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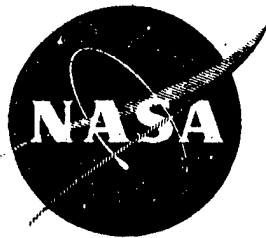
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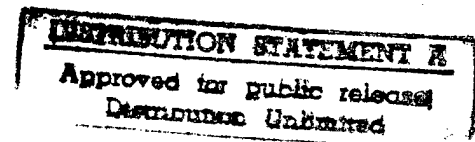
B. G. W. Yee, F. H. Chang,
J. C. Couchman and G. H. Lemon

General Dynamics
Fort Worth Division
Fort Worth, Texas

and

P. F. Packman

Vanderbilt University
Nashville, Tennessee



Prepared for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA Lewis Research Center
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N O T I C E

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16. Abstract Twenty sets of relevant NDE reliability data have been identified, collected, compiled, and categorized. Three relevant on-going programs are being monitored for future usage. A criterion for the selection of data for statistical analysis considerations has been formulated. A model to grade the quality and validity of the data sets has been developed. Data input formats, which record the pertinent parameters of the defect/specimen and inspection procedures, have been formulated for each NDE method. A comprehensive computer program has been written to calculate the probability of flaw detection at several confidence levels by the binomial distribution. This program also selects the desired data sets for pooling and tests the statistical pooling criteria before calculating the composite detection reliability. Probability of detection curves at 95 and 50 percent confidence levels have been plotted for individual sets of relevant data as well as for several sets of merged data with common sets of NDE parameters.					
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ASSESSMENT OF NDE RELIABILITY DATA

B. G. W. Yee, F. H. Chang,
J. C. Couchman and G. H. Lemon

General Dynamics
Fort Worth Division
Fort Worth, Texas

and

P. F. Packman
Vanderbilt University
Nashville, Tennessee

Final Report

Prepared for
NATIONAL AERONAUTICS & SPACE ADMINISTRATION
Lewis Research Center
Cleveland, Ohio

Contract NAS 3-18907

Foreword

This final report covers the work performed under Contract NAS-3-18907 from July 1974 to September 1975. The study was accomplished by General Dynamics Corporation, Fort Worth Division, Fort Worth, Texas and Vanderbilt University, Nashville, Tennessee. The program was managed by Dr. B. G. W. Yee of General Dynamics, with Dr. J. C. Couchman and Dr. F. H. Chang serving as principal investigators. Valuable contributions were made to the development of the statistical analysis by Dr. G. H. Lemon and computer programming by J. S. Kunselman and T. Walker. Dr. P. F. Packman of Vanderbilt University served as associate program manager. The program was under the technical direction of Mr. S. J. Klima, NASA Lewis Research Center, Cleveland, Ohio.

Participants in this program are indebted to many people in the NDE community for furnishing data to this program and for providing consultation.

Thank you!

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SUMMARY

The overall objective of this program is to assess available nondestructive testing data for the determination of the sensitivity and reliability of state-of-the-art production NDE methods for flaw detection on metallic materials. This program was separated into four different tasks. They were:

Task I	Acquisition of Information
Task II	Screening and Separation of Data by NDE Method and Material
Task III	Statistical Determination of NDE Reliability
Task IV	Reporting

Twenty sets of relevant NDE reliability data have been identified, collected, compiled, and categorized. Three relevant on-going programs have also been identified. A criterion for the selection of data for statistical analysis considerations has been formulated. A model to grade the quality and validity of the data sets has been developed. Data input formats, which record the pertinent parameters of the defect/specimen and inspection procedures, have been formulated for each NDE method. A comprehensive computer program has been written to calculate the probability of flaw detection at several confidence levels by the binomial distribution. This program also selects the desired data sets for pooling, and tests the statistical pooling criteria before calculating the composite detection reliability. Probability of detection curves at 95 and 50 percent confidence levels have been plotted by NDE technique and material type for individual sets of data as well as for merged data.

I. INTRODUCTION

In order to apply linear-elastic fracture mechanics to structural design, NDE has to show at a high level of confidence that no flaw larger than a specific size exists in the structure. To establish the minimum detectable flaw size, many companies and organizations have conducted NDE demonstration programs. Most of these demonstration programs have been conducted in the production and field-service environment, but some have been conducted in the laboratory environment.

The results obtained from demonstration programs are lacking in universal agreement. This lack of agreement is not surprising because each company or organization may use a different NDE procedure, different personnel, different procedures and parameters to generate the test flaws, different flaws and material types, and even different statistical analysis procedures. There appears to be a need to (1) collect much of the available NDE reliability data, (2) closely examine all the parameters that could affect the detection reliability, (3) compare the parameters used by each organization to obtain the data, and (4) attempt to identify the parameters that most likely cause observable differences in detection reliability. It appears worthwhile to obtain a composite detection reliability for each NDE method, material type, and flaw type by pooling data obtained from several sources. At the same time, the merits and shortcomings of several statistical analysis procedures should be carefully examined and the procedure most suitable for the analysis of NDE reliability data should be selected. Any needs for improved methods should be identified.

The program reported on in this document was intended to collect all available NDE data, screen and separate the data by NDE method and material, perform statistical analyses, and evaluate the state-of-the-art in NDE reliability.

II. ACQUISITION OF INFORMATION

The acquisition of NDE reliability related data, identification of on-going programs, and preparation of a bibliography of the acquired data is discussed in this section.

2.1 Acquisition of NDE Reliability Related Data

Twenty-three sets of potentially useful data have been identified during this program and twenty sets were acquired. Three sets of data involve on-going programs and the data were not made available for inclusion in this study. Of the twenty sets of data received, only seven sets were statistically analyzed. The thirteen sets of data that were not statistically analyzed were rejected because they did not satisfy the selection criterion discussed in Section III of this report or the owner refused to permit the data to be used.

2.2 Bibliography

The twenty sets of NDE reliability related data that have been acquired are listed below. Some of the references are private data in which case only company or committee report numbers are available. Several references to government funded programs, which have not been published can only be identified by sponsoring agencies and the name of an individual at the company where the work was conducted. Copies of these data can be obtained by either contacting an individual within the sponsoring agency or an individual associated with the company.

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2.3 On-Going Programs

There are several on-going programs that are currently known. Of these, only three are government funded and their results will be available to the public for analysis. The data from the privately funded programs may never be made available for public analysis.

The three government funded on-going programs are:

1. Crack detection reliability on welded plates and structures, Martin Marietta, Ward Rummel, sponsored by NASA/Johnson Space Center, NAS 9-13578.
2. Crack detection reliability on actual aircraft structures at the depot level, Lockheed, GA., W. Lewis, sponsored by Kelly Air Force Base.
3. Crack detection reliability on bolt holes on F-111 fatigue tested structures, General Dynamics, Fort Worth Division, B. G. W. Yee, Sponsored by SMALC.

III. SCREENING AND SEPARATION OF DATA BY NDE METHOD AND MATERIAL

This section describes the development of data selection criteria, separation and categorization of data, development of a model to grade quality of the data, and the development of a data input format for each NDE method.

3.1 Criteria for Selection of Data for Statistical Analysis

All of the reliability related NDE data are not necessarily suitable for statistical analysis. Some are lacking in the documentation of certain key pertinent parameters, such as the defect dimension, defect type, NDE method, etc. Statistical analysis of data when the key pertinent parameters are not documented would be marginal in value. A data selection criteria is needed to screen the data and prejudge the suitability of the data for statistical analysis. Such a criteria is necessarily subjective because it involves human judgment of data value or usefulness. It is felt that such a subjective criteria will still be useful to screen out data having marginal statistical value and to eliminate lost time in processing the data.

To be eligible for statistical analysis, a set of data must satisfy the following conditions:

- a) An NDE procedure or specification must accompany the data which clearly describes the equipment and the parameters used so that the data may be reproduced in other facilities (assuming the same equipment or its equivalent is used).
- b) The defect dimensions and specimen geometry must be well documented so that data may be statistically analyzed and compared to defect detection in the proper defect size range. When artificial methods of defect fabrication are used, at least ten percent (10%) of all defects in a given set must be destructively tested to obtain the defect dimensions. For methods that are used to produce multiple defects in a specimen or methods that are questionable for producing controllable defect dimensions, at least fifty percent (50%) of all defects in a given set must be destructively tested to verify the defect dimensions.

The model that was developed to grade the quality of the data was very subjective. It consisted of assigning weighting factors and summing up the weighting factors to obtain an overall factor that is an index of data quality. The model is included in Appendix A.

Data pooling tests that were coded in the NASA data processing code (reproduced in Appendix B) provided a means for isolating input errors and identifying any data set that may be suspect. The tests are derived from binomial statistics equations which are developed in the next section.

The computer code developed for processing the NDE reliability data is described in Appendix C. Included is a complete description of data input formats and parameter keys.

3.2 Separation and Categorization of Data Sets

The twenty sets of data listed in the Bibliography in Subsection 2.2 can be separated into three categories. Table 3-1 describes the data separated into the three categories and the status of these data sets. The first category is the data that appear to satisfy the criteria discussed in Subsection 3.1, and they will be considered for statistical analysis. There are seven (7) sets of data in this category. The second category is data that probably could be used if permission to use the data is granted by the rightful owner of the data. There are two sets of data in this category. The third category is the data that are either lacking in the inspection procedure documentation or defect dimension documentation. There are eleven sets of data in this category. The data sets in each of the three categories are presented in Table 3-1.

A large majority of the data were obtained on thin flat plates which contain fatigue cracks or weld defects. There are few sets of data that were obtained with relatively complex shaped specimens such as a T, I, or H shape. In order to gain a better understanding of the availability of data on material type, defect type, and specimen complexity, a table (Table 3-2) is constructed to categorize the data sets according to test specimen complexity. Within each data set, a brief description of the material type, NDE methods, and defect type is presented.

The materials and shapes for which valid data were obtained and statistical analysis results are computed are tabulated later in Section V (RESULTS).

Table 3-1 STATUS AND CATEGORY OF DATA
CONSIDERED FOR NDE RELIABILITY ASSESSMENT

Data that satisfy the criteria discussed in Subsection 3.1 and were statistically analyzed	Data that lack owner permission use	Data that were not statistically analyzed due to the lack of sufficient inspection procedure or defect dimension documentation or both
<u>References:</u> 2 3 4 8 10 11 16	<u>References:</u> 5 Pressure Vessel Research Committee approval needed before data can be used 6 Same as 5 above	<u>References:</u> 1 7 9 12 13 14 15 17 18 19 20

Table 3-2 Data Grouping According to Specimen Thickness and Complexity

Flat Plates and Simple Shape	Cylindrical, I, H, T and other Moderately Complex Shapes	Actual Aircraft Structures
References: 1 2219-T87 Al up to 1 cm thick - o Cracks in plates and welded plates - o Ultrasonics, penetrant, eddy current, and X-ray - o Laboratory environment 2 2219-T87 Al up to 1 cm thick - o Fatigue cracks in flat plates - o Ultrasonic, penetrant, eddy current, and X-ray - o Laboratory environment (mostly) 4 2219-T87 Al up to 1 cm thick - o Fatigue cracks in flat plates - o Ultrasonic, penetrant, eddy current, and X-ray - o Laboratory environment (mostly)	References: 3 7075-T6511 Al - o Fatigue cracks in cylindrical tubes - o Ultrasonic, penetrant, and X-ray 4300 V Steel - o Fatigue cracks in cylindrical tubes - o Ultrasonics, penetrant, X-ray, and magnetic particle - o Laboratory environment 10 2024 Al - o Forged defects - o Ultrasonic, penetrant, eddy current, X-ray - o Production environment 4340 M Steel - o Forged defects - o Ultrasonics, penetrant eddy current, X-ray, and magnetic particles - o Production environment - Some grinding cracks and hydrogen embrittlement cracks	References: 11 7178-T651 Al - o Naturally occurring fatigue cracks in bolt holes - o Eddy current - o Laboratory and depot level 13 6Al-4V-Ti and 7075-T6Al - o Fatigue cracks off C-5A Pylon (actual and simulated) - o Ultrasonics and X-ray 14 7075-T6 Al - o Fatigue cracks off C-130 wing boxes (actual and simulated) - o Ultrasonics and eddy current 20 KC-135 lower wing skin panel and laboratory specimens with fatigue cracks under installed fastener - o Ultrasonic - o Laboratory and field environment

Table 3-2 (Continued)

Flat Plates and Simple Shape	Cylindrical, I, H, T and other Moderately Complex Shapes	Actual Aircraft Structure
5 Steel forging up to 25 cm thick - o Induced and naturally occurring defects - o Ultrasonics - o Laboratory environment	15 6Al-4V-Ti - o Induced forging defects - o Ultrasonics, penetrant X-ray - o Most production environment	
6 Steel welded-plates up to 28 cm thick - o Induced weld defects - o Ultrasonics and X-ray - o Laboratory environment	18 D6ac Steel - o Induced forging defects - o Ultrasonics, magnetic particle and rubber - o Production environment	
7 2219-T87 welded plates of 0.62 and 1.25 cm thick - o All types of weld defects - o Ultrasonic and X-ray		
8 2219-T87 Al up to 1 cm thick - o Fatigue cracks in flat plates - o Ultrasonic, penetrant, eddy current, and X-ray - o Production environment (mostly)		
9 2219-T87 and 2014-T6Al up to 2.5 cm thick 6Al-4V-Ti and 5Al-2.5 Sn Ti up to 1½ cm thick o Fatigue cracks in flat plates weld defects in plates		

Table 3-2 (Continued)

Flat Plates and Simple Shape	Cylindrical, I, H, T and other Moderately Complex Shapes	Actual Aircraft Structure
- o Ultrasonic, penetrant, X-ray, and eddy current - o Laboratory environment 12 2219-T87 Welded plates of 1.25 and 2.5 cm thick - o All types of weld defects - o Ultrasonic and X-ray 16 6Al-4V-Ti up to 13 cm thick - o Ultrasonic - o Flat bottom holes and induced defects 6Al-4V-Ti Diffusion Bonded thin plates - o Induced defects - o Penetrant Al Samples - o Fatigue cracks in flat plates - o Penetrant 6Al-4V-Ti - o Fatigue cracks in flat plates - o Penetrant Steel - o Induced weld defects - o Ultrasonics		

Table 3-2 (Continued)

Flat Plates and Simple Shape	Cylindrical, I, H, T and other Moderately Complex Shapes	Actual Aircraft Structure
Al, Ti, and Steel Plates (multiple) - o Cracks in fastener holes - o Eddy current All in production environment 17 Similar to those described in Reference 16 19 o D6ac Steel Plate Delta Scan Ultrasonics		19 o D6ac, 4340, and other Steel Alloys Actual Aircraft Structure Magnetic Particle

IV STATISTICAL DETERMINATION OF NDE RELIABILITY

This section describes the binomial statistical method, cumulative schemes, statistical pooling procedure, and digital computer code for computing NDE reliability.

