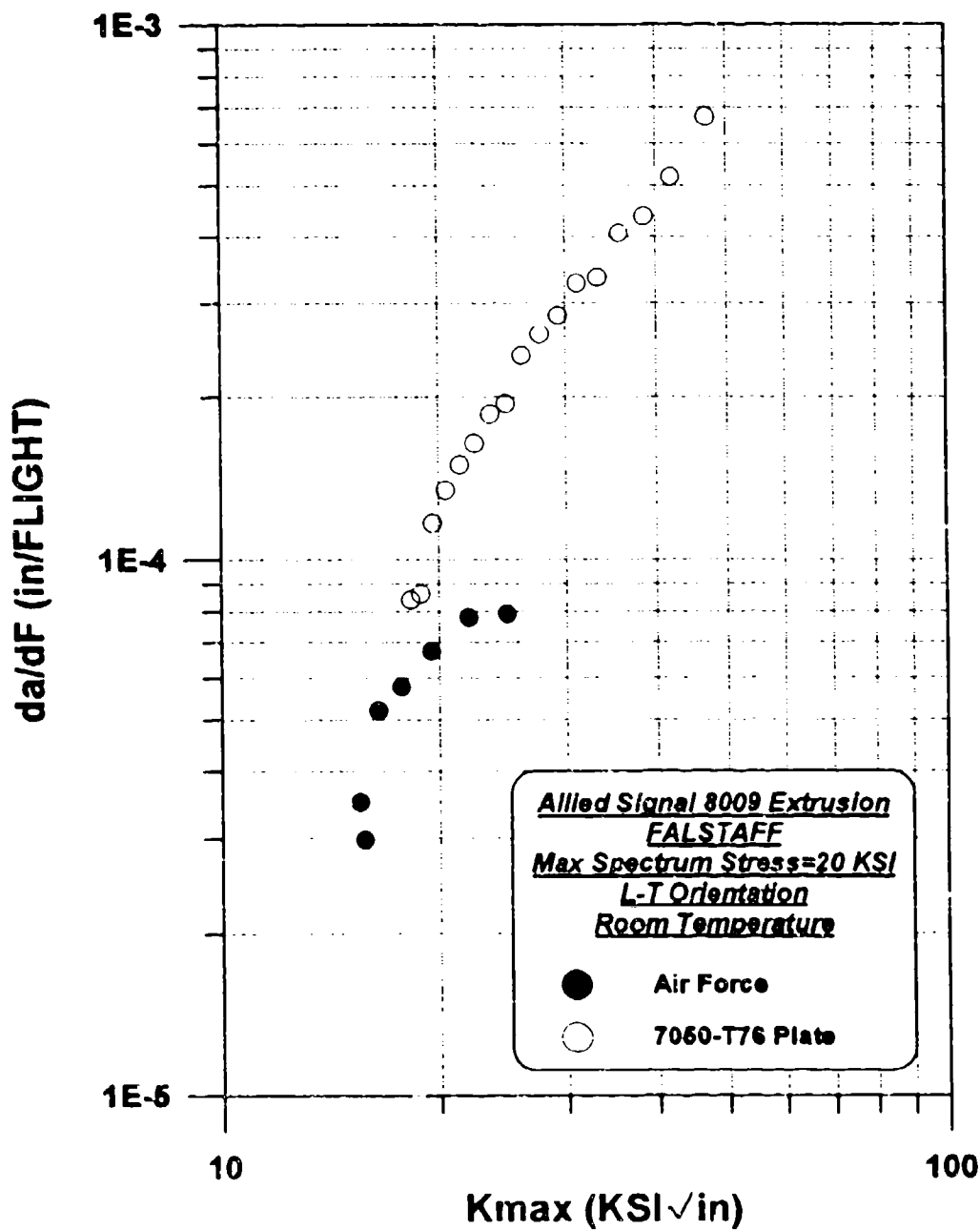


FIGURE B15. COMPARISON OF 8009 EXTRUSION AND 7050 PLATE FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: CC-43
 MATERIAL TYPE: 8009
 ORIFNTATION: L-T
 SPECTRUM TYPE: FALSTAFF
 SPECIMEN THICKNESS= 0.2512 IN.
 SPECIMEN WIDTH= 4.002 IN.
 Pmax= 20000 LBS

TOTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.3773		
200	0.3843	3.51E-05	15.47
600	0.4022	2.99E-05	15.73
1000	0.4542	5.20E-05	16.43
1400	0.5349	5.77E-05	17.70
1800	0.6561	6.74E-05	19.51
2200	0.8275	7.79E-05	21.94
2400	1.0179	7.94E-05	24.77

TABLE B56. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (L-T ORIENTATION) AIR FORCE.

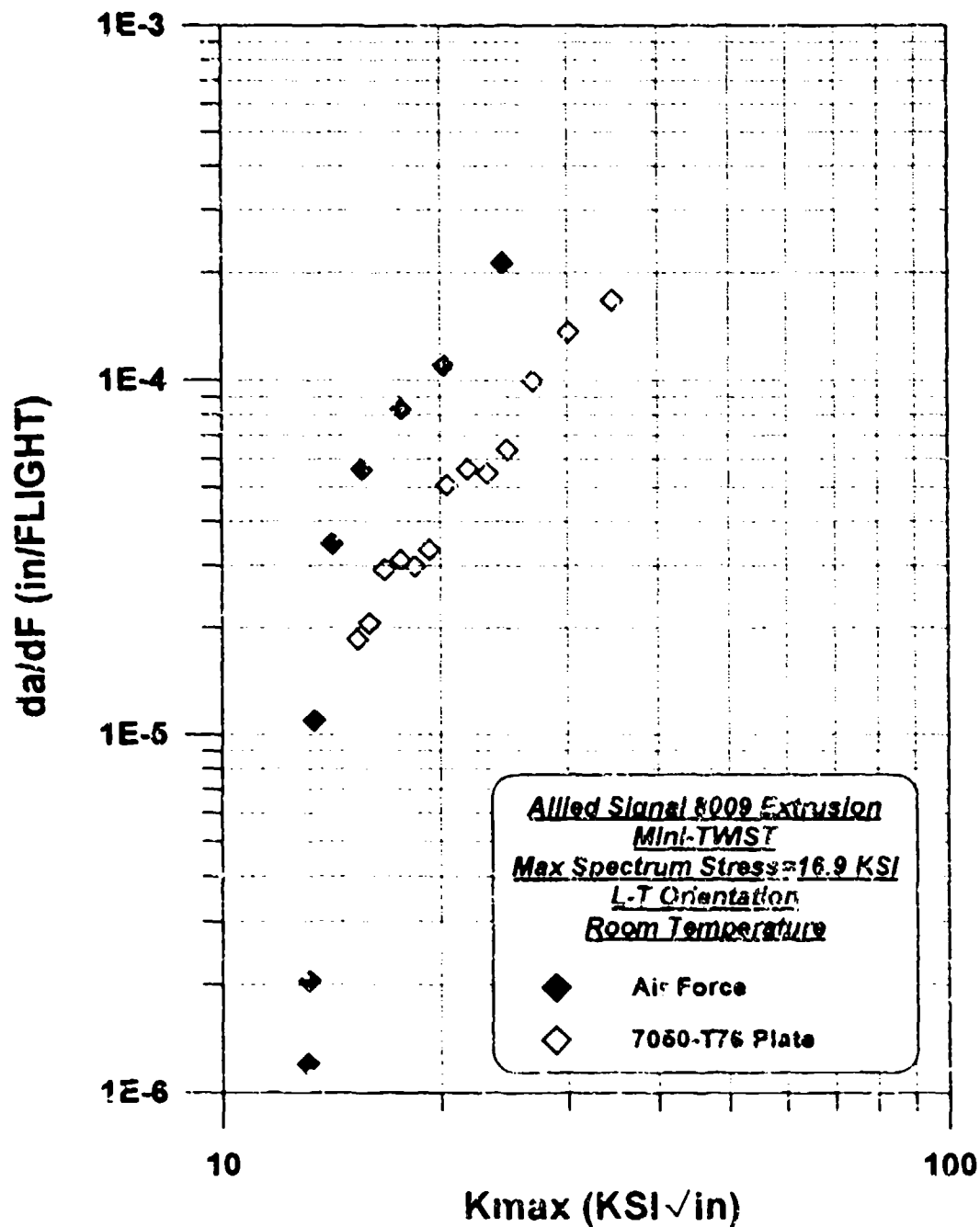


FIGURE B16. COMPARISON OF 8009 EXTRUSION AND 7050 PLATE MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: CC-44
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: Mini-TWIST
 SPECIMEN THICKNESS= 0.2438 IN.
 SPECIMEN WIDTH= 4.002 IN.
 Pmax= 16489 LBS

TOTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.3777		
2000	0.3801	1.20E-08	13.11
4000	0.3842	2.05E-08	13.17
6000	0.4061	1.10E-05	13.40
8000	0.4753	3.46E-05	14.17
10000	0.5873	5.60E-05	15.61
12000	0.7529	8.29E-05	17.64
14000	0.9733	1.10E-04	20.26
16000	1.3997	2.13E-04	24.41

TABLE B57. MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (L-T ORIENTATION) AIR FORCE.

APPENDIX C

**CZ42 SHEET
0.09" X 12" X 48"**

TABLE C1
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	RT	LONG	70.6	66.0	7.5		10.8
			70.4	65.5	8.0		10.2
			70.6	64.7	8.0		10.3
		AVERAGE	70.5	65.4	7.8		10.4
		STANDARD DEVIATION	0.1	0.7	0.3		0.3

TABLE C2
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	RT	L TRANS	68.3	60.9	10.0		10.6
			67.9	59.1	10.0		10.6
			68.3	59.3	10.0		10.6
		AVERAGE	68.2	59.8	10.0		10.6
		STANDARD DEVIATION	0.2	1.0	0.0		0.0

TABLE C3
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	450	LONG	43.6	40.7	7.0		9.5
			44.8	38.9	8.0		9.5
			43.6	38.2	9.0		8.7
		AVERAGE	44.0	39.3	8.0		9.2
		STANDARD DEVIATION	0.7	1.3	1.0		0.5

TABLE C4
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	450	L TRANS	43.4	35.5	9.0		9.2
			43.1	36.3	8.5		9.4
			43.4	35.3	8.0		9.0
		AVERAGE	43.3	35.7	8.5		9.2
		STANDARD DEVIATION	0.2	0.5	0.5		0.2

TABLE C5

TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	LONG	24.6	17.9	13.0		9.1
			24.6	18.8	12.0		9.6
			25.2	20.7	14.0		9.7
		AVERAGE	24.8	19.1	13.0		9.5
		STANDARD DEVIATION	0.3	1.4	1.0		0.3

TABLE C6

TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	L TRANS	25.3	18.5	9.5		8.8
			24.5	18.8	7.0		8.7
			24.2	18.7	9.5		8.6
		AVERAGE	24.7	18.7	8.7		8.7
		STANDARD DEVIATION	0.6	0.2	1.4		0.1

TABLE C7
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	-320	LONG	107.6	87.1	2.5		9.5
	-320	L TRANS	106.4	78.7	2.0		9.1

TABLE C8
COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	LONG	45.1 48.1	
		AVERAGE	46.6	
		STANDARD DEVIATION	2.2	

TABLE C9
COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	60.6 59.4	
		AVERAGE	60.0	
		STANDARD DEVIATION	0.8	

TABLE C10

COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	LONG	36.2 36.6	
		AVERAGE	36.4	
		STANDARD DEVIATION	0.3	

