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UNITED STATES GOVERNMENT

Memorandum

6390-328M:FJL:ldw

TO : C. Z. Serpan, NRC-RSR DATE: 7 September 1978

FROM : F. J. Loss, NRL Code 6392

SUBJECT: Monthly Status Report for August 1978

1. FATIGUE CRACK GROWTH

a. 1T Water Pot - Test of matrix item 1D2 (30 min ramp, 3 min hold) ΔK_i = ~33 ksi $\sqrt{in.}$, current K 59. Test status is excellence. Crack growth rate vs ΔK data to date shown in Fig. 1.

b. 1T Autoclave - Test of matrix item 2B4 (1 min ramp, 60 min hold), ΔK_i = ~33 ksi $\sqrt{in}$. Test has accumulated 1670 cycles, however a recent problem with the LVDT prevents crack length determination. Test to be suspended early in September to prepare autoclave for round-robin testing. Top hat (internal) load cell has been received and is ready for installation. This internal load cell is required to eliminate the seal friction load that is currently detected by the externally-mounted load cell.

c. 2T/4T Autoclave - Test using haversine waveform. Test initiated in late August, ΔK_i ~28 ksi $\sqrt{in}$. Test status excellent, no differentiable data as yet. This waveform is being utilized to check the high growth rate data generated by Westinghouse using only this waveform.

d. Multispecimen Autoclaves -

(1) Autoclave #1 - Three specimen daisy chain, matrix item 2C1 (5 min ramp, 1 min hold), ΔK_i ~ 27, 35, 24. Tests ran successfully through the month with one brief shutdown on account of gasket failure. Broken specimen (R-12) was replaced and test continues. Data from R-12 is shown in Fig. 2. Low and medium ΔK specimens producing data but ΔK range is not large enough to draw substantive conclusions. Test status excellent.

(2) Autoclave #2 - New heaters and power controller have been received and will be installed in September. Test of piping materials is planned for this chamber to commence in October.

(3) Autoclave #3 - Three specimen daisy chain, matrix item 2D2 (30 min ramp, 3 min hold),. Test halted at beginning of month due to gasket failure. Restarted on 10 August. High ΔK specimen (R-07) broke on 27 August. Crack rate vs K data shown in Fig. 3. Test continues; status excellent.

e. The data acquired from these most recent NRL tests support the hypothesis that combinations of rise and hold time waveforms result in crack growth rates which lie above the ASME Section XI air default line by a factor of two or three. The sine waveform test just initiated in the 2T/4T autoclave will provide verification of Westinghouse sine wave data which has generally exhibited crack growth rates which are faster than ramp/hold type waveforms.

2. FRACTURE TOUGHNESS

a. Computerized data acquisition system for J-R curve determination is operational. Check tests are proceeding with unirradiated material. The question of the depth of face grooves to be used must be decided soon before testing .

b. Modification of hot cells for remote J testing is nearing completion.

c. Plans have been made for NRL personnel to conduct pre-acceptance testing on the high rate MTS machine in mid-September.

3. RADIATION SENSITIVITY AND POSTIRRADIATION PROPERTIES RECOVERY

a. IAR Program Operations - During this month, the intermediate (second cycle) annealing operations on Experiments UBR 18 and UBR 19 were completed. The third cycle irradiation operations were also completed.

b. IAR Program Material Assessments - Reference tests of unirradiated condition Charpy-V (C_v) specimens were completed.

c. Continued exploratory irradiation of A508-2 forgings using C_v specimens (UBR 21).

d. Completed tests on postirradiation heat treatment condition of 7 B&W welds from Experiment UBR 20; commenced postirradition analysis of C_v results .

e. Commenced construction of experiment for UBR reactor containing forging fatigue samples.

f. Completed testing of DW and C_v samples from Thermal Shock Vessel Test No. 1 (TSV-1)

g. Planned for September

(1) Obtain bids for replacement weld materials for Phase II IAR studies

(2) Commence decanning of IAR Experiments 18 and 19

(3) Complete irradiation and commence decanning and testing of Experiment UBR 21 containing A508-2 forging samples.

(4) Complete construction of forging irradiation experiment for UBR reactor

4. MEETINGS

a. A meeting between NRL, Westinghouse, and ORNL representatives was held at NRL on 28 August to discuss results and future coordination of the CCGR program.