4.1 Introduction

There are four possible outcomes from any nondestructive inspection of an item: (1) detection of a defect that is present, (2) non-detection of a defect that is present, (3) detection of a defect that is not present (false indication), and (4) non-detection of a defect that is not present. Because of these four possible outcomes, any single inspection may be called a quadrinomial event. Although it is recognized that false indications of defects and true indications of non-defective items (cases 3 and 4) are of practical significance to both the manufacturer and the customer, it is beyond the scope of this investigation to develop a straightforward statistical method for handling the quadrinomial event.

Preliminary indications show that most NDE reliability investigations have neglected to report information concerning either false indications of defects, or true indications that specimens contained no intentionally induced flaws. However, the data input format discussed in the previous section provides for storage of information concerning false indications for future use when more of these data become available.

Cases (1) and (2) involve either a detection or non-detection of a defect that is known to exist. This event can best be described statistically by applying the binomial distribution. The Normal, Chi-square, and Poisson distributions are sometimes used as approximations to the binomial. Their applicability to the problem of NDE reliability is to be considered in the later sections of this report.

4.2 Application of Binomial Distribution

An event that has only two possible outcomes is referred to as a binomial event. Suppose, for example, an experiment in NDE is performed where N specimens, all containing identical

flaws, are routed through an ultrasonic inspection system. Suppose further, that the system capability does not change throughout the entire inspection process, i.e., each specimen is evaluated independently of the others. Let p equal the true, (but as yet unknown) probability of detecting each flaw and $q=1-p$ be the probability of missing each flaw. Assuming p remains the same for all specimens, the random variable X can be defined as being the number of flaws that are detected in any given experiment. X , then, is referred to as a binomial random variable with parameters N and p . Its possible values are $0, 1, 2, \dots, N$. Equivalently, it can be said that X has a binomial distribution. The probability of obtaining any one of the $N+1$ possible values of X from such an experiment is described by the following equation:

$$P(X=n) = \binom{N}{n} p^n q^{N-n}, \quad n=0,1,\dots,N \quad (1)$$

where $\binom{N}{n} = \frac{N!}{n!(N-n)!}$.

The sum of all the possible values for equation (1) is equal to unity and can be written as follows:

$$(p+q)^N = \sum_{n=0}^N \binom{N}{n} p^n q^{N-n} = 1 \quad (2)$$

The probability of detecting n or more flaws can be found by summing equation (1) over all the values of X for which $X \geq n$. Thus,

$$P(X \geq n) = \sum_{i=n}^N \binom{N}{i} p^i q^{N-i}. \quad (3)$$

4.2.1 Confidence Interval Estimates of the True Probability of Detection

The objective is to estimate the true proportion of defects of a particular type and size that can be detected by a given NDE method. The best single estimate, $\bar{p}$, of the true

detectable proportion is the number of flaws detected divided by the total number of flaws present:

$$\bar{p} = \frac{n}{N} \quad (4)$$

If the binomial experiment (N, n_k^*, p) is repeated an infinite number of times and if P_k is computed each time, then the average of all the p_k s will be equal to p . So $\bar{p}$ is an unbiased estimator of the true probability of crack detection.

Since the probability is small that $\bar{p}$ will exactly equal p on any specific replication of the experiment, an interval estimator that will contain p most of the time is considered useful. A lower one-sided confidence interval can be used to estimate a lower bound on the true probability of crack detection. The lower bound, p_1 , for n detections of N cracks is computed as follows:

$$\text{Solve } \alpha = \sum_{i=n}^N \binom{N}{i} p_1^i (1-p_1)^{N-i} \quad (5)$$

for p_1 , where

$$\alpha = 1 - G \quad (6)$$

The following interpretation can be given for a 100G percent lower binomial confidence interval. If the binomial experiment (N, n_k, p) is repeated many times (theoretically infinite), and if p_{1k} is computed each time, then 100G percent of these lower confidence intervals will be equal to or lower than p . Thus, there is 100G percent "confidence" that the lower bound, p_1 , computed for any specific binomial experiment will be less than or equal to the true probability of crack detection. The choice of G is arbitrary and depends on how sure one needs to be that the true probability of detection is in the interval from p_1 to 1, (the larger the value of G , the smaller the calculated lower bound p_1 will be).

* n_k is the number of successes in the K^{th} replication of a binomial experiment consisting of N measurements.

4.2.2 Sample Size Determination

The objective is to determine the sample size required to estimate the lower confidence limit and confidence level. This can be accomplished by utilizing equation (6). By specifying the confidence level, G , and the lower confidence limit p_1 , a set of values (which must be integers) can be computed for N and n . Each combination of N and n in this set indicates the number of inspections and the number of detections required to achieve the specified probability of detection (POD) at the stated confidence level. For example, if G and p_1 are chosen to be 0.95 and 0.9 respectively, equation (5) becomes

$$0.95 = 1 - \sum_{i=n}^N \binom{N}{i} (0.9)^i (0.1)^{N-i}. \quad (7)$$

One of the combinations of N and n is 29 and 29 respectively. This represents the smallest sample size that can be utilized to meet the minimum specified values for G and p_1 . The next smallest sample size is $N=46$. In this case n must equal at least 45 to achieve 90% probability of detection at 95% confidence level. The higher the reliability requirements, of course, the larger the sample size required.

Equation (5) can also be used to calculate the number of added NDE tests required to upgrade an existing batch of data in the hope of achieving higher reliability estimates. Equation (5) takes on the form

$$1-G = \sum_{i=n+\delta-\epsilon}^{N+\delta} \binom{N+\delta}{i} p_1^i (1-p_1)^{N+\delta-i} \quad (8)$$

where δ is the required number of additional tests and ϵ is the maximum number of additional misses (nondetections). For example, if an experiment consisting of 29 inspections and 28 detections was performed, the reliability (equation 5) is 90% probability of detection at 80% confidence level. If a 95% confidence level is desired, the additional data requirements are indicated by equation (8). Thus, $\delta = 17$ with $\epsilon = 0$ represents the minimum added sample required to upgrade the existing data.

4.3 Comparison of Alternative Statistical Procedures

Table 4-1 lists the probability of detection at the 95% confidence level for four commonly used probability analysis methods, (Binomial, Normal, Poisson, and Chi-Square). The comparison is on the basis of 30 trials with 10, 15, 20, 25, 29 and 30 detections. The Binomial gives the exact results. The Normal approximation gives confidence values greater than the Binomial for large successes (30/30), and very nearly equal to the Binomial for intermediate successes (15 or 20/30). The Poisson approximation gives values less than the Binomial method. It is a good approximation only for cases with large number of trials with small number of successes. For 30 trials, the Chi-Square method gives values less than the Binomial for 10 to 30 successes. Like the Poisson, the Chi-Square values approach those of the Binomial for less than 10 successes in 30 trials.

However, a closer approximation to the Binomial for both the Poisson and Chi-Square can be achieved by using a conditional approach. By first calculating the upper one-sided confidence limit for the probability of missing a flaw (q_p), the lower one-sided confidence limit for $P_1 = 1 - q_p$ can then be approximated when $1 - n < n$. By using this conditional approach, a new set of values is calculated and included in Table 4-1 under the conditional approach column. These new values give a much better approximation to the Binomial when the number of successes is high.

Since the Poisson and Chi-Square approximations yield almost the same values, only one set of values was calculated under the new conditional approach.

For larger or smaller number of trials, the above comparisons is not necessarily true but the comparison generally shows the importance of analyzing binomial measurements with binomial statistics.

Table 4-1 Comparison of Probability of Detection
Values Obtained by Approximation to the
Binomial Distribution

NUMBER OF SUCCESSFUL DETECTIONS IN 30 TRIALS	POINT ESTIMATE OF PROBABILITY OF DETECTION ($\bar{p}$)	LOWER ONE SIDED CONFIDENCE LIMITS AT 95% CL				CONDITIONAL APPROACH
		BINOMIAL (Exact)	NORMAL	POISSON*	CHI-SQUARE*	
10	0.333	0.193	0.192	0.181	0.181	0.181
15	0.500	0.339	0.350	0.308	0.308	0.308
20	0.667	0.501	0.525	0.441	0.442	0.435
25	0.833	0.681	0.721	0.578	0.579	0.650
29	0.967	0.851	0.913	0.691	0.691	0.842
30	1.000	0.905	1.000	0.715	0.720	0.900

*No conditional information was used in obtaining these numbers, see "Reliability
Management Methods and Mathematics," Lloyd and Litow, Prentice Hall, 1962, pp. 218-219

4.4 Data Cumulation Methods

The calculated value for the lower confidence limit (probability of detection, p_1 , at some selected confidence level, CL) is influenced by the total number of measurements (sample size). In order to achieve a high POD at a high CL, such as 90% at 95% confidence level, a minimum of 29 measurements have to be made without a miss for a given flaw size. Because of the high costs involved, it is generally not economical to make 29 or more measurements for each flaw size for the entire range of flaw sizes of interest. At the same time, in the inspection of actual structural components, it is unlikely to have 29 or more measurements at any specific flaw size. As a result, size interval grouping has been used in order to obtain a sufficient number of measurements to compute a high p_1 at a high CL and to smooth over the flaw sizes that have no measurements. A cumulation plan permits the accumulation of data over a range of flaw sizes for computing a p_1 which is representative of that range.

Several cumulation procedures were considered. These procedures include (1) the range interval "RI", (2) the overlapping 60 points "OSP" and (3) the procedure developed under this contract which will be called the optimized probability method "OPM." Other procedures evaluated are reported in Reference 1. For the same set of data, the computed p_1 can be considerably different depending on which of these cumulative procedures is used. Generally, NDE reliability is demonstrated by inspecting specimens containing flaws distributed uniformly over a wide flaw size range. The smallest flaws should be virtually nondetectable and the largest flaws should be 100% detectable. First, the raw data set is arranged in order of increasing flaw size with the appropriate outcome indicated for each measurement. The various cumulative procedures are applied as follows:

(a) Range interval method. The data are separated into groups of equal flaw size increments. The probability of detection at the one sided lower confidence limit is computed for each group separately and plotted as a histogram bar. A conservative p_1 curve can be obtained by connecting the upper right hand corner of the bars. This procedure is most appropriate for computing probabilities of detection and confidence limits when large numbers of data are available so that all histogram bars represent large data samples. It is important to note that sample size (N) may vary widely between intervals.

(b) Overlapping sixty point method ($N = 60$). One begins by combining detection results for the largest sixty crack sizes. The POD is calculated for this interval and plotted at the largest flaw size within the size range spanned. The next data increment is obtained by starting at the median flaw size of the first interval and combining the data for the next smaller 60 cracks. The POD of the second set is plotted at its largest flaw size and the process is repeated until all data have been combined. Each interval overlaps its adjacent interval by 30 data points. Note that the sample size is the same for each interval, but the breadth of the interval can vary widely.

(c) Optimized Probability Method. The ordered NDE data are grouped into J (a computer input number) intervals of successively increasing size range. The POD of the largest size range is computed at some desired confidence level. The next smaller size range data are combined with the first and the POD of the second grouping is computed. This process is continued until J probabilities of detection are computed, and the largest value of POD obtained is plotted at the largest flaw size contained in the corresponding composite grouping. The largest flaw size interval is removed from consideration and this procedure is repeated starting from the next to largest flaw size grouping. The pattern is repeated until J probability of detections can be plotted. Note that if J is sufficiently large, the POD curve produced by this method will be the upper envelope of either the RI or the OSP method. The advantage to this method is that the sample size (N) is maximized, and results in the maximum possible value of p_1 for the available data. A basic assumption is that the larger the flaw, the more detectable it is.

V. RESULTS

Of the twenty sets of data collected, only seven sets were statistically analyzed. These seven sets appeared to meet the criteria stated in Section III of this report. Each of these seven sets, in turn, was subdivided into subsets and analyzed according to the NDE method and material types. Appendix D contains a computer listing of NDE data and detection reliability results that were analyzed during this program. Table 5-1 summarizes the results of the statistical analysis. There is a total of one hundred and twelve subsets and the subset number is given in the first column of Table 5-1. The second column gives data source. The third and fourth columns identify the material and defect type respectively. The fifth and sixth columns identify the specimen geometry and NDE method respectively. The seventh column lists some of the pertinent parameters, and the eighth column gives the crack length at which 90% probability of detection at 95% confidence level $POD_{90}(CL_{95})$ was first achieved. The shortest crack length that reached $POD_{90}(CL_{95})$ by either the OPM or OSP scheme was used and is herein referred to as the threshold level. In many instances, the $POD(CL_{95})$ became smaller than 90% at crack lengths above the threshold level. This is particularly true for the OSP scheme (see Appendix D). For more details on the NDE parameters and inspection procedures that were used to acquire each set or subset of data, one has to refer to the original data reference.