TABLE C11

COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	43.4 42.6	
		AVERAGE	43.0	
		STANDARD DEVIATION	0.6	

TABLE C12

COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	LONG	27.2 26.3	
		AVERAGE	26.7	
		STANDARD DEVIATION	0.6	

TABLE C13

COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	33.3 33.8	
		AVERAGE	33.5	
		STANDARD DEVIATION	0.4	

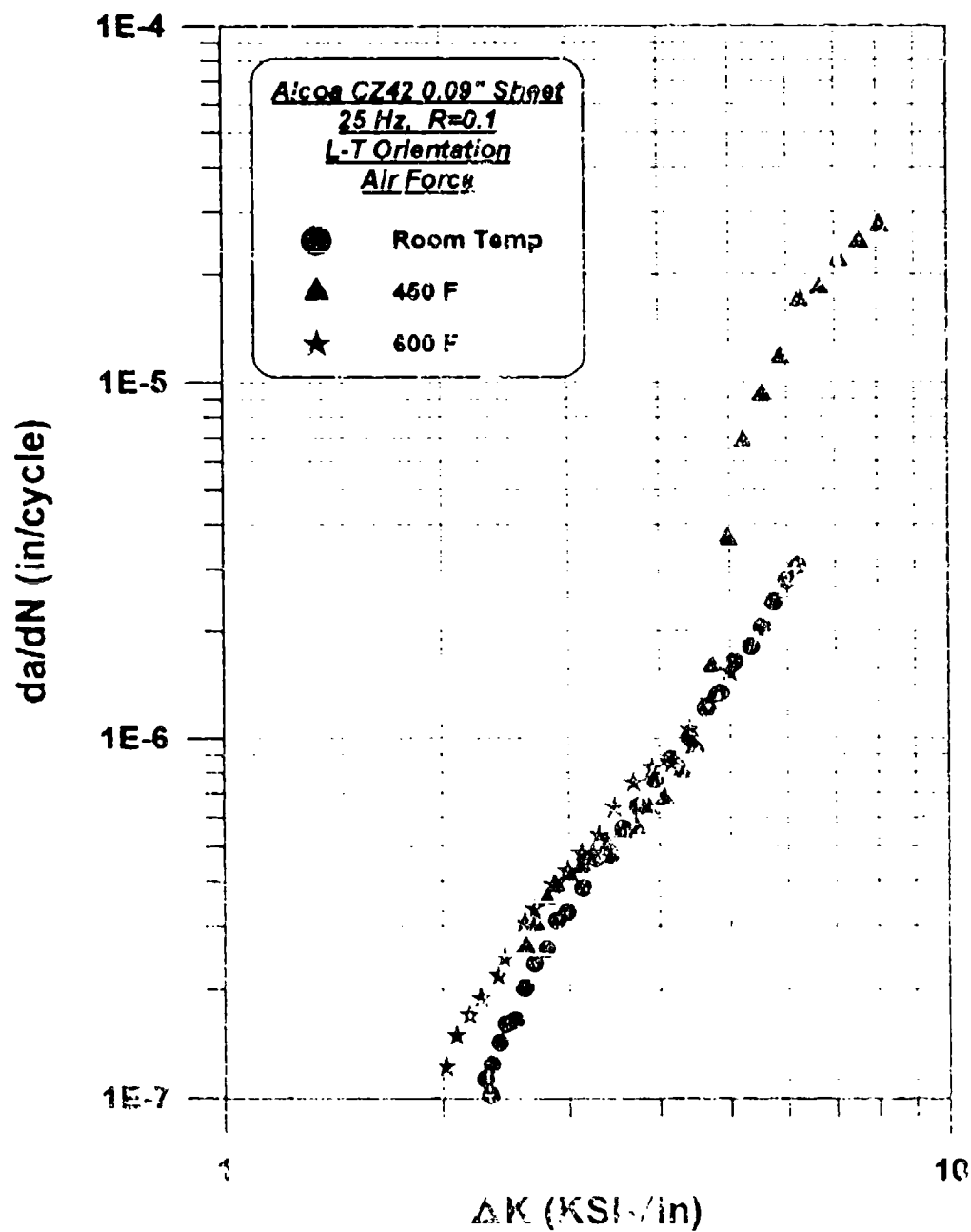


FIGURE C1. FATIGUE CRACK GROWTH RATE RESULTS OF CZ42 SHEET
 (L-T ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE

Alcoa CZ42 0.09" Sheet
 25 Hz, R=0.1
 L-T Orientation
 Air Force

Room Temperature		450 F		600 F	
Delta K	da/dN	Delta K	da/dN	Delta K	da/dN
2.23	1.02E-07	2.61	2.52E-07	2.02	1.22E-07
2.29	1.13E-07	2.69	3.02E-07	2.09	1.49E-07
2.34	1.24E-07	2.79	3.55E-07	2.18	1.70E-07
2.4	1.43E-07	2.88	3.86E-07	2.26	1.89E-07
2.45	1.61E-07	2.99	4.15E-07	2.39	2.18E-07
2.52	1.65E-07	3.12	4.35E-07	2.44	2.44E-07
2.6	2.03E-07	3.23	4.72E-07	2.6	3.06E-07
2.68	2.35E-07	3.39	5.01E-07	2.68	3.33E-07
2.73	2.59E-07	3.56	5.45E-07	2.35	3.89E-07
2.88	3.10E-07	3.71	5.60E-07	2.98	4.25E-07
2.96	3.27E-07	3.87	6.36E-07	3.12	4.75E-07
3.13	3.82E-07	4.06	6.73E-07	3.3	5.35E-07
3.26	4.60E-07	4.3	7.99E-07	3.47	6.38E-07
3.42	4.71E-07	4.49	9.45E-07	3.68	7.48E-07
3.56	5.59E-07	4.72	1.59E-06	3.91	8.22E-07
3.74	6.44E-07	4.97	3.62E-06	4.15	8.47E-07
3.94	7.61E-07	5.23	6.83E-06	4.4	1.05E-06
4.14	8.71E-07	5.56	9.19E-06	4.7	1.27E-06
4.39	1.00E-06	5.89	1.17E-05	5	1.53E-05
4.63	1.21E-06	6.26	1.70E-05		
4.84	1.34E-06	6.67	1.83E-05		
5.08	1.64E-06	7.09	2.20E-05		
5.35	1.81E-06	7.58	2.47E-05		
5.55	2.06E-06	8.08	2.74E-05		
5.76	2.42E-06				
5.93	2.78E-06				
6.21	3.06E-06				

TABLE C16. FATIGUE CRACK GROWTH RATE RESULTS CZ42 SHEET
 (L-T ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

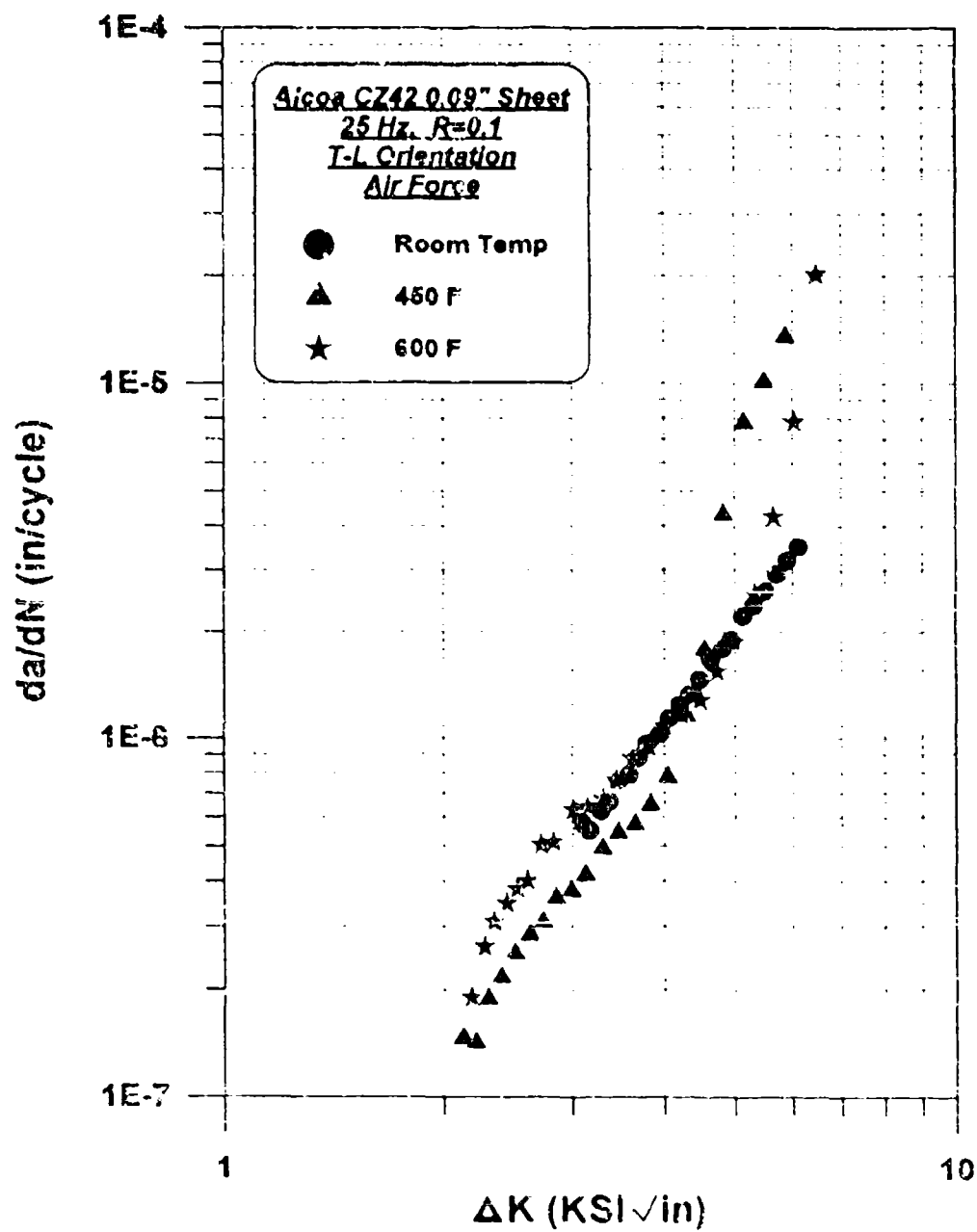


FIGURE C2. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 SHEET (T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