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Encl:
Figures 1-3

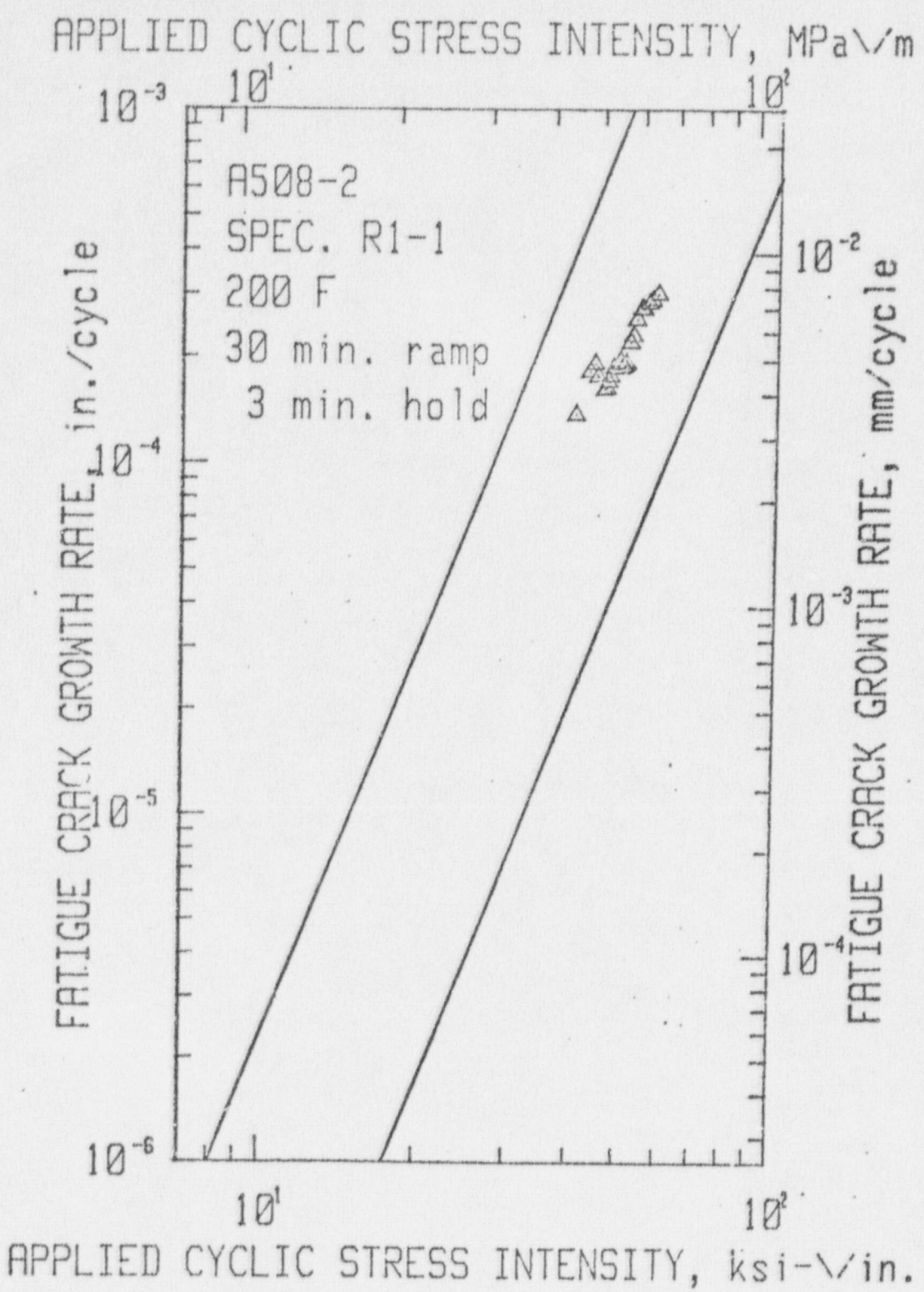

Fig. 1 Plot of da/dN vs$^{\Delta}$ K for Specimen R1-1, test of matrix item ID1. This is a water pot tested sample, and is only a partial data set. The test is on-going with expected failure in mid-September. The applied ramp time is the longest to date, but the growth rates are similar to those pertaining to shorter ramp and hold times.