The first set of data analyzed is from Martin Marietta (Contract NAS 9 12276). Four subsets, one by ultrasonic surface wave, one by penetrant, one by eddy current, and one by the X-ray method, were available before the specimens were chemically etched and another four subsets were available after chemically etching the test specimens.

The second and third sets of data analyzed are from Rockwell International-Space Division (Contract NAS 9-14000) and General Dynamics, Convair Aerospace Division (Contract NAS 9-12326). This set of data includes data from Contract NAS 9-12276 with the specimens in the "after-etched" condition.

TABLE 5-1 SUMMARY OF NDE DATA STATISTICALLY ANALYZED

CAUTION: The crack lengths in the POD90(CL95) column are not intended to be used for design purposes unless the user demonstrates a similar capability

DATA SUB-SET	DATA SOURCE	MATERIAL TYPE	DEFECT TYPE	SPECIMEN GEOMETRY	NDE METHOD	PERTINENT PARAMETERS	CRACK LENGTH cm
1	Martin Marietta NAS 9 12276	2219-T87 A1	Fatigue Cracks	Flat Plates	Ultrasonic- Surface Wave	Before Etch, and with 3 Ops; 10 MHz	POD90 (CL95) .345
2					Liquid Penetrant	Same as above, Uresco P151, K410, D499C	.665
3					Eddy Current	Same as above; NDT-3; 100KHz	.274
4					X-ray	Same as above	-
5					Ultrasonic- Surface Wave	After Etch, and with 3 Ops.	.211
6					Liquid Penetrant	Same as above	.274
7					Eddy Current	Same as above	-
8					X-ray	Same as above	.665
9	Rockwell Inter. Space Div. (NAS9- 14000); Martin Marietta, and GD Convair	2219-T87	Fatigue Cracks	Flat Plates	Ultrasonic- Shear Wave (Surface Wave) f = 2.25 MHz for RI-SD f = 10 MHz for GD Convair	After Etch, and by Operator O Operator P Operator Q Operator R Operator S	.737 .221 .699 .699 .358
10					Liquid Penetrant	After Etch, and by	.282
11					P-133, D495A	Operator H	.737
12					for RI - SD	Operator I	.737
13						Operator J	.333
14						Operator K	.737
15						Operator L	.340
16						Operator M	1.36
17						Operator N	.665
18						After Etch, and by	.201
19					Eddy Current	Operator T	-
20					Defectometer Model 2.154 f = 2 MHz for RI - SD	Operator U	.333
21						Operator V	.320
22						Operator W	
23						Operator X	
24							
25							

*Data Set Numbers are Included on the Corresponding Computer Output in Appendix D.

TABLE 5-1 SUMMARY OF NDE DATA STATISTICALLY ANALYZED (Continued)

DATA SUB-SET	DATA SOURCE	MATERIAL TYPE	DEFECT TYPE	SPECIMEN GEOMETRY	NDE METHOD	PERTINENT PARAMETERS	CRACK LENGTH cm
26					X-ray	After Etch and by Operator A	POD90 (CL95)
27						Operator B	-
28						Operator C	-
29						Operator D	-
30						Operator E	.737
31						Operator F	-
32						Operator G	-
33	RI-SD, Martin Marietta, & GDC	2219-T87 A1	Fatigue Cracks	Flat Plate	Ultrasonics	After Etch and Merged Results of 5 Operators	.201
34					Liquid Penetrant	After Etch and Merged Results of 7 Operators	.237
35					Eddy Current	After Etch and Merged Results of 5 Operators	.282
36	RI-B-1 Division (TFD-72-925)	Ti-6Al-4V	Fatigue Cracks	Flat Plate	Liquid Pene.	Used P5F-1 Penetrant	.183
37	(TFD-72-1005)					Used P5F-2	.170
38	(TFD-72-1515)					Used P5F-2 and D100 Developer	.178
39	(TFD-72-793)					Used P5F-2.5	.127
40	(TFD-72-767)	7075-T6511 A1	Fatigue Cracks	Flat Plates		Used P5F-2.5	.173
41	(TFD-73-532)					Used P5F-2.5, NQ-1	.203
42	(TFD-73-532)					Used P5F-2.5, D100	
43	(TFD-73-496)	PH13-8 Mo. St.	Fatigue Cracks	Flat Plates		Used P5F-2 and NQ-1 Developer	
44	(TFD-73-371)	Ti-6Al-4V	Fatigue Cracks Corroded	Welded Flat Plates	Ultrasonic, Shear Wave		.173
45	(TFD-73-372)	4330V St.				Simulate Welded Flaws	.211
46	(TFD-73-140)	PH17-4 St.				Simulate Flaws in Wrought St.	.218
47	(TFD-72-768)	PH17-4 St.	Fatigue Cracks	Flat Plates			-
48	RI-SD, MM, GDC, and RI-B1	2219-T87 and 7075-T6511 A1	Fatigue Cracks	Flat Plates	Liquid Penetrant	Merged Results from the Four Data Source on A1	.241

TABLE 5-1 SUMMARY OF NDE DATA STATISTICALLY ANALYZED (Continued)

DATA SUB-SET	DATA SOURCE	MATERIAL TYPE	DEFECT TYPE	SPECIMEN GEOMETRY	NDE METHOD	PERTINENT PARAMETERS	CRACK LENGTH cm
49 50	Lockheed GA (TR-68-32)	4330V St.	Fatigue Cracks	Cylindrical Shell	Liquid Penetrant	Laboratory Condition	-
51		7075-T6511 A1		7.62 cm in dia.	Magniflux ZL-2, ZE-3, and ZP-4	Production Condition	-
52		4330V St.		0.64 cm thick	Mag. Particle	"	-
53		4330V St.			Ultrasonic	"	-
54		7075-T6511 A1			Shear Wave 5 MHz	"	-
55		7075-T6511 A1			Ultrasonic	"	-
56		4330V St.			Shear Wave	"	-
					X-ray	"	-
					X-ray	"	-
57	Boeing, W.Kan.	7178-T651 A1	Fatigue Cracks	KC-135 Wings	Eddy Current	Hand Held E.C. Probe at Tear Down Insp. at Depot Level	-
58						Results of Team 2 (Atypical of 3 more teams)	-
59						Results of Team 4 (A- typical)	-
60	Boeing Comm.	2024-T6 A1	Forge Closed	Tandem T	Liquid Penetrant	Merged results of 5 teams Production Insp.	-
61	Airplane Co.	4340 M St	"	Solid Cyl., Threaded	ZL-2A and 30A;	"	-
62	(TR-74-241)	"	"	Hollow Cyl.,	ZE-4B;	"	-
63		"	"	Fillieter	ZP-9B	"	-
64		"	"	Hollow Cyl.,	Plus Others	"	-
65		2074-T6 A1	"	Solid Cyl. Tandem T	Liquid Penetrant	Laboratory Insp.	.178

TABLE 5-1 SUMMARY OF NDE DATA STATISTICALLY ANALYZED (Continued)

DATA SUB-SET	DATA SOURCE	MATERIAL TYPE	DEFECT TYPE	SPECIMEN GEOMETRY	NDE METHOD	PERTINENT PARAMETERS	CRACK LENGTH
66		4340 M St	Forged Closed	Solid Cyl., Threaded	ZL-2A and 30A;	Laboratory Insp.	.584
67		"	EDM, Slots	Hollow Cyl., Filletted	ZE-4B;	"	.787
68		"	"	Hollow Cyl.,	ZP-9B;	"	-
69		"	"	Solid Cyl., Fil.	Plus Others	"	.229
70		"	"	"	Ultronics	"	.406
71		2024-T6 Al	"	Tandem T	Ultronics	Production Insp.	.533
72		4340 M St.	"	Solid Cyl. Threaded	5 and 10 MHz	"	-
73		"	"	Hollow Cyl. Filletted	Shear and Surface	"	.330
74		"	"	Hollow Cyl.	Wave	"	-
75		"	"	Solid Cyl., Filletted	"	"	.178
76		"	"	"	"	"	.356
77		"	"	Solid Cyl.	Ultronics	Laboratory Insp.	.356
78		"	"	"	Filletted 5 and 10 MHz	"	.229
79		"	"	Hollow Cyl.	Shear and Surface	"	.254
80		"	"	"	Filletted Wave	"	.330
81		2024-T6 Al	"	Tandem T	"	"	.432
82		4340 M St.	"	Solid Cyl.	X-ray	Production Insp.	-
83		"	"	"	Filletted	"	-
84		"	"	Hollow "	"	"	-
85		"	"	"	"	"	-
86		"	"	Solid ", Threaded	"	"	-
87		2024-T6 Al	"	Tandem T	"	"	-
88		4340 M St	"	Solid Cyl.	X-ray	Laboratory Insp.	-
89		4340 M St	"	Hollow ", Filletted	"	"	-
90		"	"	Solid ", Filletted	"	"	-
91		"	"	Hollow ",	"	"	-

TABLE 5-1 SUMMARY OF NDE DATA STATISTICALLY ANALYZED (Continued)

DATA SUB-SET	DATA SOURCE	MATERIAL TYPE	DEFECT TYPE	SPECIMEN GEOMETRY	NDE METHOD	PERTINENT PARAMETERS	CRACK LENGTH Cm POD90(CL95)
92		2024-T6 A1		Tandem T			.279
93		4340 M St.	Forge	Solid Cyl.	Mag. Particle	Production Insp.	.305
94		"	Closed	" " , Filletted			.330
95		"	EDM Slots	Hollow "			-
96		"	"	" " , Filletted			-
97		"	"	Solid " , Threaded			-
98		"	"	Solid Cyl.	Mag. Particle	Laboratory Insp.	.305
99		"	"	Hollow " , Filletted			.329
100		"	"	Solid " , Threaded			-
101		"	"	" " , Filletted			.178
102		"	"	Hollow "			.254
103		"	"	Solid Cyl.	Eddy Current	Production Insp.	.400
104		"	"	" " , Filletted ED400 and 520			.762
105		"	"	Hollow Cyl.	at f=100 KHz		-
106		"	"	" " , Filletted			-
107		2024-T6 A1	"	Tandem T			.330
108		"	"	Tandem T	Eddy Current	Laboratory Insp.	.457
109		4340 M St.	"	Solid Cyl.	ED400 and 520		.508
110		"	"	Hollow Cyl., Fil. at f=100 KHz			.356
111		"	"	Solid " , Filletted			.584
112		"	"	Hollow Cyl.			-

There are five subsets of data obtained with the ultrasonic method, each subset for a different inspector, three inspectors for Contract NAS 9-12276, one for NAS 9-14000, and one for NAS 9-12326. There are seven subsets of data obtained with the liquid penetrant method, each subset by a different inspector, three inspectors for NAS 9-12276, three for NAS 9-14000, and one for NAS 9-12326. There are five subsets of data obtained with the eddy current method, each subset by a different inspector, three inspectors for NAS 9-12276, one for NAS 9-14000, and one for NAS 9-12326. There are seven subsets of data obtained with the X-ray method, each subset by a different inspector: three inspectors for NAS 9-12276, three for NAS 9-14000, and one for NAS 9-12326. Subsets 33, 34 and 35 were obtained by merging the data of five ultrasonic inspectors, seven penetrant inspectors, and five eddy current inspectors. The X-ray data were not merged because the results are not worthy of further consideration.

The fourth set of data analyzed is from Rockwell International B-1 Division, B-1 NDI Demonstration Program. There were twelve subsets of data in this set. The fifth set of data analyzed is from Lockheed, Georgia, AFML Report No. TR-68-32. There are eight subsets in this data set. The sixth set of data analyzed is from Boeing Company of Wichita, Kansas. This set of data was obtained from eddy current inspection of bolt holes, after pulling off the bolts, from actual aircraft parts.

The seventh set of data analyzed is from the Boeing Commercial Airplane Company, AFML Report No. TR-74-241. There are fifty-three subsets in this set of data.

Data subset number 48 was obtained by merging the data from Martin Marietta (NAS 9-12276), Rockwell Int.-Space Division (NAS 9-14000), General Dynamics' Convair Division (NAS 9 12326), and Rockwell Int.-B-1 Division for aluminum for the liquid penetrant method.

All the data described in this report were taken from a total of nine alloys of aluminum, titanium, and steel. These alloys are described in Table 5-2. The predominant amount of data were taken with the four aluminum alloys.

Table 5-2 Alloys with Valid Data

<u>Aluminum</u>	<u>Steel</u>	<u>Titanium</u>
2219-T87	PH13-8MO	6Al-4V
7075-T6511	4330V	
2024-T6	PH17-4	
7178-T651	4340M	

VI. DISCUSSION OF RESULTS

The tabulated and graphical computer output format (Appendix D), is convenient for assessing the state-of-the-art in NDE reliability. It contains:

- (1) the binomial experiment results (N,n) in each of 32 crack size intervals (tabulated in units of Mils and plotted in both Mils and cm.);
- (2) the 50 percent lower confidence limit for each interval $POD(CL50)$
- (3) the 95 percent lower confidence limit $POD(CL95)$; and
- (4) the number of new measurements required in each interval to demonstrate a 90 percent probability of detection at a 95 percent confidence level " $POD90(CL95)$ ".