Alcoa CZ42 0.09" Sheet
25 Hz, R=0.1
T-L Orientation
Air Force

<i>Room Temperature</i>		<i>450 F</i>		<i>600 F</i>	
<u>Delta K</u>	<u>da/dN</u>	<u>Delta K</u>	<u>da/dN</u>	<u>Delta K</u>	<u>da/dN</u>
3.08	5.80E-07	2.123	1.46E-07	2.176	1.90E-07
3.16	5.52E-07	2.207	1.42E-07	2.268	2.63E-07
3.27	6.24E-07	2.295	1.88E-07	2.339	3.08E-07
3.358	6.63E-07	2.395	2.16E-07	2.435	3.46E-07
3.464	7.57E-07	2.495	2.51E-07	2.515	3.90E-07
3.576	7.87E-07	2.615	2.83E-07	2.595	4.01E-07
3.679	8.81E-07	2.725	3.08E-07	2.705	5.02E-07
3.787	9.66E-07	2.843	3.59E-07	2.819	5.12E-07
3.93	1.02E-06	2.984	3.75E-07	3.002	6.29E-07
4.049	1.13E-06	3.121	4.17E-07	3.132	6.43E-07
4.191	1.24E-06	3.285	4.91E-07	3.292	6.73E-07
4.324	1.33E-06	3.455	5.43E-07	3.437	7.61E-07
4.465	1.46E-06	3.647	5.73E-07	3.615	8.72E-07
4.629	1.67E-06	3.822	6.47E-07	3.806	9.44E-07
4.803	1.79E-06	4.042	7.75E-07	4.006	1.08E-06
4.951	1.90E-06	4.282	1.15E-06	4.216	1.16E-06
5.126	2.22E-06	4.548	1.78E-06	4.473	1.28E-06
5.312	2.38E-06	4.827	4.31E-06	4.722	1.54E-06
5.508	2.61E-06	5.152	7.77E-06	4.996	1.88E-06
5.697	2.92E-06	5.487	1.01E-05	5.323	2.57E-06
5.899	3.20E-06	5.875	1.35E-05	5.66	4.24E-06
6.113	3.50E-06			6.042	7.83E-06
				6.474	2.02E-05

TABLE C15. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 SHEET
(T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

APPENDIX D

**CZ42 EXTRUSION
1" X 3" X 72"**

TABLE D1
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	LONG	58.5	56.4	11.1	45.0	
			59.3	57.0	12.4	43.7	
			59.5	56.6	13.2	48.5	
		AVERAGE	59.1	56.7	12.2	45.7	
		STANDARD DEVIATION	0.5	0.0	1.1	2.5	

TABLE D2
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	1. TRANS	55.3	48.8	13.5	42.5	
			55.9	48.0	12.3	39.9	
			56.4	49.8	10.8	45.8	
		AVERAGE	55.9	48.9	12.2	42.7	
		STANDARD DEVIATION	0.5	0.9	1.4	2.9	

TABLE D3

TENSILE RESULTS FOR

ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	450	LONG	39.6	37.5	9.2	20.7	
			40.0	37.7	6.9	25.9	
			39.6	36.7	8.7	21.7	
ARMY	450	LONG	41.5		2.8	16.0	
			44.0	38.5	5.4	16.0	
			45.0		7.5	12.0	
		AVERAGE	41.6	37.6	7.1	18.7	
		STANDARD DEVIATION	2.4	0.8	2.5	5.0	

TABLE D4

TENSILE RESULTS FOR

ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	450	L TRANS	39.0	36.5	9.4	15.9	
			38.8	34.6	6.5	17.7	
			38.1	35.1	9.2	20.9	
ARMY	450	L TRANS	44.4	40.5	7.5	15.6	
			42.5	37.5	3.1	12.0	
			42.8		4.7	12.0	
		AVERAGE	40.9	36.8	6.7	15.7	
		STANDARD DEVIATION	2.6	2.3	2.5	3.4	

TABLE D5
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	600	LONG	26.5	24.3	15.6	24.8	
			25.9	24.1	15.7	23.1	
			26.8	25.3	13.6	23.8	
ARMY	600	LONG	29.2	26.8	4.1	16.0	8.1
			28.6	26.6	3.1	16.0	8.5
		AVERAGE	27.4	25.4	10.4	20.7	8.3
		STANDARD DEVIATION	1.4	1.3	6.3	4.4	0.3

TABLE D6
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	600	L TRANS	26.5	24.4	14.0	24.9	
			25.6	23.5	14.7	16.1	
			25.3	25.2	15.0	19.5	
ARMY	600	L TRANS	27.7	24.4	2.7	14.0	8.7
			26.9	23.6	3.1	16.0	8.5
			28.6	25.6	2.6	10.0	8.0
		AVERAGE	26.9	24.5	8.7	16.7	8.4
		STANDARD DEVIATION	1.1	0.8	6.5	5.0	0.4

TABLE D7

COMPRESSION RESULTS FOR

ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	LONG	51.0 59.4 60.1	
		AVERAGE	56.8	
		STANDARD DEVIATION	5.0	

TABLE D8

COMPRESSION RESULTS FOR

ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	52.7 53.9	
		AVERAGE	53.3	
		STANDARD DEVIATION	0.8	

TABLE D9
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	LONG	49.1 54.5	
		AVERAGE	51.8	
		STANDARD DEVIATION	3.8	

TABLE D10
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	L TRANS	45.2 47.8	
		AVERAGE	46.5	
		STANDARD DEVIATION	1.8	

TABLE D11
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	LONG	47.0 48.0	
		AVERAGE	47.5	
		STANDARD DEVIATION	0.7	

TABLE D12
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	L TRANS	47.2 37.3 46.7	
		AVERAGE	43.7	
		STANDARD DEVIATION	5.6	

TABLE D13
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{-0.5})	Kq (KSI in ^{-0.5})	COMMENT
ARMY	RT	L-T		27.7	(1)
AIR FORCE	RT	L-T	26.6 23.5	22.6	(2)
		AVERAGE	25.1	25.1	
		STANDARD DEVIATION	2.2	3.6	

(1): SPECIMEN DID NOT MEET THICKNESS CRITERIA OF ASTM E399
(2): $P_{max}/P_q > 1.1$

TABLE D14
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{-0.5})	Kq (KSI in ^{-0.5})	COMMENT
ARMY	RT	T-L	19.1	16.8	VALID (1)
AIR FORCE	RT	T-L	12.4 12.0 12.2		VALID VALID VALID
		AVERAGE	13.9	16.8	
		STANDARD DEVIATION	3.5		

(1): $P_{max}/P_q > 1.1$

TABLE D15
FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
ARMY	450	LONG	38.0	50,000	
			38.0	99,000	
			36.5	57,000	
			36.5	512,000	
			36.0	2,251,000	
			35.0	15,308,000	*
			35.0	10,033,000	*
			30.8	8,655,000	

(*): RUN OUT

TABLE D16
FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
ARMY	600	LONG	32.0	616,000	
			32.0	403,000	
			30.0	1,053,000	
			29.0	1,811,000	
			28.0	8,047,000	
			28.0	5,425,000	
			27.0	2,895,000	
			25.5	4,099,000	
			24.0	14,950,000	*

(*): RUN OUT

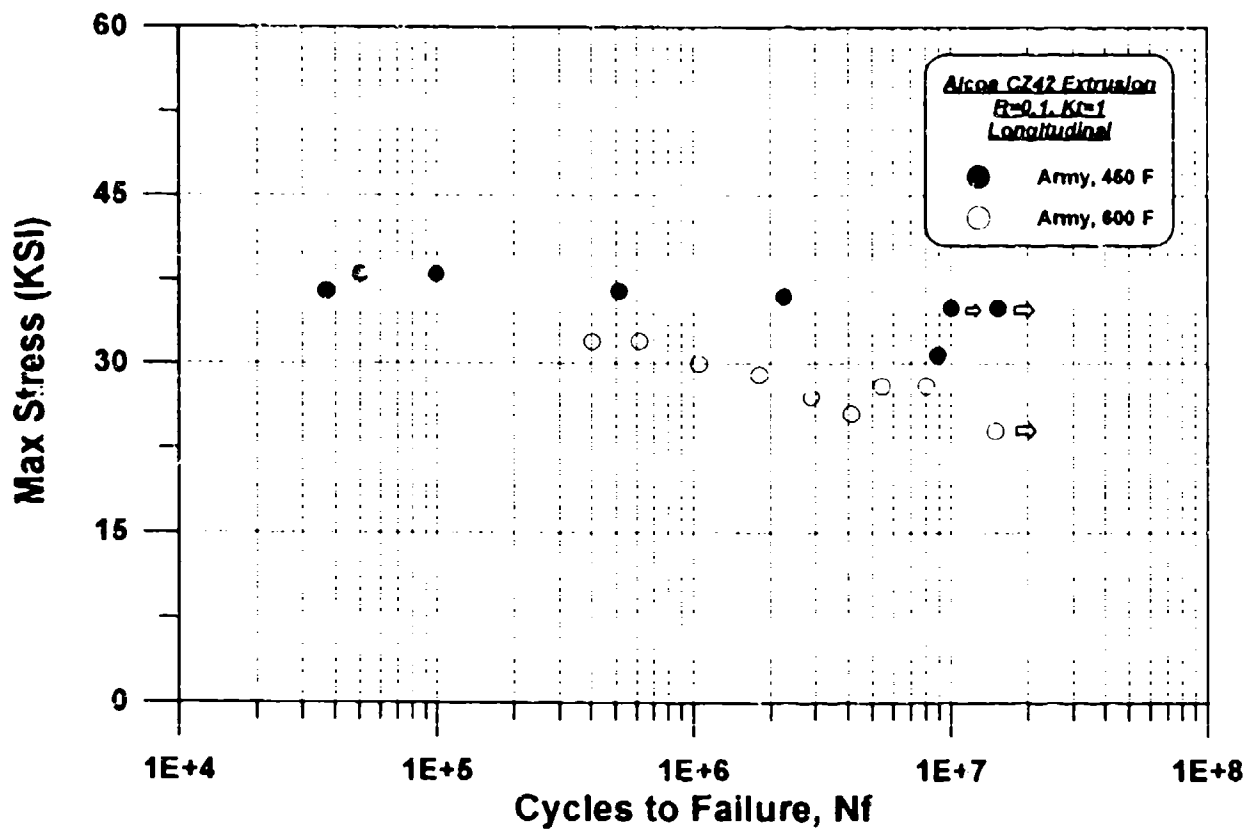


FIGURE D1. FATIGUE RESULTS FOR CZ42 EXTRUSION
(LONGITUDINAL ORIENTATION, 450 F AND 600 F) ARMY

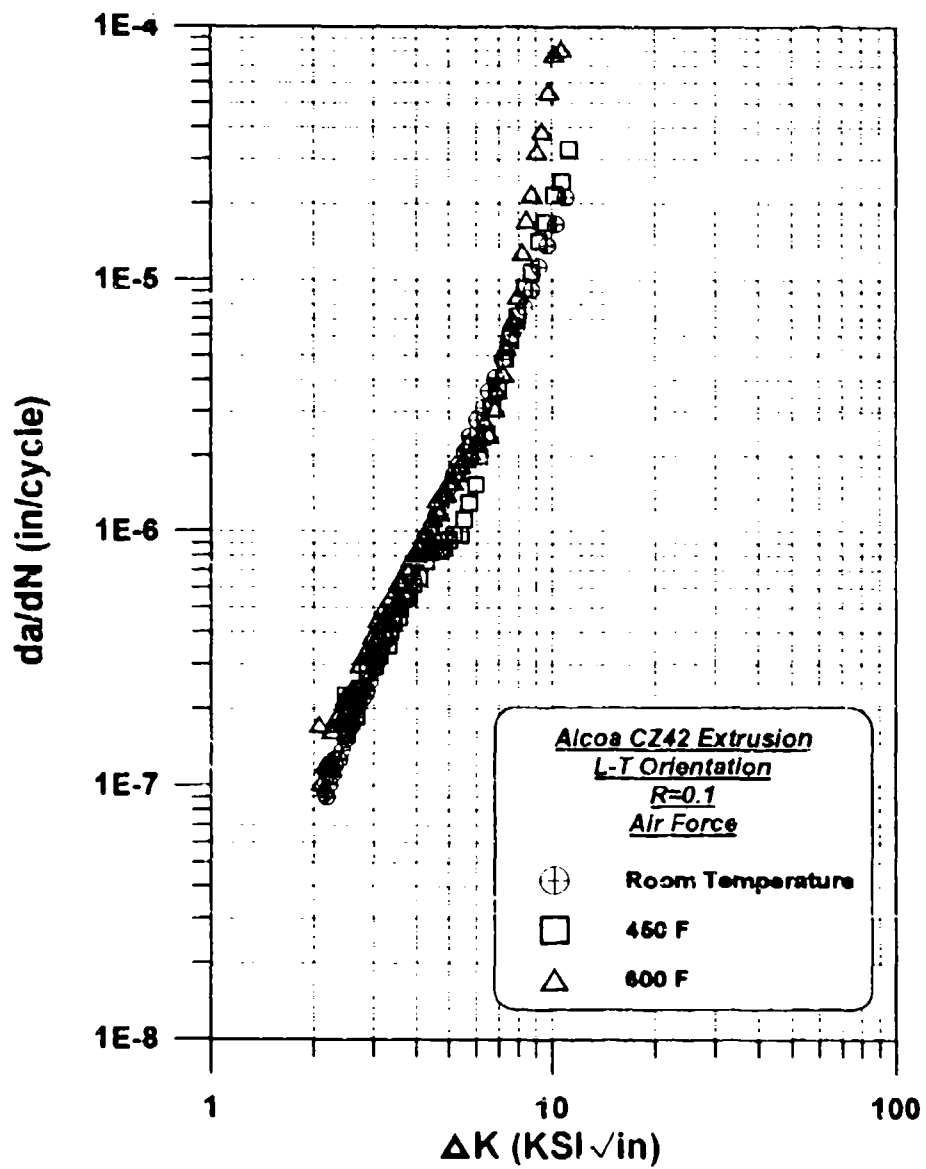


FIGURE D2. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION (L-T ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