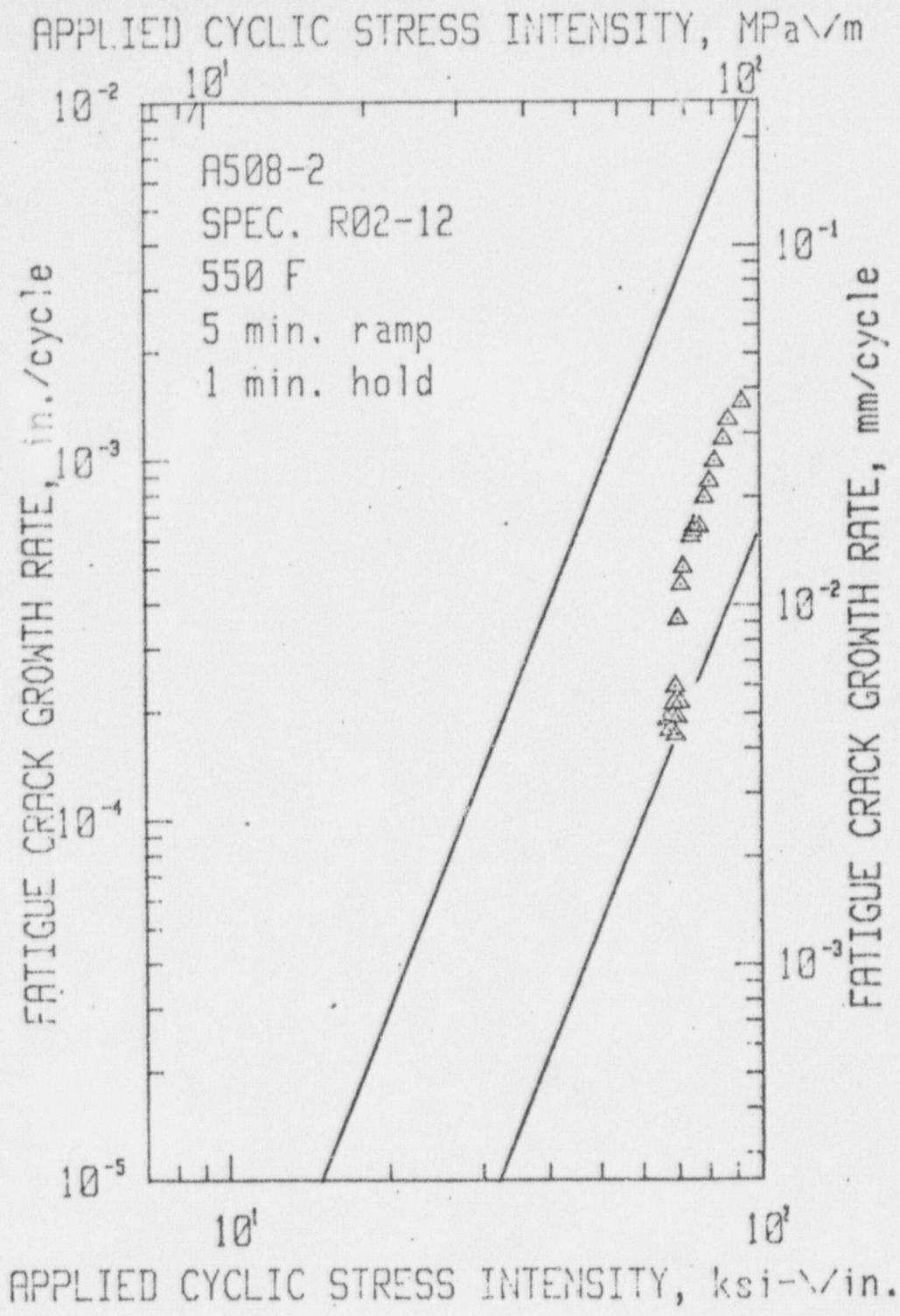

Fig. 2 Plot of da/dN vs ΔK for Specimen R-12, test of matrix item 2C1. This sample had the longest crack of the three specimen daisy chain, and this test is complete. Data resides between Section XI air and water default lines, in agreement with an earlier ICI test conducted in a water pot. Test continues on the other two specimens in the daisy chain, R-09 and R-11.