These data are useful for comparing the effects of material, inspector, and inspection parameters on NDE reliability and seeing where data deficiencies lie.

As can be seen in Figure D-1a the POD fluctuates widely throughout 32 ranges for this set of data because of the variation in the number of measurements, N , reported in each range. Twenty of the ranges contain less than 29 measurements while six ranges contained no measurements at all. The number of measurements per range can be increased by broadening the flaw size interval per range, but there is still no assurance that all of the broader ranges will contain measurements. Fluctuation in the probability of detection due to the variation in the number of measurements in a range is a shortcoming of the range interval method.

Figure D-1b shows the tabulated and graphic results obtained by using the optimized probability method (OPM) for the set of data in Figure D-1a. As can be seen, the number of measurements available for each interval is much larger than for the range scheme. The thirty-first interval lists 183 detections out of 183 measurements resulting in a POD of 98% plotted at 1.18 cm. The POD computed with the OPM increases monotonically with increasing crack length and does not fluctuate as in the range scheme. The POD at 95% CL reaches 89% for the first time at .32 cm for the OPM versus .358 cm for the range scheme.

Figure D-1c shows graphic and tabulated results using the overlapping 60 points scheme. In this scheme, the number of measurements for each POD calculation is constant (60). Fluctuation in the POD can be attributed primarily to human operator and inspection process variations. The POD at 95% CL reaches 89% for the first time at .328 cm, which is intermediate between the OPM and the RI results.

6.1 Effects of Material, Source, and Inspection Parameters

It is apparent from data subsets 1 through 8 in Table 5-1 that the sensitivity is increased for ultrasonic, liquid penetrant, and X-ray techniques after the test specimens were chemically etched. This increase is reasonable since the crack openings are enlarged. The sensitivity is decreased, however, for eddy current method after chemically etching the specimens. This effect is difficult to explain.

Data subsets 9 through 32 show that the difference in the POD90(CL95) obtained by different inspection operators within a company vary as much as those obtained by companies which use different inspection parameters and procedures. Several observations can be made with subsets 9 - 14:

(1) Operators P and S in subsets 10 and 13 can be considered to be model operators. Not only did they achieve a smaller POD90(CL95) threshold level than other operators, they were able to maintain the POD(CL95) at a relatively constant (and high) level for crack lengths above the threshold level (Figures D-10 and D-13). (2) Subsets 10 and 13 show that the sensitivity of the ultrasonic method increases or remains constant for increasing crack length, particularly for crack lengths above the threshold level. (3) Fluctuations in the POD(CL95) for crack lengths above the threshold level are primarily caused by fluctuations in operator efficiency and less likely by the sensitivity of the NDE method.

Subsets 14-20 (Figures D-14 to D-20) show more fluctuation in the POD(CL95) due to variation in operator efficiency than to types of penetrant or procedures used by the three different companies that made the measurements. There is a large variation in the threshold level of the seven operators. Three operators demonstrated threshold levels around .33 cm, another three demonstrated the level at .737 cm, and the seventh one demonstrated it at 1.35 cm. One should keep in mind that most of these POD (CL95) curves are relatively flat and the POD(CL95) is greater than 80% from .254 cm on to the longer crack length.

Like the ultrasonic and penetrant results, the eddy current results showed considerable differences in the threshold level for the five different operators. In fact Operator V did not demonstrate POD90(CL95). However, he did demonstrate POD88(CL95) at a crack length of .737 cm. Operator T demonstrated POD90(CL95) at a crack length of .665 cm. However, he reached POD88(CL95) at a crack length of .399 cm.

X-ray is not a good inspection technique for reliably detecting fatigue cracks. Data sets, 26 to 32 show that only one operator can achieve POD90(CL95). This forecasts that X-ray techniques will not be viable procedures for detecting fatigue cracks. However, this does not necessarily mean that the technique should not be used to detect other defects such as porosity.

Merging data provides a means for observing overall detection reliability trends. When the data for five ultrasonic operators were merged (subset No. 33) and calculated with the OSP scheme the POD(CL95) reached 95% at a crack length of 0.66 cm (see Figure D-33c). However, it fell below 95% at higher crack length, and it reached a minimum of 79% at a crack length of 0.810 cm. When the results of seven penetrant operators were merged (subset No. 34) and calculated with the OSP scheme, the POD(CL95) reached 92% at a crack length of 0.26 cm (see Figure D-34c), but it fell below 90% between 0.26 cm and 0.63 cm. It peaked to 95% at 0.65 cm, then fell below 90% and reached a minimum of 81% at a crack length of 1.12 cm. When the results of five eddy current operators were merged (subset No. 35) and calculated with the OSP scheme, the POD(CL95) reached 92% at a crack length of 0.32 cm (see Figure D-35c). But like the ultrasonic and penetrant results, the POD(CL95) for the eddy current fell below 90% at higher crack length and it reached a minimum of 81% at 0.88 cm.

Data subsets 36 through 47 (Figures D-36 to D-47) are from the B-1 NDI demonstration program. These data show that the POD(CL95) either increases monotonically or remains constant with increasing crack length once the threshold level is reached. In several data sets no further measurements were made once the desired threshold level was demonstrated. It is interesting that the threshold level as well as a large portion of the POD(CL95) curve does not differ greatly for several types

of penetrant applied to materials such as Ti-6Al-4V, 7075-T6511 Al, PH 13-8 Mo steel, 4330V steel, and PH 17-4 steel.

Data subset 48 represents the merged results of four data sources (RI-Space Division, Martin Marietta, General Dynamics Convair, and RI-B-1) on 2219-T87 Al by the liquid penetrant method on flat plates.

Data subsets 49 through 56 were obtained with fatigue cracks in 4330V steel and 7075-T6511 Al having a cylindrical shape (7.62 cm in diameter and .62 cm thick). Data were taken in both the laboratory and production environments. None of the curves for these 8 sets of data attained POD90(CL95), however, the penetrant results for 7075-T6511 Al did demonstrate POD87(CL95) at a crack length of 1.0 cm, POD87(CL95) at a crack length of 1.17 cm, and POD89(CL95) at 1.47 cm. The POD for ultrasonic shear wave reached a value of POD86(CL95) at a crack length of .80 cm and POD87(CL95) at a 1.27 cm.

Data subsets 57, 58, and 59 were obtained with eddy current inspection of bolt holes during tear-down inspection of KC-135 wings at the depot level. The same holes were inspected by five separate inspection teams. The inspection results from four of the five teams were about the same. Figure D-57 shows the results of team number two which is representative of the four teams. Figure D-58 shows that the detection reliability of team number four is considerably different than the other four teams. Figure D-59 shows the merged results of the five teams. None of the five teams achieved POD90(CL95).

Data subsets 60 through 112 (Figures D-60 to D-112) were obtained from the Practical Sensitivity Limits program which was conducted by Boeing Commercial Airplane Company and supported by the NDE Branch of Air Force Materials Laboratory. The inspection results were obtained in both the laboratory and production lines of several Boeing Divisions. Divisions used different NDI procedure or specification, as well as different NDI techniques. For example, ultrasonic shear and surface waves of 5 and 10 MHz were used, different liquid penetrant systems in either the Group V or VI category were used, etc. Because the results were obtained under different NDE procedures, it is difficult to make comparison between results from different data sources. Furthermore, the majority of the defects used in this program were forging cracks instead of fatigue cracks, nevertheless the length of the crack at POD90(CL95) found by each of the NDI techniques is comparable, in most cases, to those found at other companies using fatigue cracks.

6.2 Statistical Analysis Procedures

All NDE measurements are considered to be binomial and describable by binomial distribution functions and binomial statistics. Because of this consideration, lower one sided confidence limits and data deficiencies can be rigorously computed.

The only factor which reduces mathematical rigor is the crack length parameter. It is necessary to group NDE data into a size interval that will contain a population of 29 successes without a miss in order to show 95 percent confidence that the probability of detection exceeds 90 percent. If a miss is encountered, it is necessary to have a higher population (see Table 6-1) in order to demonstrate POD90(CL95).

Table 6-1

Interval Sample Size and
Successes Required to Achieve POD90(CL95)

No. of Misses	Interval Population Required, N	No. of Successes, n
0	29	29
1	46	45
2	61	59
3	76	73
4	89	85
5	103	98
6	116	110
7	129	122
8	142	134
9	154	145
10	167	157

Once an acceptable size interval has been chosen that will produce a reasonable population, there remains a problem of selecting the crack length within the range at which to plot the computed POD(CL95). For conservatism, the POD curves in this report are plotted through the maximum crack length in the interval. The crack interval is also indicated by a horizontal line connecting maximum and minimum crack sizes.

Three procedures for determining the probability of detection for the lower one-sided confidence level are compared in this report. Described earlier in Section 4.3, they were the range interval (RI) method, the optimized probability method (OPM) and the overlapping sixty point method (OSP). The optimized probability method is preferred over the RI or OSP but requires more computational time. The main claim to success for the OSP method is that it forces groupings to be large enough to provide the capability for achieving POD95 (CL95). The OPM should provide the upper envelope to both the RI and the OSP methods.

6.3 Data Deficiencies

The data described in this report represents more than 30,000 measurements, yet there are many gaps in the probability of detection for different defect types, material types, and specimen geometry by the five NDE methods (ultrasonics, liquid penetrant, eddy current, X-ray, and magnetic particle). The most data are available for fatigue cracks in flat plates of 2219-T87 aluminum which reasonably characterize the reliability of all five NDE methods. There are also several sets of data for fatigue cracks in aluminum cylinders, forging cracks in extruded aluminum (tandem T configuration), and fatigue cracks in bolt holes of actual aluminum aircraft parts. There is a notable data deficiency for steel. Most of the steel data are for fatigue and forged cracks in cylinders. There are, however, four sets of data for fatigue cracks in flat plates of steel. Only five sets of data are available for titanium and all of them were taken on flat plates.

With the exception of the B-1 NDE demonstration data most of the data exhibit a gap over some range of the crack lengths. A perfect example of this is the data from Martin Marietta, Rockwell International-Space Division, and General Dynamics-Convair Division. All these three companies made measurements using the same set of specimens which contains two gaps. As can be seen from the crack size distribution curve in Figure 6-1, there are no cracks with length between 0.47 to 0.59 cm and between 1.03 to 1.17 cm. Thus, no cracks can be detected in these two gaps and the probability of detection, regardless of which cumulative scheme is being used, is affected. A set of specimens without gaps in the crack size distribution curve is needed to study the actual probability of detection in future programs.

6.4 Application to Fracture Mechanics

The threshold crack length (the shortest crack length that reached to POD90(CL95)) that was detected by the different NDE techniques is given in Table 5-1. However, as can be seen from the curves in Appendix D, the POD (CL95) in many instances falls below 90% for some crack length longer than the threshold level. Thus the potential user is cautioned against using these threshold crack lengths in the design process. In the first place, the POD can vary from company to company even when the same inspection procedures were used because of training procedures and using different inspectors. In the second place, some of these POD curves do not have a zero or positive slope for crack length above the threshold level. The decrease in the POD above the threshold level could be a real phenomenon and might not necessarily be attributed to human factors. There are scatter reports, in the case of liquid penetrant, that indicate penetrant washes out of wide cracks before the developer is applied.

In the fracture mechanics design process, one must be assured with some probability at some confidence level that no cracks larger than the assumed size can be present in the structure. Thus, for fracture mechanics to be a viable design process, the probability of detection as a function of crack length must be monotonically increasing or at least levels off above some selected threshold crack length.

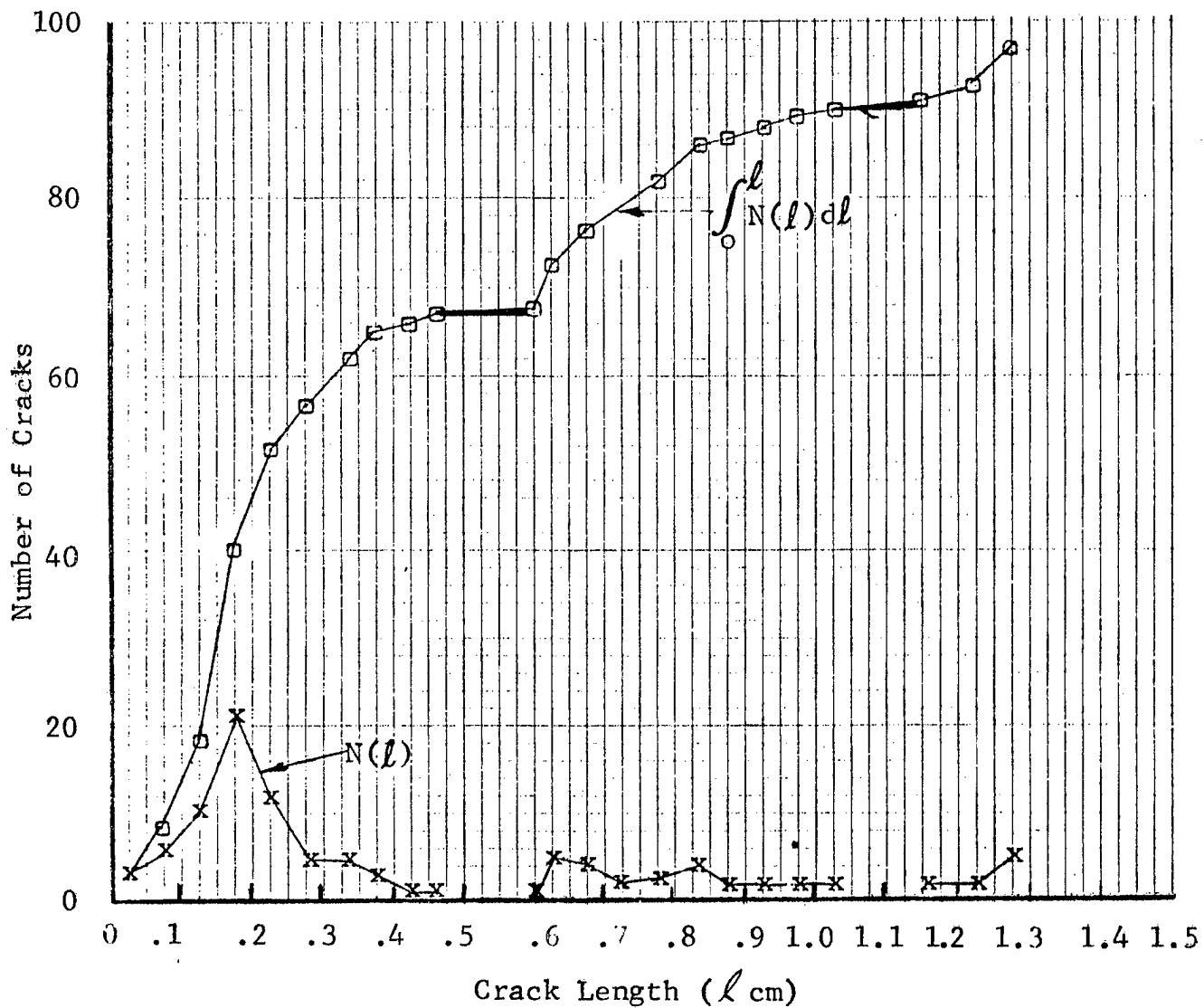


Figure 6-1 Differential and Integral Crack Distribution Function for the Martin Marietta Demonstration Program. 2219-T87.