Alcoa CZ42 Extrusion
R=0.1
L-T Orientation
In Force

Room Temperature		450 F		600 F	
Specimen # LT78		Specimen # LT78		Specimen # LT7	
Delta K	da/dN	Delta K	da/dN	Delta K	da/dN
2.16	9.31E-08	2.48	2.26E-07	2.08	1.75E-07
2.19	9.09E-08	2.49	1.60E-07	2.1	1.03E-07
2.23	1.02E-07	2.57	1.93E-07	2.16	1.21E-07
2.28	1.10E-07	2.67	1.87E-07	2.21	1.20E-07
2.32	1.20E-07	2.69	2.14E-07	2.25	1.27E-07
2.38	1.26E-07	2.64	2.13E-07	2.26	1.66E-07
2.42	1.37E-07	2.7	2.22E-07	2.27	1.18E-07
2.48	1.52E-07	2.76	2.40E-07	2.34	1.88E-07
2.53	1.67E-07	2.89	2.82E-07	2.37	1.76E-07
2.59	1.72E-07	2.99	3.13E-07	2.38	1.94E-07
2.65	1.85E-07	3.05	2.92E-07	2.41	1.76E-07
2.72	2.08E-07	3.14	3.27E-07	2.47	2.23E-07
2.79	2.21E-07	3.24	3.77E-07	2.49	1.99E-07
2.86	2.35E-07	3.34	3.54E-07	2.55	2.05E-07
2.93	2.58E-07	3.38	4.05E-07	2.58	2.34E-07
3.01	2.86E-07	3.45	4.35E-07	2.59	2.40E-07
3.09	3.05E-07	3.57	4.56E-07	2.63	2.40E-07
3.18	3.42E-07	3.6	4.94E-07	2.71	2.42E-07
3.26	3.72E-07	3.71	5.45E-07	2.74	3.00E-07
3.36	4.09E-07	3.81	5.59E-07	2.8	3.23E-07
3.45	4.46E-07	3.94	6.15E-07	2.84	3.30E-07
3.55	5.10E-07	4.09	6.58E-07	2.89	3.27E-07
3.65	5.43E-07	4.29	7.65E-07	2.94	3.25E-07
3.77	6.26E-07	4.42	8.30E-07	2.97	3.88E-07
3.89	6.77E-07	4.54	8.52E-07	3.02	3.75E-07
4.01	7.52E-07	4.71	8.40E-07	3.07	4.51E-07
4.16	8.45E-07	4.84	8.61E-07	3.13	3.87E-07
4.29	9.37E-07	4.99	9.18E-07	3.18	4.90E-07
4.44	1.05E-06	5.17	9.73E-07	3.25	4.61E-07
4.58	1.15E-06	5.39	9.75E-07	3.26	4.53E-07
4.77	1.31E-06	5.53	1.12E-06	3.37	5.55E-07
4.96	1.47E-06	5.74	1.30E-06	3.43	5.04E-07
5.18	1.68E-06	6.01	1.53E-06	3.48	5.88E-07
5.35	1.85E-06	6.17	1.99E-06	3.57	6.38E-07
5.56	2.08E-06	6.45	2.46E-06	3.65	6.43E-07
5.78	2.41E-06	6.7	3.09E-06	3.79	7.16E-07
6.02	2.78E-06	6.95	3.70E-06	3.87	7.80E-07
6.29	3.11E-06	7.3	4.85E-06	3.96	8.24E-07
6.55	3.61E-06	7.6	5.89E-06	4.04	8.06E-07
6.86	4.09E-06	7.92	7.20E-06	4.08	8.79E-07
7.17	4.82E-06	8.31	9.25E-06	4.21	9.71E-07
7.53	5.63E-06	8.73	1.07E-05	4.31	9.87E-07
7.89	6.53E-06	9.2	1.42E-05	4.4	1.05E-06
8.3	7.80E-06	9.62	1.68E-05	4.5	1.14E-06
8.75	9.16E-06	10.19	2.18E-05	4.6	1.35E-06
9.21	1.13E-05	10.74	2.44E-05	4.7	1.20E-06
9.74	1.37E-05	11.25	3.29E-05	4.8	1.43E-06
10.31	1.66E-05			4.93	1.42E-06
10.94	2.12E-05			4.99	1.59E-06
				5.16	1.58E-06
				5.29	1.71E-06
				5.43	1.84E-06
				5.51	1.95E-06
				5.71	2.27E-06
				5.81	2.08E-06
				6.04	2.23E-06
				6.2	2.39E-06
				6.38	2.74E-06
				6.57	2.45E-06
				6.78	3.11E-06
				6.91	3.63E-06
				7.2	4.25E-06
				7.35	5.41E-06
				7.65	6.93E-06
				7.93	8.69E-06
				8.19	1.30E-05

TABLE D17. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION
(L-T ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

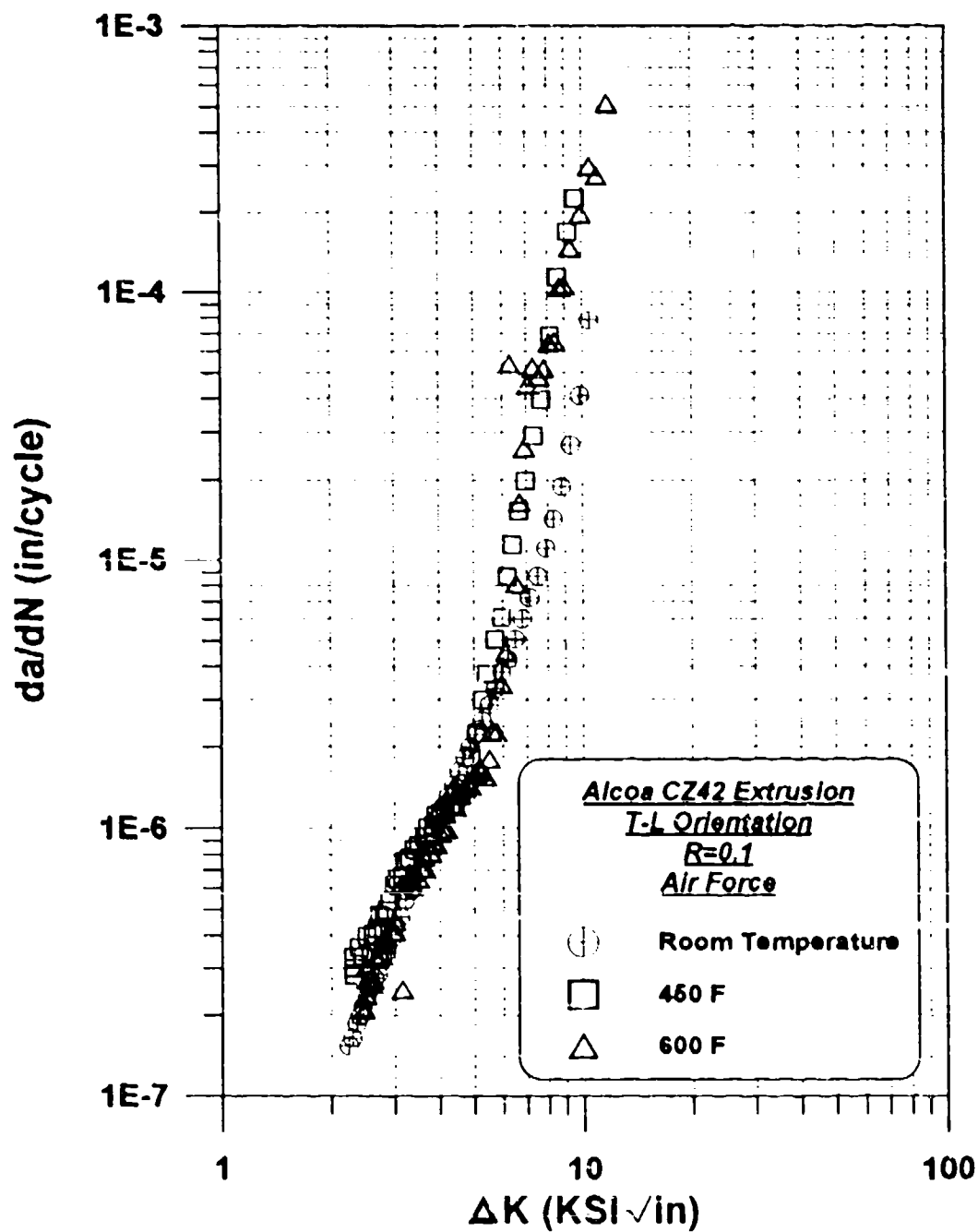


FIGURE D3. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION (T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE

A-44 & CZ42 Extrusion
 R=0.1
 T-L Orientation
 Air Force

Room Temperature		450 F		600 F	
Specimen # TL74		Specimen # TL73		Specimen # TL75	
Delta K	da/dN	Delta K	da/dN	Delta K	da/dN
2.23	1.54E-07	2.31	2.82E-07	2.46	2.10E-07
2.28	1.64E-07	2.3	3.32E-07	2.5	2.73E-07
2.34	1.86E-07	2.3	3.01E-07	2.49	2.37E-07
2.39	1.99E-07	2.38	3.59E-07	2.49	3.06E-07
2.44	2.18E-07	2.43	3.33E-07	2.59	2.61E-07
2.5	2.36E-07	2.5	3.96E-07	2.61	2.73E-07
2.56	2.56E-07	2.6	4.06E-07	2.65	3.30E-07
2.63	2.77E-07	2.67	4.22E-07	2.68	3.30E-07
2.69	2.85E-07	2.71	4.75E-07	2.76	3.71E-07
2.77	3.26E-07	2.79	4.70E-07	2.75	3.37E-07
2.84	3.48E-07	2.85	4.96E-07	2.81	3.88E-07
2.93	3.86E-07	2.91	5.37E-07	2.83	3.95E-07
3.01	4.33E-07	3	6.15E-07	2.98	4.13E-07
3.1	4.67E-07	3.05	6.51E-07	2.99	4.51E-07
3.2	5.40E-07	3.15	6.60E-07	3.12	6.18E-07
3.29	5.88E-07	3.21	7.56E-07	3.13	2.50E-07
3.37	6.54E-07	3.29	7.73E-07	3.2	5.95E-07
3.47	7.27E-07	3.39	8.32E-07	3.27	6.52E-07
3.58	7.93E-07	3.48	8.63E-07	3.31	6.46E-07
3.69	8.71E-07	3.61	9.30E-07	3.36	6.08E-07
3.81	9.62E-07	3.7	1.00E-06	3.41	6.87E-07
3.94	1.08E-06	3.84	1.02E-06	3.49	6.53E-07
4.08	1.20E-06	3.91	1.11E-06	3.54	7.09E-07
4.22	1.31E-06	4.02	1.13E-06	3.61	7.81E-07
4.36	1.44E-06	4.14	1.17E-06	3.64	7.04E-07
4.52	1.61E-06	4.3	1.21E-06	3.73	8.71E-07
4.69	1.82E-06	4.41	1.21E-06	3.78	8.12E-07
4.86	2.01E-06	4.57	1.31E-06	3.84	8.77E-07
5.05	2.22E-06	4.71	1.46E-06	3.91	8.74E-07
5.25	2.50E-06	4.9	1.82E-06	4.01	9.58E-07
5.49	2.87E-06	5.07	2.25E-06	4.08	9.85E-07
5.71	3.29E-06	5.26	2.98E-06	4.14	1.13E-06
5.95	3.80E-06	5.41	3.74E-06	4.18	9.87E-07
6.22	4.25E-06	5.71	5.03E-06	4.35	1.40E-06
6.51	5.07E-06	5.96	6.08E-06	4.43	1.20E-06
6.8	6.02E-06	6.2	8.69E-06	4.52	1.35E-06
7.14	7.21E-06	6.41	1.15E-05	4.57	1.33E-06
7.51	8.73E-06	6.69	1.53E-05	4.7	1.40E-06
7.9	1.11E-05	6.98	1.99E-05	4.79	1.46E-06
8.33	1.43E-05	7.32	2.91E-05	4.88	1.42E-06
8.77	1.89E-05	7.71	3.97E-05	5.01	1.59E-06
9.29	2.69E-05	8.17	6.84E-05	5.16	1.67E-06
9.83	4.10E-05	8.58	1.14E-04	5.22	1.62E-06
10.49	7.83E-05	9.17	1.69E-04	5.36	1.55E-06
		9.63	2.25E-04	5.5	1.80E-06
				5.61	2.28E-06
				5.75	2.27E-06
				5.96	3.43E-06
				6.13	4.52E-06
				6.31	5.40E-05
				6.54	8.13E-06
				6.71	1.66E-05
				6.91	2.63E-05
				7.08	4.51E-05
				7.31	5.22E-05
				7.58	4.81E-05
				7.84	5.18E-05
				8.11	6.44E-05
				8.43	6.50E-05
				8.69	1.05E-04
				8.94	1.06E-04
				9.22	1.47E-04
				9.91	1.97E-04
				10.52	2.53E-04
				11.02	2.74E-04
				11.78	5.13E-04

TABLE D18. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION
 (T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

APPENDIX E

**8019 EXTRUSION
1" X 3" X 72"**

TABLE E1
TENSILE RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	LONG	65.6	56.7	12.0	35.4	11.7
			65.8	56.9	11.3	35.6	10.6
			67.1	58.4	11.2	35.9	11.4
		AVERAGE	66.8	57.3	11.5	35.6	11.2
		STANDARD DEVIATION	0.3	0.9	0.4	0.3	0.6

TABLE E2
TENSILE RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	L TRANS	65.0		10.9	35.2	9.9
			65.8	54.6	10.4	32.9	13.9
			65.7	54.4	11.4	23.8	14.1
		AVERAGE	65.5	54.5	10.9	30.6	12.6
		STANDARD DEVIATION	0.4	0.2	0.5	6.0	2.3

TABLE E3
TENSILE RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	450	LONG	47.1	41.6	7.6	16.6	11.7
			46.6	42.3	7.2	14.8	9.3
			46.5	41.9	8.4	20.4	9.6
ARMY	450	LONG	47.5	41.7	4.2	13.7	9.6
			45.6	40.2	4.7	15.7	9.2
			47.2	41.0	7.9	18.0	9.3
AVERAGE			46.8	41.4	6.7	16.5	9.8
STANDARD DEVIATION			0.7	0.7	1.8	2.4	1.0

TABLE E4
TENSILE RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	450	L TRANS	44.7	39.3	7.5	17.0	10.5
			45.9	44.1	6.8	13.9	16.7
			44.9	39.5	8.0	8.8	12.8
ARMY	450	L TRANS	47.2	40.0	5.0	12.0	10.0
			46.0	36.4	6.4	14.0	8.6
AVERAGE			45.7	39.9	6.7	13.1	11.7
STANDARD DEVIATION			1.0	2.8	1.2	3.0	3.2

TABLE E5
TENSILE RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	600	LONG	31.3	28.0	10.1	17.1	12.7
			30.8	28.1	12.5	23.0	7.7
			31.1	28.1	12.4	17.7	9.0
ARMY	600	LONG	31.0	28.0	3.9	13.7	8.5
			29.0		1.9	9.8	
			29.0	25.9	4.5	7.8	6.8
		AVERAGE	30.4	27.6	7.6	14.8	8.9
		STANDARD DEVIATION	1.1	1.0	4.7	5.6	2.3

TABLE E6
TENSILE RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	600	L TRANS	29.8	26.5	10.3	12.4	8.4
			29.8	25.9	12.9	18.5	11.4
			30.2	26.4	12.6	16.9	8.7
ARMY	600	L TRANS	28.9	24.8	2.9	8.0	7.0
			32.4	27.8	3.0	5.8	10.3
			29.2	25.1	3.3	7.8	7.8
		AVERAGE	30.1	26.1	7.5	11.6	8.9
		STANDARD DEVIATION	1.2	1.1	4.9	5.2	1.6

TABLE E7
COMPRESSION RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	LONG	57.8	
			56.5	12.6
			53.2	13.6
		AVERAGE	55.8	13.1
		STANDARD DEVIATION	2.4	0.7

TABLE E8
COMPRESSION RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	55.3	14.4
			58.0	14.1
			53.7	
		AVERAGE	55.7	14.2
		STANDARD DEVIATION	2.2	0.2

TABLE E9

COMPRESSION RESULTS AT $t/2$ LOCATION FOR

ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	LONG	54.3	13.5
			49.3	12.1
			54.8	
		AVERAGE	52.8	12.8
		STANDARD DEVIATION	3.1	1.0

TABLE E10

COMPRESSION RESULTS AT $t/2$ LOCATION FOR

ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	L TRANS	52.0	12.1
			49.6	11.2
			51.2	11.3
		AVERAGE	50.9	11.6
		STANDARD DEVIATION	1.2	0.5

TABLE E11
COMPRESSION RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	LONG	49.9	11.8
			50.4	10.0
		AVERAGE	50.2	10.9
		STANDARD DEVIATION	0.4	1.2

TABLE E12
COMPRESSION RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	L TRANS	50.7	9.8
			52.2	8.4
		AVERAGE	51.5	9.1
		STANDARD DEVIATION	1.0	1.1

TABLE E13
BEARING RESULTS AT t/2 LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
AIR FORCE	300	LONG	2.0	106.1	69.9
				103.0	83.9
				103.3	79.6
				AVERAGE	104.1 77.8
				STANDARD DEVIATION	1.7 7.2
AIR FORCE	450	LONG	2.0	85.9	69.6
				86.2	70.9
				85.1	70.3
				AVERAGE	85.7 70.3
				STANDARD DEVIATION	0.6 0.7
AIR FORCE	600	LONG	2.0	55.1	48.5
				55.3	45.1
				55.6	45.2
				AVERAGE	55.3 46.3
				STANDARD DEVIATION	0.3 1.9

TABLE E14
BEARING RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
AIR FORCE	RT	L TRANS	2.0	126.1 126.7	98.8 99.8
			AVERAGE	126.4	99.3
			STANDARD DEVIATION	0.4	0.7
AIR FORCE	450	L TRANS	2.0	87.5 86.0 86.3	72.7 68.0 72.4
			AVERAGE	86.7	71.0
			STANDARD DEVIATION	1.0	2.6
AIR FORCE	600	L TRANS	2.0	56.2 55.8 56.5	40.9 43.4 43.2
			AVERAGE	56.2	42.5
			STANDARD DEVIATION	0.4	1.4

TABLE E15
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT			
AIR FORCE	RT	L-T		18.7	(1)			
				19.9	(1)			
				19.5	(1)			
			20.4					
			23.2					
ARMY	RT	L-T	14.6	11.0	(2)			
			AVERAGE			19.4	17.3	
			STANDARD DEVIATION			4.4	4.2	

(1): INVALID DUE TO EXCESSIVE CRACK FRONT CURVATURE
(2): INVALID DUE TO VIOLATION OF $0.45 < a/W < 0.55$ CRITERIA

TABLE E16
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
AIR FORCE	RT	T-L		11.3	(1)
				12.0	(1)
				11.3	(1)
			10.9		
			12.1		
ARMY	RT	T-L		15.9	(2)
				16.0	(2)
			AVERAGE		11.5
STANDARD DEVIATION			0.8	2.4	

(1): INVALID DUE TO EXCESSIVE CRACK FRONT CURVATURE
(2): INVALID DUE TO $P_{max}/P_q > 1.1$

TABLE E17
FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES	
AIR FORCE	RT	LONG	70.0	1,496	
			55.0	82,497	
			50.0	86,351	
			50.0	323,738	
			47.5	1,122,758	
			45.0	5,030,776	
			40.0	19,715,400	*
			30.0	21,703,100	*
			20.0	23,597,900	*
ARMY	RT	LONG	48.0	60,000	
			46.0	118,000	
			46.0	330,000	
			44.0	148,000	
			44.0	81,000	
			42.0	17,794,000	*
			42.0	1,135,000	
			40.0	15,328,000	*