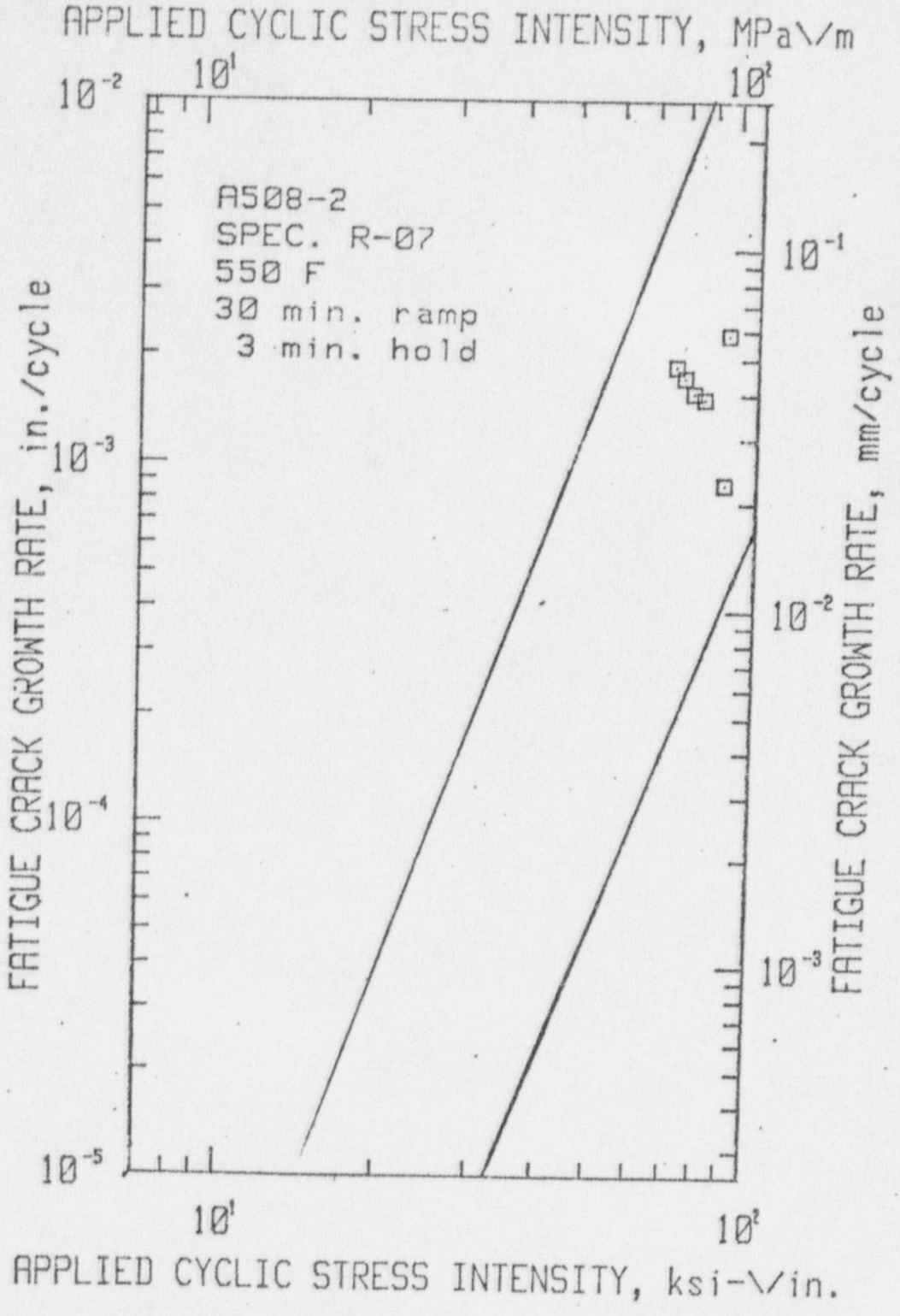

Fig. 3 Plot of da/dN vs ΔK for Specimen R-07. This was a high ΔK range test of matrix item 2D2, 30 min ramp, 3 min hold. The data reside somewhat above the Section XI air default line, in agreement with water pot (200°F) data of the same waveform.

INTERIM REPORT

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