6.5 Optimum Demonstration Program

In order to determine the reliability of an NDE technique without operator influence, the optimum demonstration program will have to employ computer automation in scanning specimens and interpreting NDE signals. It should incorporate ultrasonic, eddy current and penetrant inspection into each demonstration program.

The data in this report can be used to estimate the sample size required for the optimum demonstration program. For example, if one can afford to test 100 specimens and requires a 50-50 chance of success in demonstrating POD90/CL95 then one would have to select a data set representative of this expected capability and select a crack length for his demonstration program for which the probability of detection is at least 95%. If he can afford only 45 specimens then he must choose a crack length for which the probability of detection is at least 98%. This can be seen in Figure 6-5 where number of misses corresponding to POD90(CL95) is plotted against the number of specimens tested. The shaded region is the region of success for which POD 90(CL95) has been met or exceeded. The broken lines show the number of failures expected for various values of POD (98, 95, 94, 93, 92, and 90%).

Assume that data set # 1 (Figure D-1) is for a geometry and NDE method that is most representative of those required in a demonstration program. These data demonstrate a POD(CL95) at .345 cm. Figure D-1a would lead one to believe that POD 90(CL95) might be demonstrated at about .27 cm for which 38 out of 39 cracks were detected. Figure D-1a shows that one can be 50 percent confident that the probability of detection exceeds 95% for this case if his NDE techniques are as good as those used to produce data set # 1. Figure 6-2 shows that if 110 test cracks were fabricated and tested and that less than 5 cracks were missed, then the demonstration program would be successful.

The previous example is indicative of the usefulness of these data as a means for minimizing the number of specimens required for achieving a successful demonstration program. The common practice of manufacturing a large number of crack specimens for which there is little chance to achieve POD 90(CL95) will be eliminated by this approach to designing an optimum demonstration program.

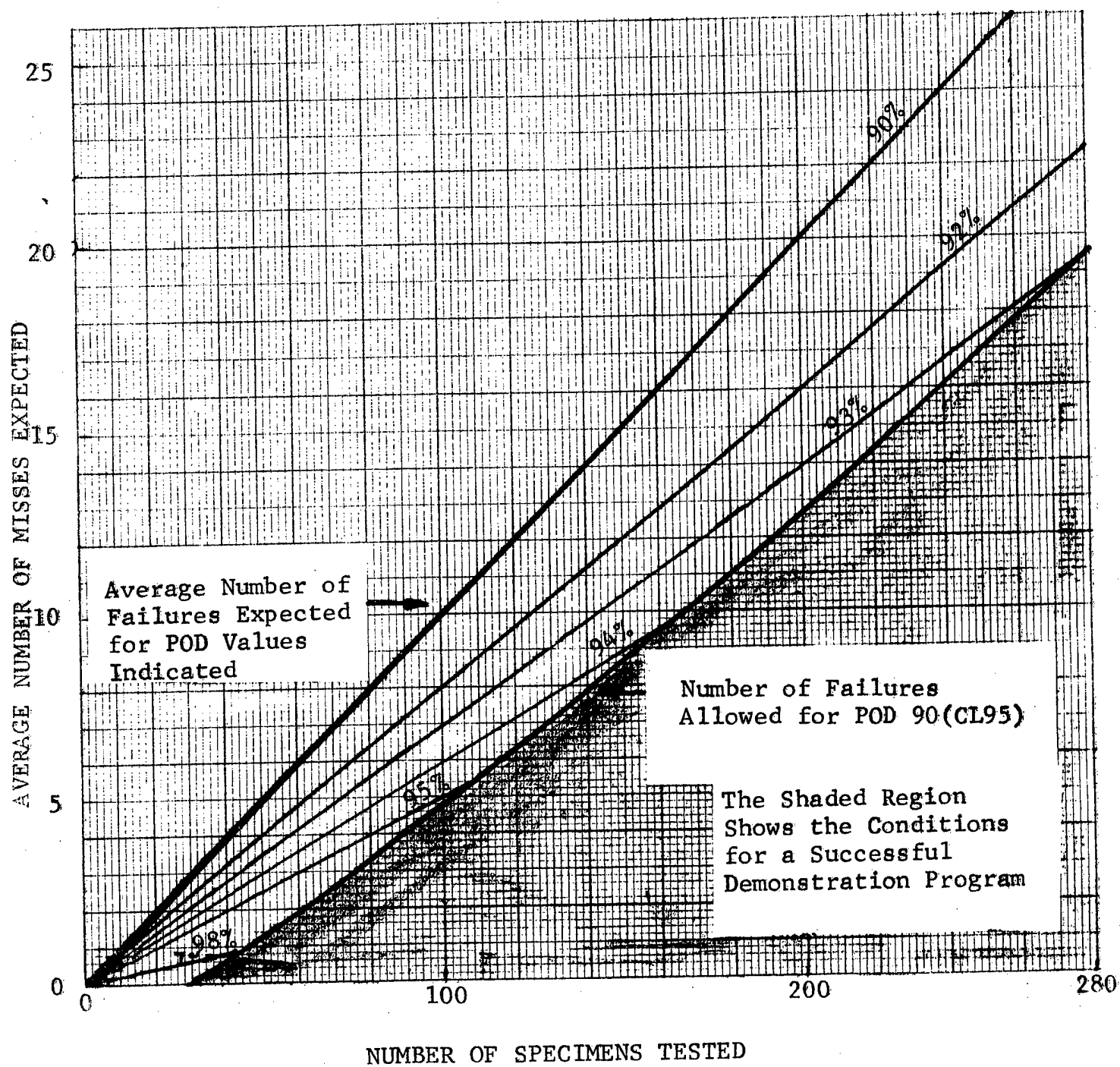


Figure 6-2 Conditions for Success in Selecting a Sample Size that will Potentially Demonstrate POD90(CL95)

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

VII. CONCLUSIONS

This program was sponsored by NASA as a service to the new fracture mechanics approach to structural design whereby system reliability may be related to the expectation that flaws larger than a specific size may exist in the structure. The program objectives were to (1) collect all available NDE reliability data, (2) examine the validity of the data, (3) select and computerize a statistical procedure for analyzing the data, and (4) generally assess the current state-of-the-art in NDE. We feel that the surface has been broken by this program but vigorous follow-on work would be very valuable to the field of structural design.

Some of the specific conclusions that can be drawn from the contents of this report and the experience gained in performing this study are:

- (1) The human factors influence stands out as dominating in influencing NDE reliability. Although a company can demonstrate a 90 percent probability of detecting a crack at a lower one sided confidence limit at the 95 percent confidence level, there is no guarantee that this is indicative of a continuing capability unless some form of automation has replaced human judgment. This then indicates a need for some type of periodic audit of capability.
- (2) Although more than 30,000 measurements have been filed in a computer library and analyzed to determine the NDE reliability of X-ray, ultrasonics, eddy current, and penetrants, there are still many gaps in the data: There are no eddy current data in the data bank for titanium nor are there much data for crack lengths near .5 or near 1.2 cm. These data deficiencies cause large uncertainties in the POD plots for these crack lengths.
- (3) Binomial statistics are recommended for analyzing NDE reliability data. This report contains a comprehensive discussion of the preferred analysis model.
- (4) The optimized probability method (OPM) of data cumulation is preferred over the range interval or the overlapping sixty point scheme for computing probability of detection. The optimum probability model which was developed during this program is discussed in this report.

(5) Data show that the X-ray technique is not viable for detecting tight fatigue cracks.

(6) In order to obtain optimum results from an NDE demonstration program, special care must be taken in the design of flaw size distribution. The cumulative distribution must always maintain a positive slope or there will be gaps without data which can have deleterious effects on the POD curves as a function of flaw sizes.

(7) The data presented in this report are offered as a guide for manufacturers who intend to perform an NDE reliability demonstration program and can identify data sets that represent their expected NDE capabilities. However, due to the human factor influence on POD, the data cannot be used as design information. Each company must develop reliability numbers for their own use.

(8) A continuing program to maintain an NDE reliability data file and to optimize the data processing procedures formulated during this program would be useful to the field of fracture mechanics. As the data base becomes larger it will begin to support parametric studies of the influence of NDE variables.

APPENDIX A

A MODEL TO GRADE THE QUALITY OF THE DATA SETS

The thoroughness of the characterization of the defect-specimen and the documentation of the inspection procedures affects the quality and the usefulness of the data sets. A designer will not have confidence in using the data unless the inspection procedures and defect dimensions are sufficiently documented so that it can be reproduced in future inspections.

The model described in this section will only relate to the quality of each set of data. It will not address the question of applicability. That is, a set of data obtained on flat

plates will not be graded on the basis of its applicability to the design of complex structures.

The model is empirical and the weighting factors assigned to the various known pertinent parameters are rather arbitrary. However, it does represent a first attempt to quantitatively evaluate the quality of a data set. Each of the pertinent parameters in this model is listed in the Input Data Format which will be discussed in the next subsection. The grade for a given set of data can be tallied in the computer by checking the entries to the columns containing these pertinent parameters. A score of one hundred (100) corresponds to a perfect set of data. A perfect set of data is one where all the pertinent parameters are documented.

The preliminary model to grade the data quality for the ultrasonic, eddy current, liquid penetrant, magnetic particle, and X-ray methods is given in Table A-1. The model is divided into two major groups. Group A is the characterization of specimens and defects and it is common to all techniques. Group B is the documentation of the inspection and is different for different NDE techniques. The first eight parameters in this last group are common to all techniques. Each technique has about eleven parameters that are considered pertinent to adequately document the inspection. Parameter A1 is the description of the specimen geometry and defect location. This is considered a key parameter and a value of 7 points is arbitrarily assigned to it. If no description about the specimen geometry and defect location is given, that data point or set of data will receive no points. Those parameters that are marked by an asterisk are considered key parameters. If any of them is not recorded, the data point or set will be considered for possible exclusion from statistical analysis.

Table A-1

THE GRADING FACTORS USED TO GRADE NDE DATA QUALITY

A.	Specimen - Defect Characterization Information		35
1.	Specimen geometry complexity and defect location	*	7
2.	Crack dimension verification	*	10
3.	Defect type	*	3
4.	Specimen surface condition	*	3
5.	Material characterization (thermo-mechanical history)		3
6.	Material inside defect	*	3
B.	Inspection Documentation		65
1.	False indication recording		4
2.	Inspector qualification level		3
3.	Knowledge of defect orientation, location, and presence by inspector	*	9
4.	Use of proof load	*	3
5.	Use of control specimens without crack		3
6.	Method of data recording		3
7.	Method of scanning specimens		3
8.	Insp. environment	*	3
9.	Number of insp. prior to this insp.		3
10.	Parameters recorded by nondestructive testing standards		
a.	Radiography		38
1)	Radiographic source	*	3
2)	Ref. standard		3

10. (Continued)

3) Detector type	*	4
4) Voltage	*	4
5) Current	*	4
6) Exposure time	*	4
7) Source/film distance	*	4
8) Angle of entry	*	3
9) Film development parameters		3
10) Radiograph density	*	3
11) Radiographic equipment type		3
b. Ultrasonics		38
1) Ultrasonic method	*	4
2) Frequency	*	4
3) Transducer type and size	*	4
4) Reference standard type and size	*	4
5) Angle of incidence (inside the material)	*	3
6) Equipment type		3
7) Gate alarm level (% of ref. signal)	*	4
8) Gain setting (% of screen saturation)	*	4
9) Type of coupling		3
10) Index interval	*	3
11) Contact or Immersion		3

10. (Continued)

c. Eddy Current		38
1) Method of Scan	*	3
2) Coil size	*	4
3) Coil arrangement and shape	*	3
4) Frequency	*	4
5) Reference type and size	*	4
6) Equipment type		3
7) Index interval	*	3
8) % of meter response (Real Part)	*	4
9) % of meter response (Imaginary Part)	*	4
10) Lift-off compensation		3
11) Signal processing		3
d. Penetrant		38
1) Penetrant type	*	4
2) Developer type	*	4
3) Classification of penetrant (group no.)		2
4) Emulsifier type	*	4
5) Pre-insp. surface cleaning and penetrant removal	*	3
6) Method of penetrant application		3
7) Dwell time	*	4
8) Development time	*	4

10. (Continued)

9) Wash time		4
10) Light type and intensity at specimen surface		3
11) Reference standard type		3
e. Magnetic Particle		38
1) Type of current used	*	4
2) Current level (Amperes)	*	4
3) Method of magnetization		4
4) Direction of magnetization	*	4
5) Magnetic flux density	*	4
6) Magnetic particle type and size	*	3
7) Magnetic particle density		3
8) Type of liquid vehicle		3
9) Method of particle application		3
10) Equipment type		3
11) Dwell time (seconds)	*	4

APPENDIX B

DATA POOLING

B.1 Data Pooling by NDE Method and Parameters

Data that meet the preliminary criterion as described in Subsection 3.1 are input to the computer for statistical analysis. Then data from several sets are pooled and analyzed if they have a common set of parameters. Data from different NDE methods are not to be pooled. For a given NDE method such as ultrasonic shear wave at 5 MHz, reliability curves will be plotted for a material type, a defect type, an environment, a specimen geometry and defect location, and either before or after some enhancement such as a proof test. Composite reliability curves can be plotted by pooling data with different parameters, such as pooling 5 and 10 MHz shear wave data, laboratory and production data, flat plate and cylindrical shell data, etc.