(*): RUN OUT

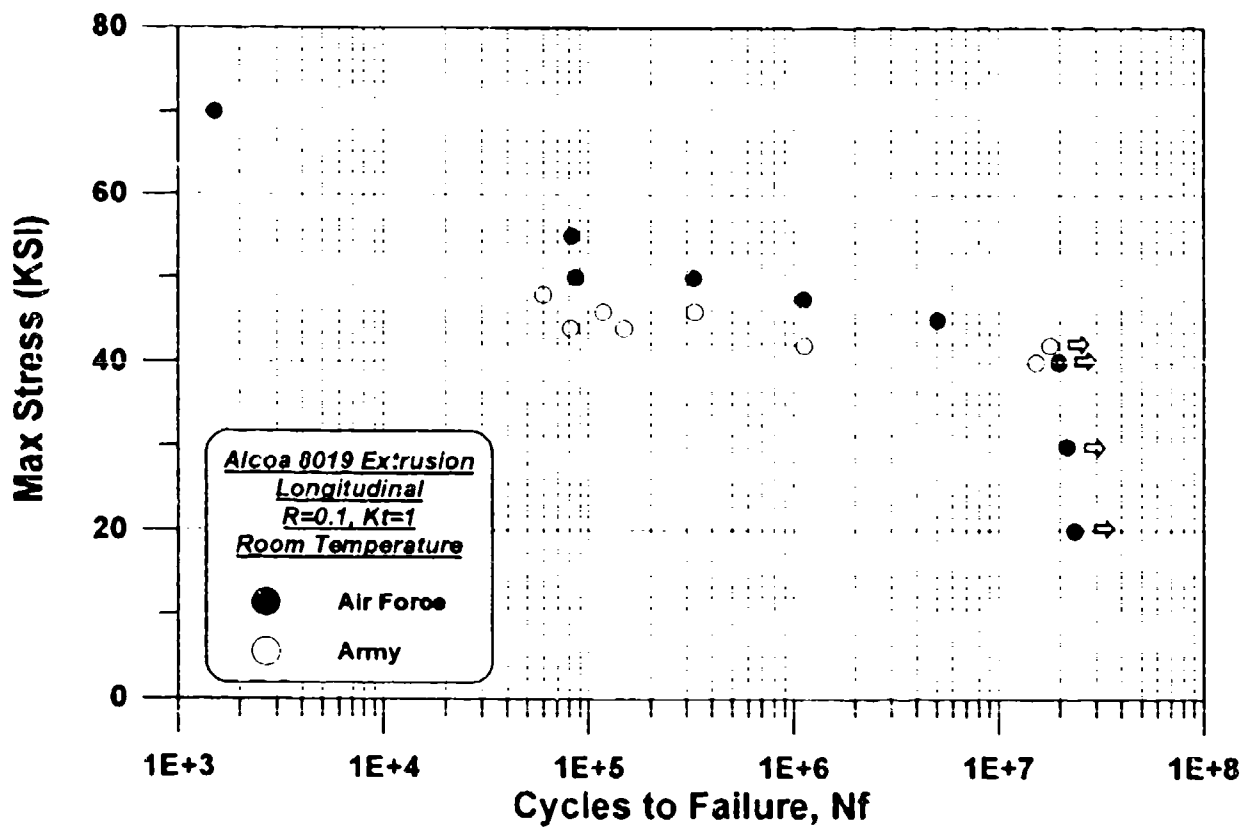


FIGURE E1. FATIGUE RESULTS FOR 8019 EXTRUSION
 (LONGITUDINAL, ROOM TEMPERATURE, $K_t=1$)

TABLE E18
FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALCOA CU78 (9019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES
AIR FORCE	450	LONG	60.0	2,728
			55.0	41,273
			52.0	136,800
			45.0	59,569
			41.0	923,774
			37.5	4,903,067
			30.0	10,753,363 *
			20.0	12,096,984 *
			15.0	14,487,063 *
ARMY	450	LONG	39.0	181,000
			37.0	105,000
			37.0	67,000
			35.0	361,000
			34.5	1,195,000
			33.5	10,200,000 *
			32.0	11,598,000 *
			30.0	10,416,000 *

(*): RUN OUT

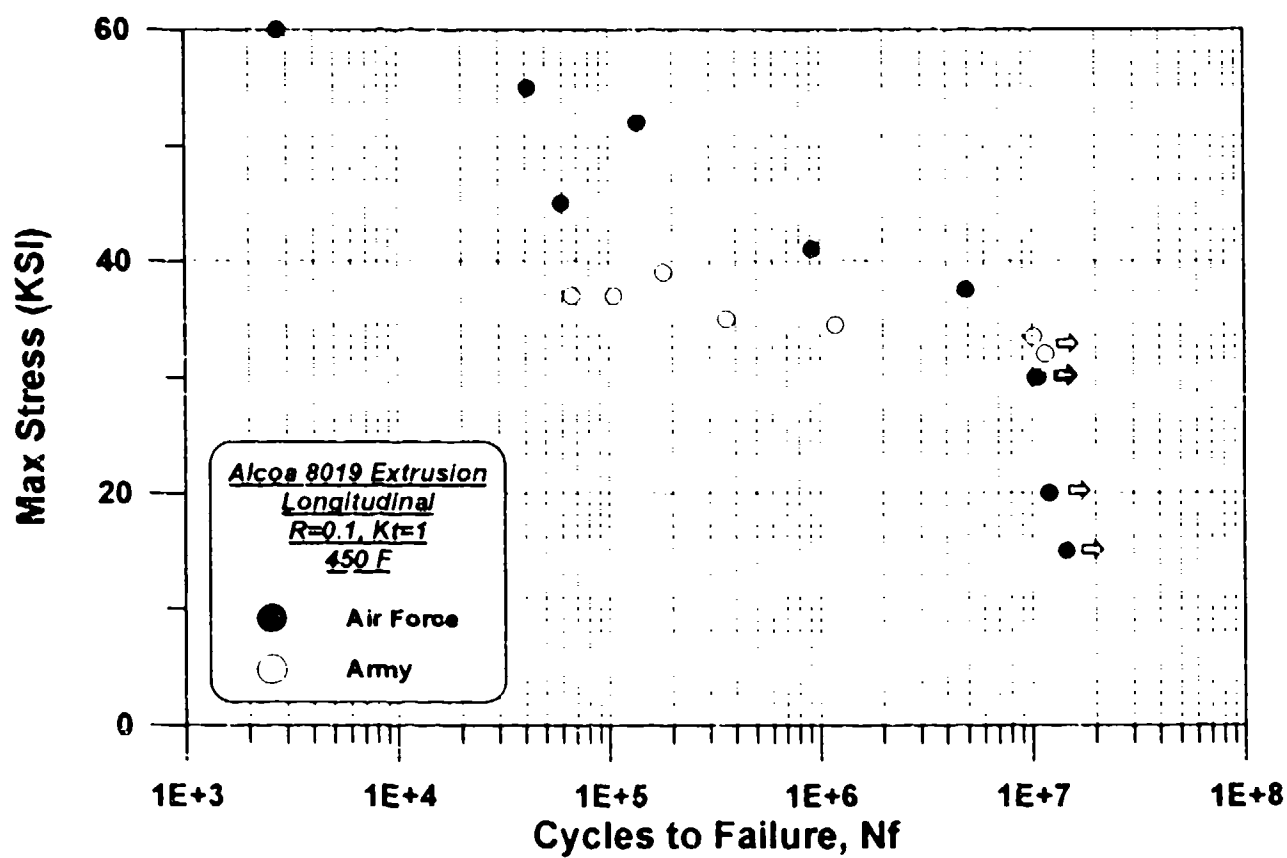


FIGURE E2. FATIGUE RESULTS FOR 8019 EXTRUSION
 (LONGITUDINAL, 450 F, $K_t=1$)

TABLE E19
 FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES	
AIR FORCE	600	LONG	42.0	1,927	
			37.5	39,386	
			32.5	234,943	
			30.0	356,575	
			27.5	1,340,904	
			25.0	12,477,988	*
ARMY	600	LONG	31.5	485,000	
			30.2	5,407,000	
			29.9	2,318,000	
			29.8	2,828,000	
			29.5	1,759,000	
			28.0	4,469,000	
			25.0	13,224,000	*
			23.0	14,969,000	*

(*): RUN OUT

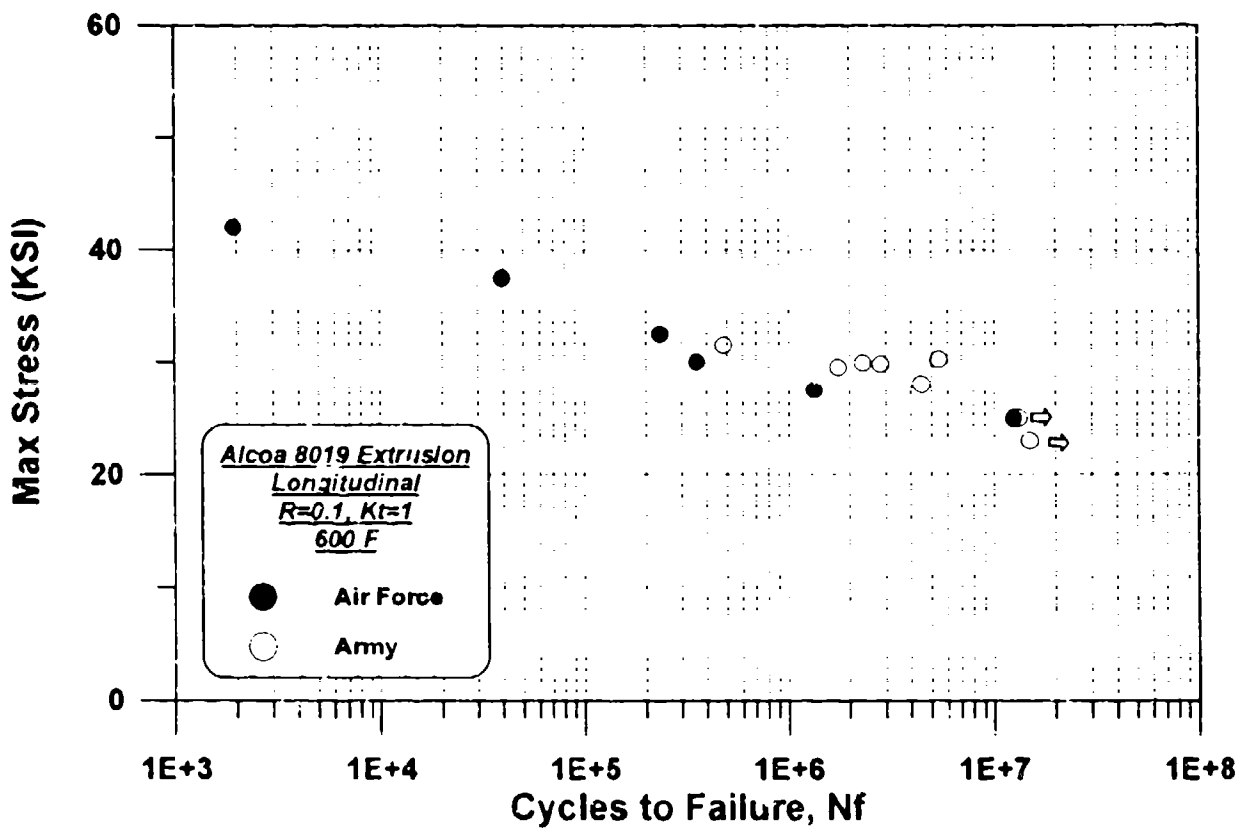


FIGURE E3. FATIGUE RESULTS FOR 8019 EXTRUSION
(LONGITUDINAL, 600 F, Kt=1)

TABLE E20
FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES	
AIR FORCE	RT	LONG	30.0	1,482	
			15.0	104,042	
			12.5	372,059	
			11.3	2,333,407	
			10.0	10,591,589	*
	450	LONG	25.0	18,349	
			21.0	36,495	
			14.0	726,152	
			12.5	160,808	
			10.8	817,495	
			10.0	16,827,951	*
	600	LONG	22.0	37,529	
			13.0	1,510,601	
			12.0	169,140	
			11.0	4,266,128	
			9.0	11,168,329	*

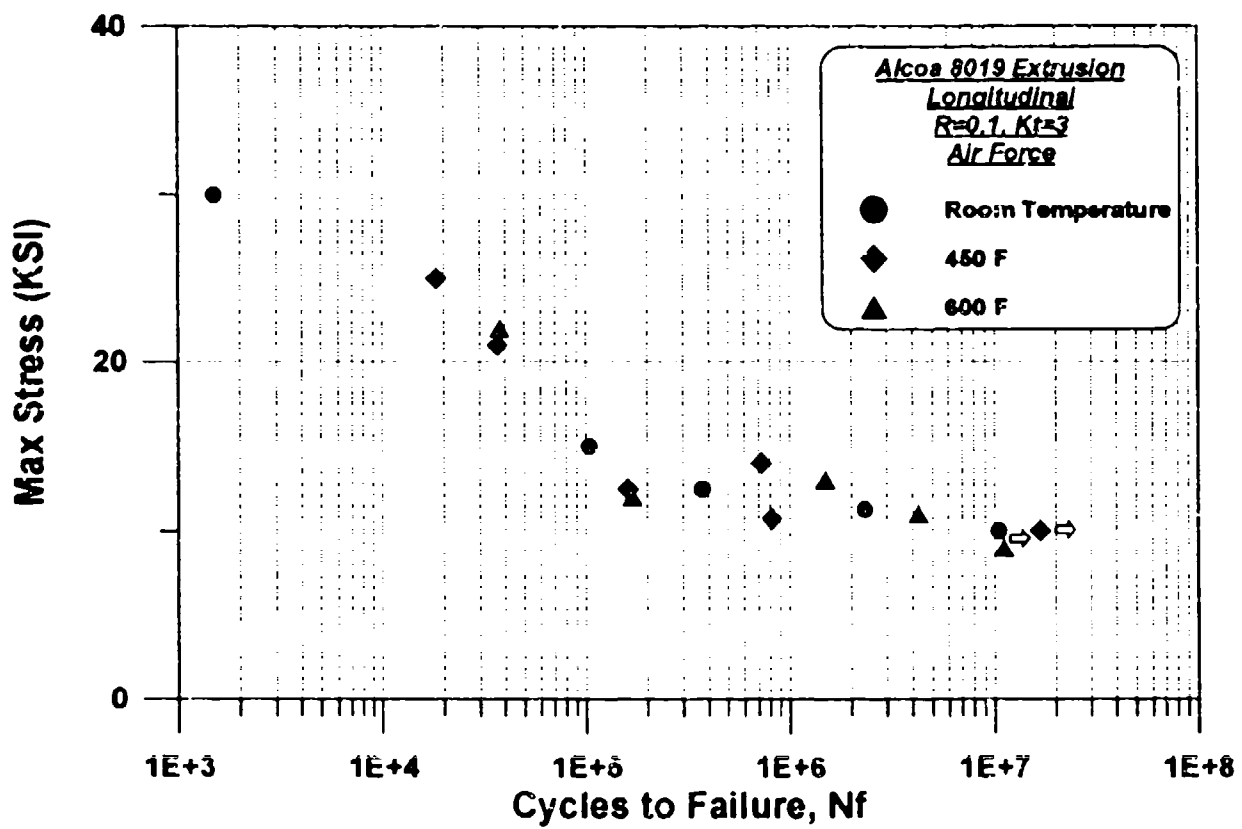


FIGURE E4. FATIGUE RESULTS FOR 8019 EXTRUSION
 (LONGITUDINAL, $Kt=3$)

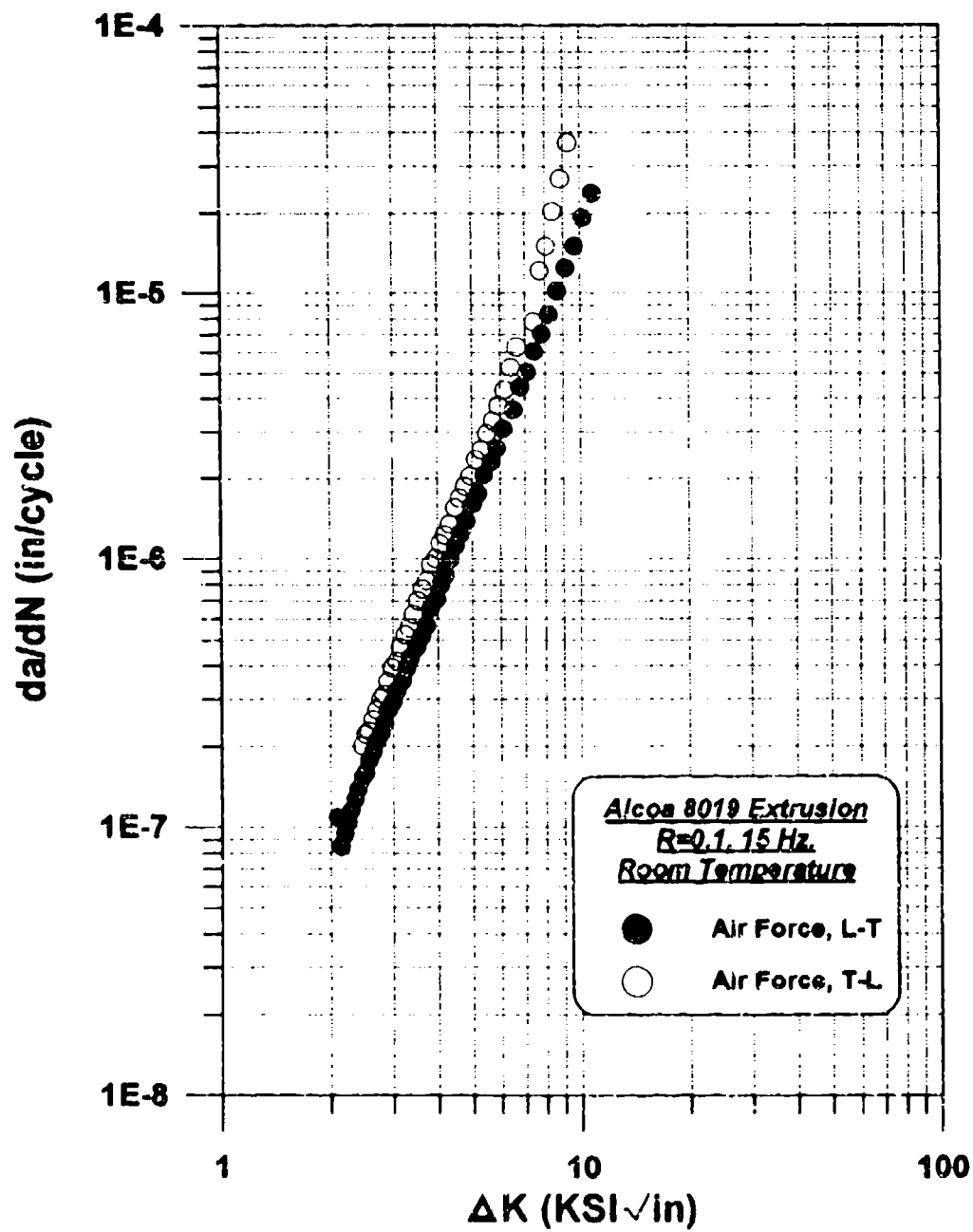


FIGURE E5. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION (L-T AND T-L ORIENTATIONS, ROOM TEMPERATURE) AIR FORCE.

Alcoa 8019 Extrusion
R=0.1
Air Force
Room Temperature

L-T Orientation		T-L Orientation	
Delta K	da/dN	Delta K	da/dN
2.1	1.09E-07	2.45	2.02E-07
2.14	8.48E-08	2.51	2.22E-07
2.19	6.47E-08	2.56	2.28E-07
2.24	1.04E-07	2.63	2.52E-07
2.28	1.16E-07	2.69	2.74E-07
2.34	1.27E-07	2.76	3.02E-07
2.39	1.39E-07	2.83	3.14E-07
2.45	1.53E-07	2.89	3.50E-07
2.51	1.60E-07	2.97	3.95E-07
2.57	1.78E-07	3.07	4.16E-07
2.63	1.91E-07	3.14	4.69E-07
2.7	2.12E-07	3.23	5.21E-07
2.77	2.23E-07	3.32	5.57E-07
2.84	2.45E-07	3.41	6.23E-07
2.91	2.74E-07	3.51	6.99E-07
3	2.95E-07	3.61	7.74E-07
3.06	3.24E-07	3.71	8.30E-07
3.17	3.51E-07	3.82	9.49E-07
3.27	3.94E-07	3.94	9.99E-07
3.35	4.30E-07	4.08	1.14E-06
3.48	4.72E-07	4.19	1.23E-06
3.59	5.13E-07	4.32	1.35E-06
3.71	5.65E-07	4.46	1.55E-06
3.81	6.57E-07	4.61	1.68E-06
3.96	7.08E-07	4.77	1.87E-06
4.07	8.05E-07	4.94	2.05E-06
4.2	8.71E-07	5.11	2.37E-06
4.33	9.97E-07	5.29	2.56E-06
4.48	1.12E-06	5.5	2.96E-06
4.63	1.25E-06	5.7	3.32E-06
4.8	1.38E-06	5.94	3.77E-06
5.01	1.60E-06	6.17	4.33E-06
5.19	1.75E-06	6.41	5.26E-06
5.4	2.07E-06	6.66	6.28E-06
5.63	2.30E-06	7.4	7.80E-06
5.87	2.61E-06	7.72	1.22E-05
6.13	3.08E-06	8.06	1.50E-05
6.51	3.63E-06	8.43	2.03E-05
6.81	4.44E-06	8.86	2.70E-05
7.11	5.04E-06	9.26	3.67E-05
7.44	6.02E-06		
7.82	7.04E-06		
8.21	8.33E-06		
8.65	1.02E-05		
9.14	1.25E-05		
9.65	1.51E-05		
10.22	1.92E-05		
10.83	2.39E-05		

TABLE E21. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION
(L-T AND T-L ORIENTATIONS, ROOM TEMPERATURE) AIR FORCE.