B.2 Statistical Pooling Criteria

The NDE data that is compiled for this contract was collected from different sources using different calibration factors, different equipment, different personnel, different environments, etc. Each set of data therefore contains unique source characteristics that preclude indiscriminate pooling for reliability calculations.

A statistical pooling criteria has been developed to safeguard against mistakes or inconsistencies in the data which would produce abnormal statistical results. The data pooling technique is based solely on the binomial distribution and is described below as a procedure which can be implemented on a computer. The procedure consists of the following four steps.

- (1) The best single estimate, $\bar{p}_c$, for probability of detection

$$\bar{p}_c = \frac{\sum_{k=1}^M n_k}{\sum_{k=1}^M N_k} , \quad (9)$$

where M is the number of data sets to be pooled.

- (2) The best single estimate of the true probability

$$\bar{p}_k = \frac{n_k}{N_k}, \quad (10)$$

of each of the data subsets is computed.

- (3) Consider the binomial distribution function for each data set (N_k, n_k) having a true probability of detection given by $\bar{p}_c$. The two-sided probability, α_2 , that (N_k, n_k) and all less likely outcomes are possible is computed from

$$\alpha_2 = 2 \sum_{i=0}^{n_k} \binom{N_k}{i} \bar{p}_c^i (1-\bar{p}_c)^{N_k-i} \quad (11)$$

$$\text{if } \frac{n_k}{N_k} < \bar{p}_c$$

or by

$$\alpha_2 = \sum_{i=n_k}^{N_k} \binom{N_k}{i} \bar{p}_c^i (1-\bar{p}_c)^{N_k-i} \quad (12)$$

$$\text{if } \frac{n_k}{N_k} > \bar{p}_c$$

- (4) All data sets having a value of α_2 less than a reference value α' (computer input value) are removed as candidates for pooling.

The choice of α' is somewhat arbitrary and depends upon the acceptable risk. The data sets that will be rejected from pooling for a given α' value will be reviewed. If no abnormalities are found within each set of data (i.e., no mistakes in data recording, or other possible means of causing the probability of detection to be normally high or low),

a new value of α' will be tried and one that will permit the data sets to be pooled with the data base will be selected. Thus, the value for α' may be governed by operator judgment of the validity of the data.

Table B-1 is an example which contains six hypothetical binomial experiments (assuming all sets have the same measurement parameters). (For this example α' was chosen to be .05). The α_2 values for sets C, E, and F are very low. The α_2 values for sets C and E were calculated using Equation (11) and for set F was calculated using Equation (12). For set C one is only 2.22% confident that one out of eight measurements is successful. For set E one is only 0.86% confident that one out of ten measurements is successful. For set F one is only 0.11% confident that seven out of seven measurements are successful. The confidence is too low for measurements to be pooled with those of sets A, B, and D.

Upon rejecting sets C, E, and F, new α_2 values are calculated for sets A, B, and D using the $\bar{p}_c$ (16/40). These three sets have comparable confidence limits and they will be pooled.

Table B-1
SIX SETS OF DATA FROM DIFFERENT SOURCES
(A-F) TESTED FOR POOLING

<u>Source</u>	<u>N</u> Number of <u>Measurements</u>	<u>n</u> Number of <u>Successes</u>	α_2 (<u>Alpha</u>)
A	24	9	.4085 (accepted)
B	8	3	.3612 (accepted)
C	8	1	.0222 (rejected)
D	8	4	.3572 (accepted)
E	10	1	.0086 (rejected)
F	7	7	.0011 (rejected)
TOTAL	65	25	
A	24	9	.3641 (accepted)
B	8	3	.3361 (accepted)
D	8	4	.3834 (accepted)
TOTAL	40	16	

APPENDIX C

NASA. FTM COMPUTER CODE

NASA. FTM is written in Fortran and organized with a main routine performing all executive functions. Main does no data manipulation, it simply calls other routines which manipulate the data.

The flow diagram Figure C-1 illustrates the run sequence of the program. Two inputs required for the program are the Master Data File and a Problem Input Deck. At the end of a production run, the program lists the computational results.

C-1 Master Data File

The master data file consists of a sequence of 'data sets'. Each data set grouping has a common combination of conditions under which a series of specimens were inspected. These conditions are described in two 256 word records (header records). The results of the inspection are called data points and are stored after the two header records. Each data point is 8 words long and contains: crack ID, detect code, crack length, crack depth, measured crack length, measured crack depth, surface finish and thickness. The 'data records' consists of 256 words which contain 32 data points in each. Each data set is labeled by a number which is unique to the data set. The data set number and the number of data records per data set are stored in the header records of each data set. The master data file is stored on magnetic tape in binary format, 256 words per record.

C-2 Program Flow (Ref. to Table C-1)

The first step in running the program is to read all the program options. The subroutine then reads the master data file to extract, data points for analysis. These data are stored on a local disk file for up to 10,000 data points. Each data point on this data file is described by four words, crack size, detect/no detect, crack ID, and data set number. The input options have already (either implicitly or explicitly) described a set of common conditions. Subroutine Order then rewrites the local data file in increasing crack size.

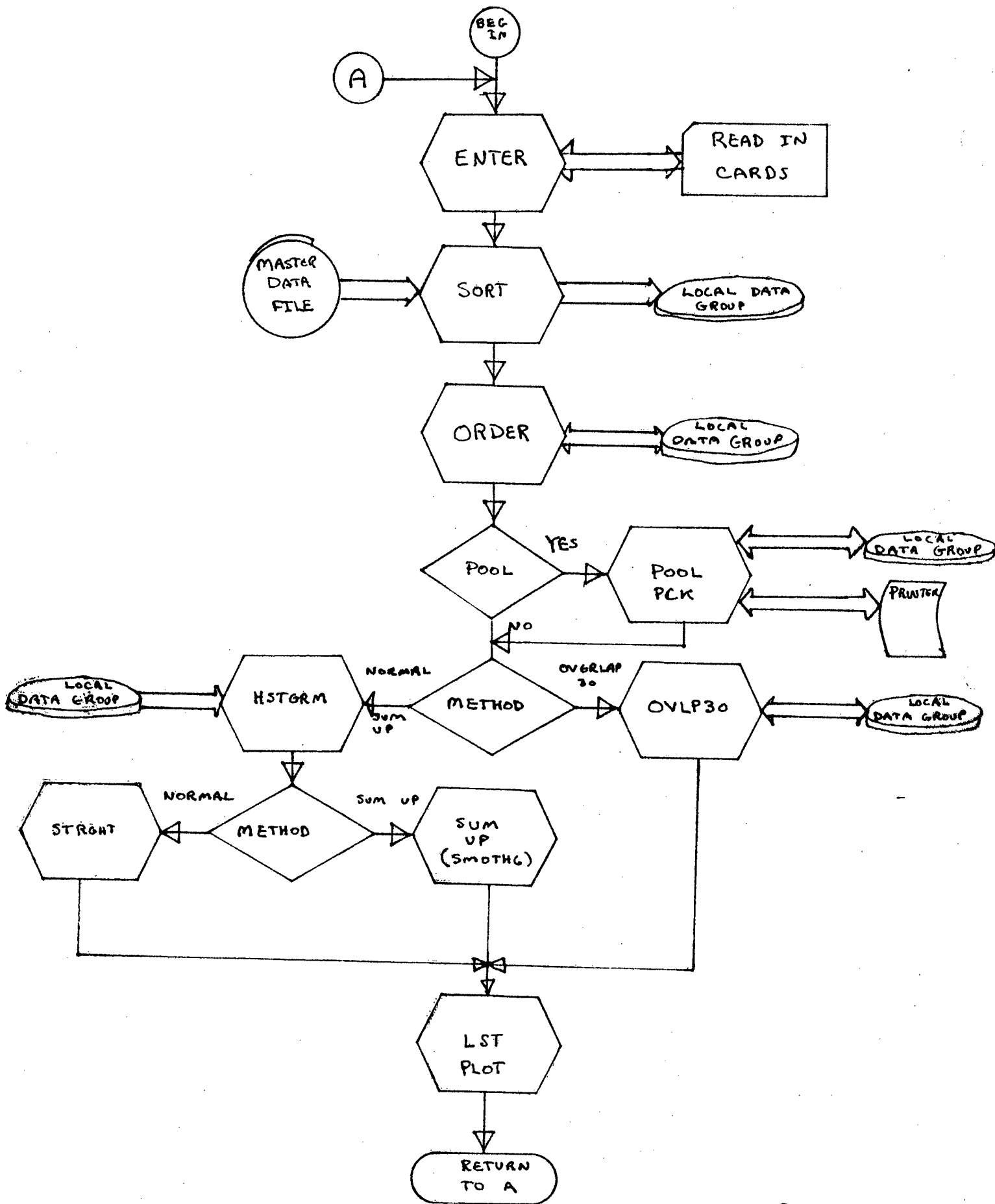


Figure C-1 Structure of Main Routine in NASA. FTN Code

C-2

Table C-1

Glossary of Programs and Subroutines
Used in NASA, FTN

NASA	-	Main program to control the program steps flow in Figure
ENTER	-	Routine to read in cards which contain the program options. The options are stored in commons for use by other routines.
SORT	-	Routine that reads the master data file, sorts out data for analysis, then writes this data on local disk file.
ORDER	-	Routine to sort the data on the local data file so that the order of the data will be by increasing crack size.
POOL	-	Routing to determine whether a particular data set belongs to the rest of the sets being considered.
POOLR	-	Routine to calculate probability of data sample belonging to a group having a known probability of detection.
RJCT	-	Routine to zero out data points of a data set that has been rejected on statistical grounds.
PCK	-	Routine to remove 'holes' in the local data file that are created by RJCT and to form a packed data file.
HSTGRM	-	Routine to sort data into 32 size interval groups.
OVLP30	-	Routine to perform an analysis of the data by using the procedure known as the "OSP" scheme.
SMOTHG	-	Routine to perform an analysis of the data by using the procedure known as the OPM.

Table C-1 (Continued)

STRGHT	-	Routine to perform analysis of the data by using the procedure known as the "RI" scheme.
BIN	-	Routine to calculate POD at a specific confidence limit for a binomial experiment consisting of N measurements and n successes.
DEFJC	-	Routine to calculate the number of successful experiments which must be performed in order to know the lower limit probability of detection within a given confidence limit.
LST	-	Routine to list the results of the analysis.
CKNRT	-	Routine which performs paging of the local data file.

If pooling is desired, routine POOL can be used to calculate the probability that each data set statistically belongs to the rest of the data sets that are collected together. Any data set that gets rejected is removed from the local data file by zeroing the data points. Routine PCK takes the local data file and re-packs it so that there are no zeroed points. All data sets removed are listed on the printer. The method of analysis determines the route the program takes next. If 'overlapping 60' is chosen routing OVLP30 "OSP" takes the local data file and processes the data directly. Routing HSTGRM is used to divide the data points into 32 groups which have equal crack size intervals ranging between a minimum and maximum input crack size. All crack sizes falling below the minimum are included in the first interval and all data falling above the maximum are included in the thirty second interval. Either the routine STRGHT "RI" or the SMOTHG "OPM" analysis procedure can be selected to analyze the data. The results are then listed. The program then returns to the beginning to read more cards. If there are no more problems to be solved, the program terminates.

C-3 Sorting Option

The program has two sort options. The first option uses the data set number directly. (See Figure 4-2). The user specifies the number of data sets to be considered, then specifies the data set numbers. The second option (Figure 4-3), makes use of the header card information which includes 26 words or numerical codes for the alphanumeric data that is contained in the header records. By supplying values for these words, each header record can be compared to this 'master' input. No zero values are compared. Each time a match is made, that data set is stored on the local data file. A maximum of 5 master header records can be combined per run.

C-4 Program Limitations

The maximum crack size that can be stored and analyzed is 2.54 cm. The maximum number of data points that can be combined into a set is 1000. The maximum number of measurements that can be analyzed by the subroutine "DEFIC" which computes data deficiencies is 120.