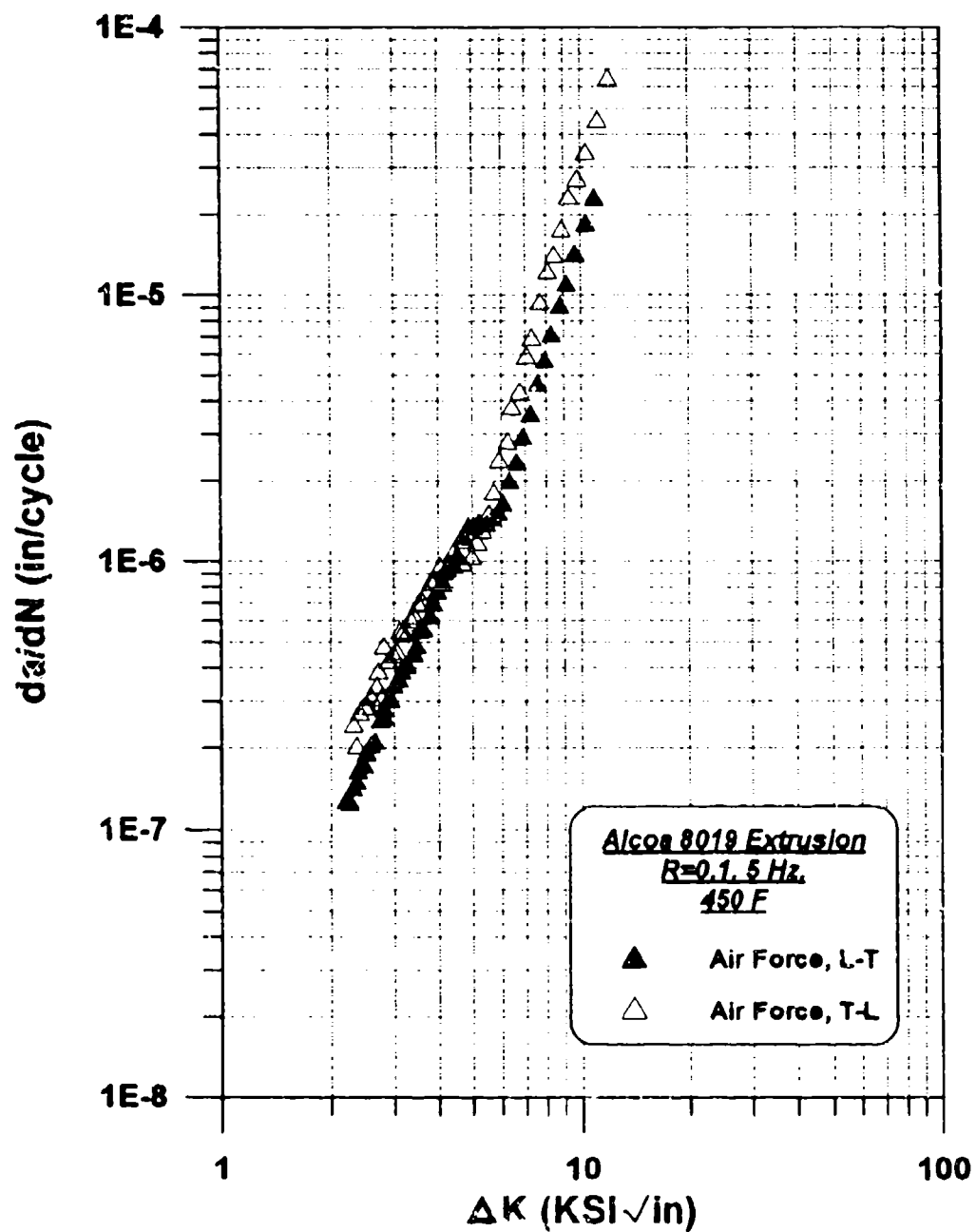


FIGURE E6. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION (L-T AND T-L ORIENTATIONS, 450 F) AIR FORCE.

Alcoa 8019 Extrusion
R=0.1
Air Force
450 F

L-T Orientation		T-L Orientation	
Delta K	da/dN	Delta K	da/dN
2.2	1.25E-07	2.32	2.41E-07
2.26	1.23E-07	2.36	2.01E-07
2.31	1.40E-07	2.41	2.67E-07
2.36	1.48E-07	2.48	2.82E-07
2.38	1.61E-07	2.53	2.81E-07
2.47	1.69E-07	2.59	3.04E-07
2.51	1.89E-07	2.68	3.34E-07
2.58	2.02E-07	2.71	3.80E-07
2.65	2.08E-07	2.77	3.00E-07
2.74	2.50E-07	2.81	4.71E-07
2.81	2.75E-07	2.89	4.15E-07
2.82	2.55E-07	2.98	4.39E-07
2.89	2.97E-07	3.05	4.49E-07
2.94	2.97E-07	3.11	5.37E-07
2.99	3.36E-07	3.19	5.32E-07
3.1	3.54E-07	3.28	5.31E-07
3.15	3.79E-07	3.35	5.95E-07
3.27	4.00E-07	3.42	6.11E-07
3.41	4.44E-07	3.52	6.79E-07
3.48	4.75E-07	3.61	6.89E-07
3.55	5.42E-07	3.71	7.54E-07
3.63	5.48E-07	3.81	8.19E-07
3.79	6.12E-07	3.92	8.32E-07
3.86	6.81E-07	4.04	9.35E-07
3.97	7.57E-07	4.15	8.95E-07
4.12	8.13E-07	4.28	9.59E-07
4.24	9.13E-07	4.4	1.06E-06
4.42	9.57E-07	4.55	1.02E-06
4.52	1.03E-06	4.67	9.71E-07
4.69	1.21E-06	4.77	1.18E-06
4.85	1.32E-06	4.97	1.02E-06
5.03	1.33E-06	5.15	1.15E-06
5.21	1.38E-06	5.31	1.28E-06
5.46	1.36E-06	5.53	1.49E-06
5.68	1.43E-06	5.7	1.79E-06
5.88	1.49E-06	5.92	2.35E-06
6.08	1.62E-06	6.25	2.77E-06
6.32	1.98E-06	6.43	3.72E-06
6.64	2.32E-06	6.75	4.25E-06
6.89	2.87E-06	7.06	5.79E-06
7.24	3.50E-06	7.31	6.77E-06
7.58	4.53E-06	7.71	9.21E-06
7.95	5.59E-06	8.09	1.21E-05
8.3	7.00E-06	8.46	1.39E-05
8.78	8.92E-06	8.9	1.73E-05
9.16	1.06E-05	9.29	2.29E-05
9.65	1.41E-05	9.81	2.67E-05
10.35	1.82E-05	10.37	3.37E-05
10.95	2.27E-05	11.16	4.44E-05
		11.98	6.36E-05

TABLE E22. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION
(L-T AND T-L ORIENTATIONS, 450 F) AIR FORCE.

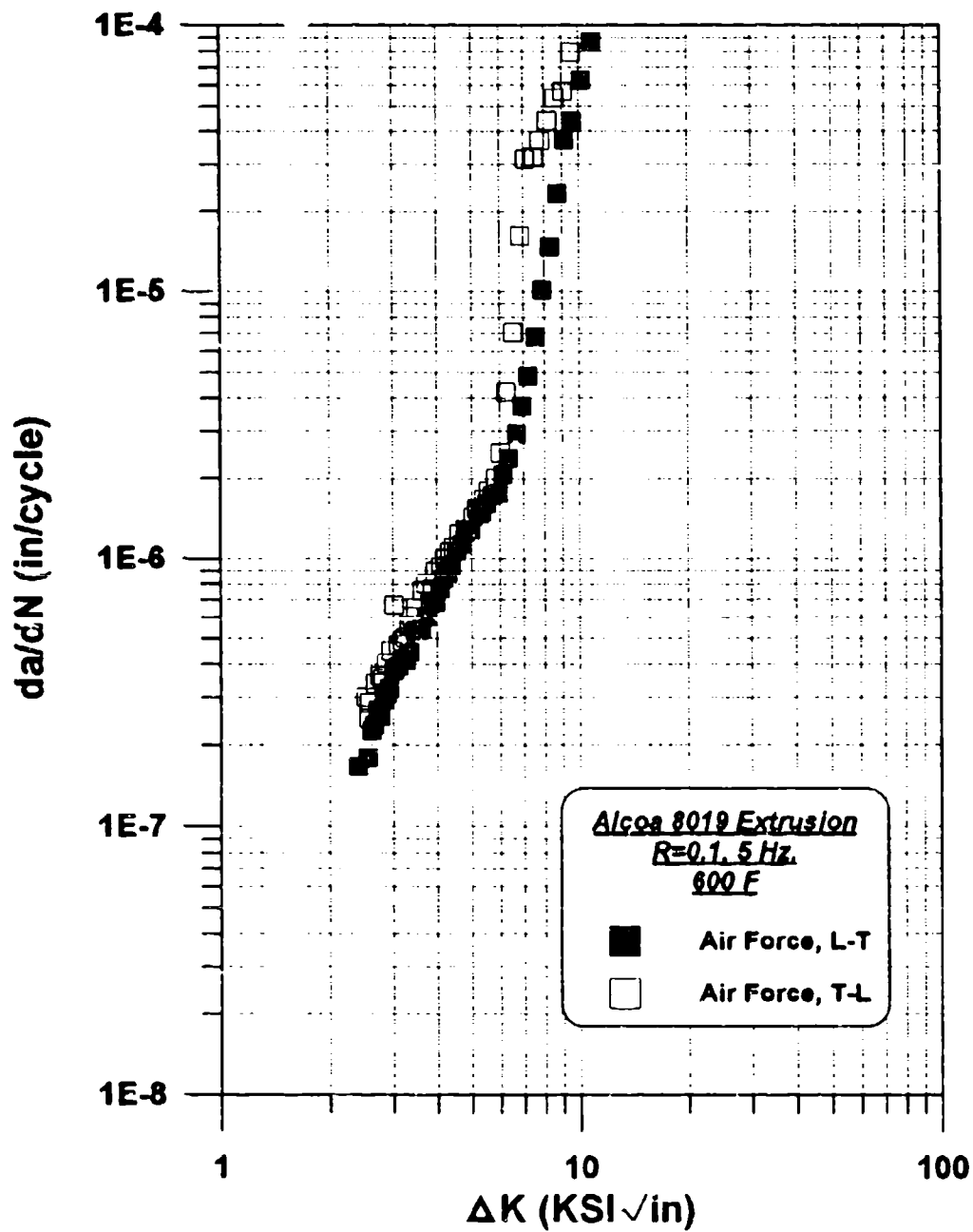


FIGURE E7. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION (L-T AND T-L ORIENTATIONS, 600 F) AIR FORCE.

Alcoa 8019 Extrusion
R=0.1
Air Force
600 F

L-T Orientation		T-L Orientation	
Delta K	da/dN	Delta K	da/dN
2.4	1.67E-07	2.52	3.02E-07
2.55	1.80E-07	2.57	2.53E-07
2.62	2.27E-07	2.58	2.87E-07
2.68	2.37E-07	2.68	3.40E-07
2.72	2.71E-07	2.75	3.63E-07
2.77	2.56E-07	2.81	3.53E-07
2.84	2.95E-07	2.87	4.02E-07
2.88	3.11E-07	2.96	4.49E-07
2.93	3.25E-07	3.02	6.67E-07
3.02	3.78E-07	3.1	4.73E-07
3.1	3.92E-07	3.18	4.92E-07
3.2	4.18E-07	3.23	5.04E-07
3.26	4.15E-07	3.32	5.65E-07
3.35	4.43E-07	3.39	6.04E-07
3.45	5.32E-07	3.46	6.55E-07
3.52	5.36E-07	3.62	7.57E-07
3.6	5.45E-07	3.71	8.06E-07
3.73	6.03E-07	3.88	7.65E-07
3.82	6.76E-07	3.95	8.95E-07
3.95	6.84E-07	4.08	9.35E-07
4.06	7.72E-07	4.2	1.00E-06
4.15	8.36E-07	4.33	1.06E-06
4.28	8.82E-07	4.43	1.10E-06
4.37	9.31E-07	4.58	1.23E-06
4.51	1.07E-06	4.78	1.29E-06
4.67	1.13E-06	4.87	1.29E-06
4.79	1.25E-06	5.04	1.43E-06
4.98	1.28E-06	5.24	1.47E-06
5.15	1.55E-06	5.41	1.67E-06
5.34	1.51E-06	5.58	1.80E-06
5.51	1.61E-06	5.84	2.01E-06
5.72	1.73E-06	6.03	2.51E-06
5.93	1.76E-06	6.25	4.21E-06
6.15	2.09E-06	6.53	7.03E-06
6.36	2.37E-06	6.85	1.62E-05
6.67	2.95E-06	7.1	3.15E-05
6.93	3.72E-06	7.5	3.20E-05
7.22	4.83E-06	7.81	3.69E-05
7.57	6.80E-06	8.21	4.39E-05
7.91	1.01E-05	8.57	5.36E-05
8.32	1.48E-05	9.06	5.67E-05
8.72	2.33E-05	9.56	7.95E-05
9.11	3.71E-05		
9.58	4.37E-05		
10.22	6.26E-05		
10.88	8.71E-05		

TABLE E23. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION
(L-T AND T-L ORIENTATIONS, 600 F) AIR FORCE.