IDSJ = NUMBER OF DATA SETS TO BE SELECTED
 JDSN = ARRAY CONTAINING THE DATA SET NUMBERS
 DSN = DATA SET NUMBER (READ FROM MASTER DATA FILE)

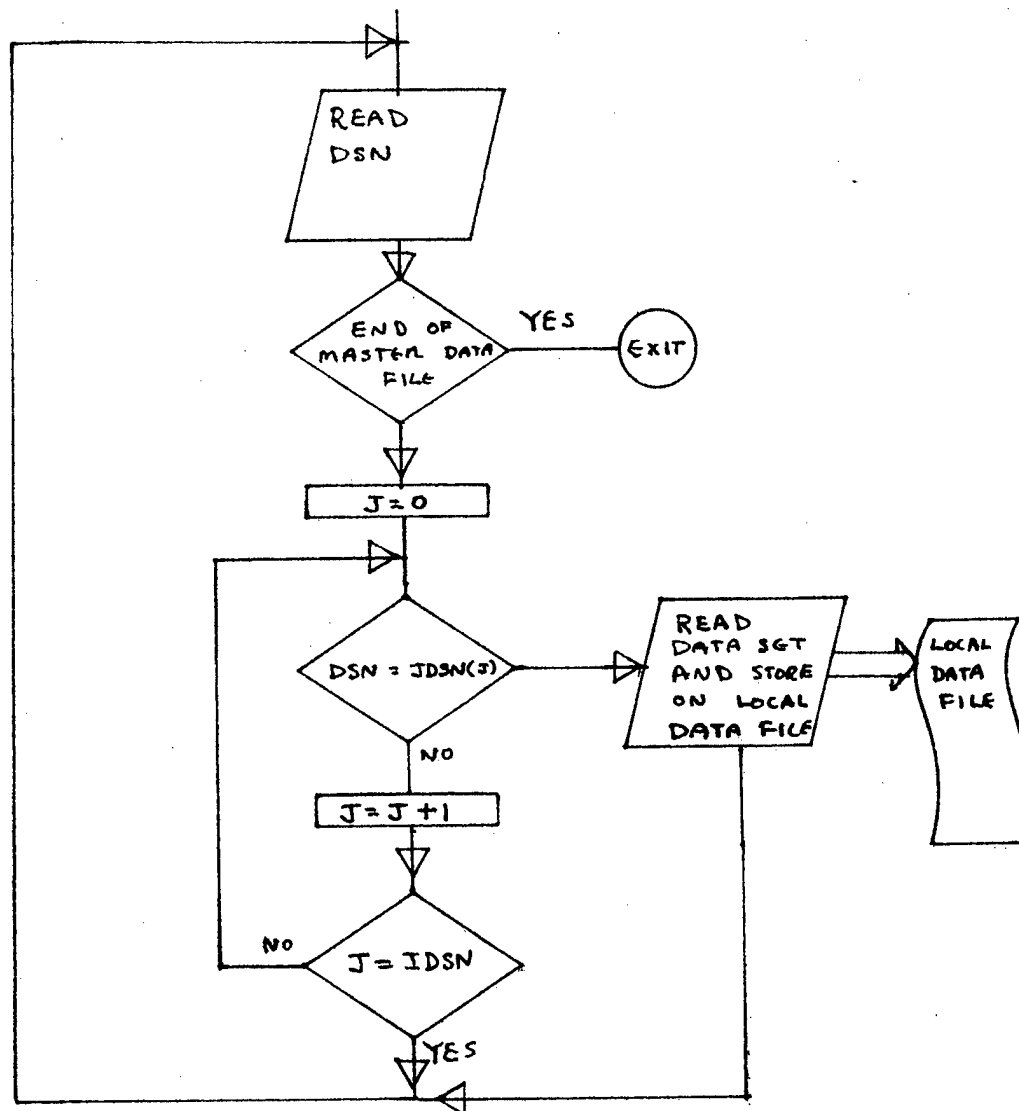


Figure C-2 Sort Subroutine Flow When Using Data Set Number Only for Sorting

C-5 Local Data File

The local data file is a direct access file which occupies a continuous block or disk space. A paging method has been incorporated to avoid executive disk I/O. The subroutine CKNXT is used for paging. At any given time, 1024 data points may be held in the core, therefore a disk access does not have to be made each time a new data point is addressed. The local data file has ten pages available for program use.

C-6 Ordering Method

A subroutine names "ORDER" reorders the local data file entries in increasing crack length then rewrites the ordered data file in place of the original unordered local data file. This ordered data is then used as input for data pooling and statistical analysis.

C-7 Lower One-Sided Confidence Limits Calculations

The binomial Equation (5) is solved by setting G equal to the confidence level desired and determining the value of p_1 which satisfies the equation. A Fortran IV program which has been made operable in a PDO 11/45 computer to perform this function is given in Figure 4-5. p_1 is the probability of detection at the lower confidence limit.

The procedure used to determine how many more measurements are required in each interval for the 95% confidence curve to reach the 90% probability of detection level is to solve Equation 8 for n and k . Figure 4-6 gives the listing of a Fortran IV program to perform this calculation.

C-6-a

ICCN = NUMBER OF CONTROL CARDS (MAXIMUM OF 5)

JCCN(26, ICCN) = ARRAY OF CONTROL CARD INFORMATION THAT IS INPUT

KCC(26) = ARRAY OF CONTROL CARD INFORMATION FOR EACH DATA SET

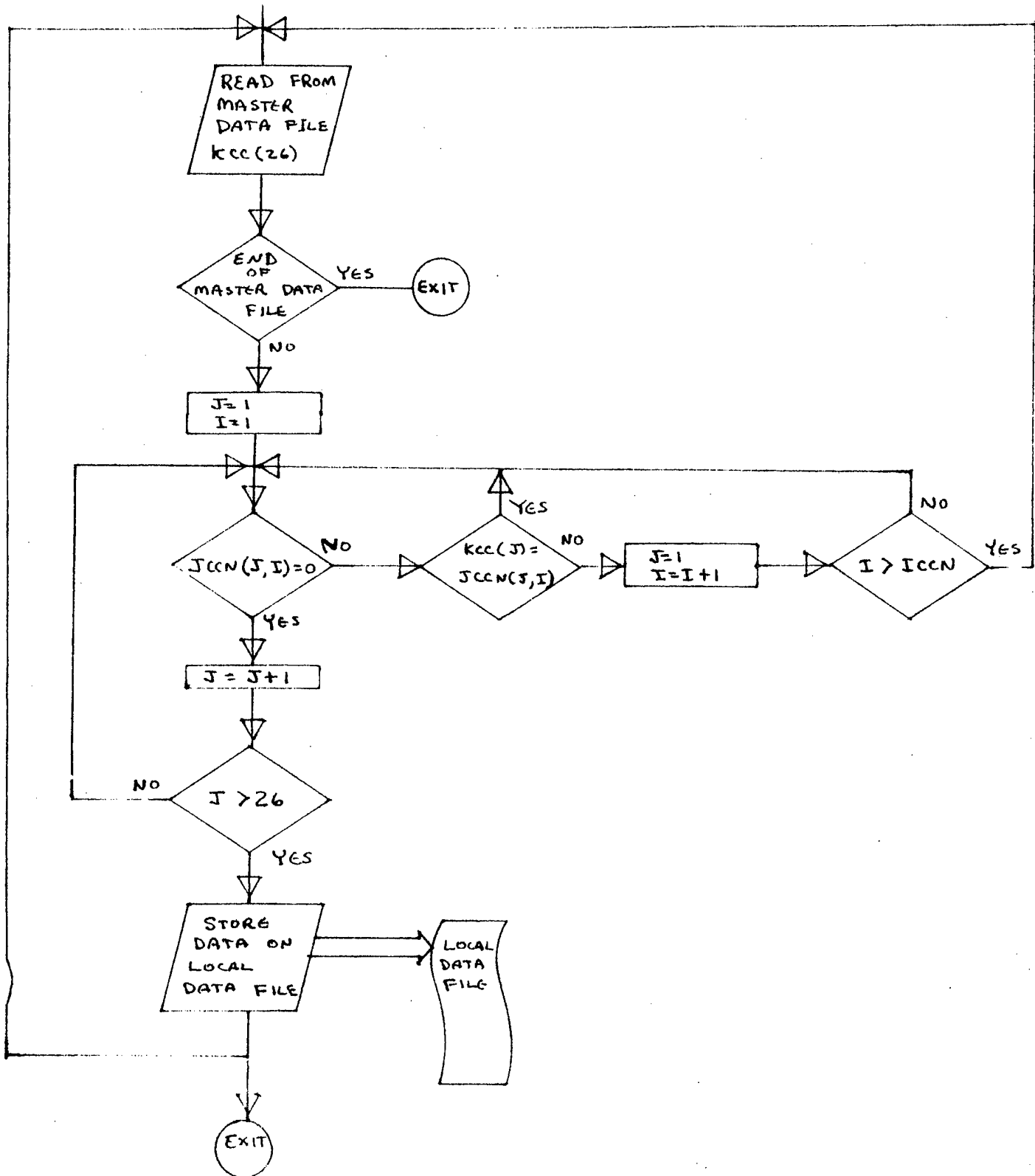


Figure C-3 Sort Subroutine Flow When Using Master Control Records to Sort on Master Data File


```

      SUBROUTINE BINCAR1,AR2,AR3,AR10)
1  IF(AR2)2,2,4
2  AR10=0.0
3  RETURN
4  IF(AR2-AR1)7,5,5
5  AR10=(1.0-AR3)**(1.0/AR1)
6  RETURN
7  ATT=2.0*AR2
8  IF(ATT-AR1)9,9,12
9  AR4=AR2-1.0
10 AR5=-1.0
11 GO TO 15
12 AR4=AR1-AR2
13 AR3=1.0-AR3
14 AR5=-1.0
15 AR10=0.5
16 AR6=1.0
17 AR8=0.0
18 AR9=1.0
19 AR11=AR1
20 AR7=(AR10**AR8)*((1.0-AR10)**(AR1-AR8))
21 IF(AR8-AR4)22,27,22
22 AR8=AR8+1.0
23 AR9=AR9*AR11/AR8
24 AR11=AR11-1.0
25 AR7=AR7+AR9*(AR10**AR8)*((1.0-AR10)**(AR1-AR8))
26 GO TO 21
27 IF(AR3-AR7)28,28,30
28 AR20=AR10-AR5/(2.0**((AR6+1.0)))
29 GO TO 31
30 AR20=AR10+AR5/(2.0**((AR6+1.0)))
31 CCC=ABS(AR7-AR3)
32 IF(CCC-0.0001)36,36,33
33 AR6=AR6+1.0
34 AR10=AR20
35 GO TO 17
36 IF(ATT-AR1)6,6,37
37 AR10=1.0-AR10
38 RETURN
39 END

```

Figure C-4 Computer Code Used to Calculate Lower One-Sided Confidence Limit

```

SUBROUTINE DEFID(AR1,AR2,FFF,AR4)
1  A=AR1-AR2+FFF
2  AR4=0.0
3  IF(A)4,4,9
4  AR4=29.0-AR1
5  IF(AR4)6,6,7
6  AR4=0.0
7  RETURN
9  X=1.0
10 AR5=0.0
11 C=1.0
12 CCC=AR1+AR4
13 AR5=0.9*CCC
14 C=(C/X)*(AR1+AR4+1.0-X)
15 DDD=AR1+AR4-X
16 AR5=AR5+(0.1**X)*C*(0.9**DDD)
17 IF(A-X)18,18,21
18 IF(0.05-AR5)19,19,7
19 AR4=AR4+1.0
20 IF ( AR4 .EQ. 100. ) RETURN
20 GO TO 9
21 X=X+1.0
22 GO TO 14
23 END

```

Figure C-5 Computer Code Used to Calculate Additional Measurements Required to Achieve 90% Probability of Detection at 95% Confidence Limit

C-8 DATA INPUT FORMAT

The data are filed in mass memory by using a 'data set' concept. All the common control parameters for a group of data points are loaded together. There are 26 such control parameters. The first 14 are the same for all NDE methods, the next 12 are different for each of the five NDE methods. The results of the inspection follow the control parameters. Eight numbers are used to describe each point. (Crack ID, detect code, crack length, crack depth, measured crack length, measured crack depth, surface finish, thickness).

A typical control parameter listing is shown in Table C-1. Nine hundred eighty four flaw measurements have these parameters in common. The data in Table C-1 can be compacted for computer storage into the format shown in Table C-2. A special data set listing like that shown in Table C-1 can be prepared from the line of integers shown in Table C-2 by using the parameter key included at the end of this appendix. Four of the 984 data points for data set # 1 were entered onto each of 246 lines in the format depicted in Table C-3. Each complete data set is terminated by a 0000 entry in Columns 1 through 4 of the digital computer data sheet.

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

Table C-1 Data Set Parameters
for Data Set Number 1

DATA SET NUMBER : 1

1)	NDE METHOD	ULTRASONIC
2)	COMPANY NAME	MARTIN MARIETTA
3)	PROGRAM ID	DETECTION OF FATIGUE CRACKS
4)	MATERIAL	ALUMINUM 2219-T87
5)	DEFECT TYPE	FATIGUE CRK./NO CYCLE/REMOVE EDM
6)	OPERATOR ID	NA
7)	QUALIFICATION	QUALIFIED ACCORDING TO MIL-STD-453
8)	INSP. ENVIRONMENT	PRODUCTION
9)	INSP. PROCEDURE	STD. INSP. / MULTIPLE FLAW SPEC.
10)	DATA RECORD TYPE	RECORD OF METER OR SCOPE DISPLAY
11)	MODE OF SCAN	MECHANICAL SCAN AND INDEX
12)	REFERENCE STANDARD	FLAT BOTTOM HOLE
13)	DEFECT MATERIAL	AIR
14)	PART GEOMETRY	FLAT PLATE

15)	ULTRASONIC METHOD	SHEAR	PULSE ECHO
16)	FREQUENCY	10 MEG HZ.	
17)	XMITTER TYPE/SIZE	FLAT FACE	95 CM
18)	RECEIVER TYPE/SIZE	FLAT FACE	95 CM
19)	EQUIPMENT TYPE	UM 715	16N PULSER/RECIEVER
20)	GAIN SET % OF SS	NA	
21)	ALARM SET % OF SS	NA	
22)	TYPE OF COUPLING	WATER IMERSION	
23)	ANGLE OF INCIDENCE	27.25 DEG.	
24)	INDEX INTERVIEW	318 CM (125 IN)	

Table C-2 Data Set Entry for Compact Storage of Data Set Parameters

Computer Input:

DIGITAL COMPUTER DATA SHEET

[illegible]

Computer Output:

5421107124331114111001111

Table C-3 Flaw Size Data Entry Format
Showing Last Four Entries with End of
File Designated by "0000"

Computer Input:

	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		

C-13

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
1	0	0	6	1	0	0	2	0	1	0	2	2	0	0								9	0	6	9	5	0	9	0	2	0			5	4			5	0

Computer Listing

Blank
Thickness
Surface Finish
Measured Crack
Depth
Crack Depth
Measured
Crack Length
Crack Length
Detect Code
Crack I.D.

21 50 0 0 10 01100 506 9010 20 52 50 1000610020 10 22200 90695090 20 54 50
0000

Table C-4 Data Key

NDI METHOD

1 EDDY CURRENT
 2 PENETRANT
 3 MAGNETIC PARTICLE
 4 RADIOGRAPHY
 5 ULTRASONIC

DATA SOURCE

COMPANY NAME
 1 GENERAL DYNAMICS FW
 2 CONVAIR/SAN DIEGO
 3 BOEING COMMERCIAL
 4 MARTIN MARIETTA
 5 ROCKWELL INTER. B-1
 6 LOCKHEED GA.
 7 MCDONNELL DOUGLAS
 8 AFM
 9 TRW
 10 GE, EVENDALE OHIO
 11 FAIRCHILD HILLER
 12 LOCKHEED CALIF.
 13 ROCKWELL INTER. SPACE CENTER
 14 BOEING WICHITA
 15
 16
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PROGRAM ID

MATERIAL

PROGRAM ID
 1 SENS. LIMITS OF PROO. NDE METHODS
 2 DETECTION OF FATIGUE CRACKS
 3 EVAL OF RELI. & SENSIT OF NDE METHODS
 4 USAF A10 SPO DEMO PROGRAM
 5 USAF B-1 SPO DEMO PROGRAM
 6 DETECTION OF TIGHTLY CLOSED FLAWS

MATERIAL
 1 ALUMINUM 2219-T87
 2 ALUMINUM 2024
 3 4340M STEEL 270-300 KSI
 4 TI-6AL-4V

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DEFECT TYPE

OPERATOR ID

DEFECT TYPE	OPERATOR ID
1 FATIGUE CRK. / NO CYCLE / REMOVE EDM	A
2 ELOX SLOT	B
3 SAW CUR	C
4 WELD DEFECT (LACK OF FUSION)	D
5 WELD DEFECT (LACK OF PENETRATION)	E
6 WELD DEFECT (POROSITY)	F
7 FORGING FLAWS WITH OXIDE IN FLAM	G
8 HYDROGEN EMBRITTLEMENT	H
9 HYDROGEN INDUCED GRINDING CRACK	I
10 FATIGUE CRACK / ADD. CYCLES / REMOVE EDM	J
11	K
12 COMPRESSED NOTCH FLAM	L
13 FATIGUE CRACKED WELDS	M
14	N
15	O
16	P
17	Q
18	R
19	S
20	T
21	U
22	V
23	W
24	X

QUALIFICATION

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QUALIFICATION
 LEVEL 1
 LEVEL 2
 LEVEL 3
 FIELD SERVICE TECHNICIAN
 LABORATORY TECHNICIAN
 LABORATORY ENGINEER
 QUALIFIED ACCORDING TO MIL-STD-453
 TECHNICALLY QUALIFIED
 CERTIFIED UNDER BOEING A.C. 5953

INSP. ENVIRONMENT

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INSP. ENVIRONMENT
 PRODUCTION
 LABORATORY
 FIELD SERVICE

INSP. PROCEDURE

DATA RECORD TYPE

INSP. PROCEDURE
 1 STD. INSP. / SINGLE FLAW SPEC.
 2 STD. INSP. / MULTIPLE FLAW SPEC.
 3 NON STD. INSP. , SINGLE FLAW SPEC.
 4 NON STD. INSP. , MULTIPLE FLAW SPEC.

MIL-STD-453 / MULTIPLE FLAW

DATA RECORD TYPE

1 MANUAL RECORD OF VISUAL DISPLAY
 2 MANUAL RECORD OF METER OR SCOPE DISPLAY
 3 MECHANICAL RECORD OF VISUAL DISPLAY
 4 RECORD OF METER OR SCOPE DISPLAY
 5 COMPUTER RECORD OF METER OR SCOPE DISPLA

MODE OF SCAN

REFERENCE STANDARD

MODE OF SCAN	REFERENCE STANDARD
1 MANUAL HAND SCAN	1 ELOX SLOT
2 MECHANICAL SCAN, HAND INDEX	2 FATIGUE CRACK
3 MECHANICAL SCAN AND INDEX	3 FLAT BOTTOM HOLE
4 COMPUTER CONTROLLED SCAN	4 FORGING FLAW
5	5 SAN CUT
6	6 SIDE DRILLED HOLE
7	7 VERTICAL DRILLED HOLE
8	8 0.039687 (1/64) FBH
9	9 0.079375 (2/64) FBH
10	10 0.119063 (3/64) FBH
11	11 0.15875 (4/64) FBH
12	12 0.198437 (5/64) FBH
13	13 REF. PANEL USED / DESCRIP. NOT KNOWN
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24

DEFECT MATERIAL

DEFECT MATERIAL

1 AIR
2 WATER

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PART GEO.

PART GEOMETRY
1 FLAT PLATE

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WELDED BUTT JOINT WITHOUT CROWNS
INTEGRALLY STIFFENED PANEL (ISP)
WELDED BUTT JOINT WITH CROWNS
I.S.P. RIVETED TO FLAT PLATE
SOLID CYLINDER
FILLETED SOLID CYLINDER
TANDEM 'T'
HOLLOW CYLINDER
HOLLOW FILLETED CYLINDER
FLAT BAR

SPECIAL
KEY FOR EDDY CURRENT
DATA

- 1 NDE METHOD
- 2 COMPANY NAME
- 3 PROGRAM ID
- 4 MATERIAL
- 5 DEFECT TYPE
- 6 OPERATOR ID
- 7 QUALIFICATION
- 8 INSP. ENVIRONMENT
- 9 INSP. PROCEDURE
- 10 DATA RECORD TYPE
- 11 MODE OF SCAN
- 12 REFERENCE STANDARD
- 13 DEFECT MATERIAL
- 14 PART GEOMETRY

- 15 EQUIPMENT TYPE
- 16 DIAMETER OF COIL
- 17 CONF./SHAPE OF COIL
- 18 FREQUENCY
- 19 TYPE OF EC RESPONSE
- 20 LIFT-OFF COMP.
- 21 SIGNAL PROCESSING
- 22 INDEX INTERVAL

15 EQUIPMENT TYPE

15 DIAMETER OF COIL

EQUIPMENT TYPE
1 NORTER NOT-3

MAGNATEST ED-400 & ED-520
VECTOR 3 : SR 150 BUDD , ULTA BRIDGE

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17 CONF./SHAPE OF COIL

18 FREQUENCY

CONF./SHAPE OF COIL
 DUAL COIL / AIR CORE
 SINGLE COIL HELICALLY WOUND

BOLT HOLE & SURFACE PROBE

FREQUENCY
 1 100 KHZ
 2 20 KHZ

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19 TYPE OF EC RESPONSE

TYPE OF EC RESPONSE
1 AMPLITUDE
2 PHASE

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20 LIFT-OFF COMP.

LIFT-OFF COMP.
1 NO LIFT-OFF COMPENSATION
2 LIFT-OFF COMPENSATED FOR (3MIL SHIM)

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22 INDEX INTERVAL

INDEX INTERVAL
 1 3048 CM (.125 IN)
 2 0508 CM (.020 IN)

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21 SIGNAL PROCESSING

SIGNAL PROCESSING
 1 STRAIGHT AMPLIFICATION

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SPECIAL
KEY FOR LIQUID PENETRANT
DATA

- 1 NDE METHOD
- 2 COMPANY NAME
- 3 PROGRAM ID
- 4 MATERIAL
- 5 DEFECT TYPE
- 6 OPERATOR ID
- 7 QUALIFICATION
- 8 INSP. ENVIRONMENT
- 9 INSP. PROCEDURE
- 10 DATA RECORD TYPE
- 11 MODE OF SCAN
- 12 REFERENCE STANDARD
- 13 DEFECT MATERIAL
- 14 PART GEOMETRY

- 15 PENETRANT TYPE
- 16 DEVELOPER TYPE
- 17 CLASS OF PENETRANT
- 18 REMOVER/EMULSIFIER
- 19 APPLICATION METHOD
- 20 DWELL TIME
- 21 DEVELOPING TIME
- 22 WASH TIME
- 23 LIGHT INTENSITY
- 24 REMOVAL/PRE-CLEANING

15 PENETRANT TYPE

PENETRANT TYPE	
1	URESCO P-151
2	
3	
4	ZL-2A , URESCO P-133 & P-134
5	URESCO P-149
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16 DEVELOPER TYPE

DEVELOPER TYPE	
1	URESCO D499C
2	
3	
4	MAGNAFLUX ZP-4A , -5, & -13, & URESCO 499B
5	URESCO D499C
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18 REMOVER/EMULSIFIER

REMOVER/EMULSIFIER
 1 URESCO K410
 2
 3
 4 ZE-4A AND ZE-4B
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17 CLASS OF PENETRANT

CLASS OF PENETRANT
 1 GROUP 1
 2 GROUP 2
 3 GROUP 3
 4 GROUP 4
 5 GROUP 5
 6 GROUP 6
 7 GROUP 7
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REPRODUCIBILITY OF THE
 ORIGINAL PAGE IS POOR

19 APPLICATION METHOD

20 DWELL TIME

APPLICATION METHOD
1 HAND BRUSH

DWELL TIME
1 30 MINUTES

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21 DEVELOPING TIME

DEVELOPING TIME
1 30 MINUTES

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

22 WASH TIME

WASH TIME
1 60 MINUTES

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

23 LIGHT INTENSITY

LIGHT INTENSITY
1 1350 LUMENS/SQ METER
2 125 FT-CANDLES, 15 IN FROM FILTER

3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

24 REMOVAL/PPE-CLEANING

REMOVAL/PPE-CLEANING
1 MARTIN MARIETTA (PER. NASA CR--2369)
2 CLEANED BY ALCOHOL IN ULTRASONIC CLEANER

3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

SPECIAL
KEY FOR MAGNETIC PARTICLE
DATA

1 NDE METHOD
2 COMPANY NAME
3 PROGRAM ID
4 MATERIAL
5 DEFECT TYPE
6 OPERATOR ID
7 QUALIFICATION
8 INSP. ENVIRONMENT
9 INSP. PROCEDURE
10 DATA RECORD TYPE
11 MODE OF SCAN
12 REFERENCE STANDARD
13 DEFECT MATERIAL
14 PART GEOMETRY

15 EQUIPMENT
16 PROCEDURE
17 MAG. PARTIAL TYPE
18 SUSPENSION TYPE

15 EQUIPMENT

EQUIPMENT
1 TYPICAL AERO-SPACE EQUIP.
2 PARKER RESEARCH CO. (MOD DA-200)
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16 PROCEDURE

PROCEDURE
1 NET CONTINUOUS FLUORESCENT PRICE
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17 MAG. PARTICAL TYPE

MAG. PARTICAL TYPE
1 MAGNAFLUX 14A
2 MAGNAFLUX 14A & 14AM
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4
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6
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8
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10
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18 SUSPENSION TYPE

SUSPENSION TYPE
1 OIL & WATER BASE
2 14A IN OIL / 14AM IN AEROSOL CANS
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SPECIAL
KEY FOR RADIOGRAPHY
DATA

- 1 NDE METHOD
- 2 COMPANY NAME
- 3 PROGRAM ID
- 4 MATERIAL
- 5 DEFECT TYPE
- 6 OPERATOR ID
- 7 QUALIFICATION
- 8 INSP. ENVIRONMENT
- 9 INSP. PROCEDURE
- 10 DATA RECORD TYPE
- 11 MODE OF SCAN
- 12 REFERENCE STANDARD
- 13 DEFECT MATERIAL
- 14 PART GEOMETRY

- 15 RADIOGRAPHY
- 16 EQUIPMENT TYPE
- 17 SOURCE ENERGY
- 18 SOURCE STRENGTH
- 19 WINDOW MATERIAL
- 20 TYPE OF FILM
- 21 EXPOSURE TIME
- 22 SOURCE TO FILM DISTA
- 23 ANGLE OF INCIDENCE
- 24 DENSITOMETER READING

15 RADIOGRAPHY

RADIOGRAPHY
1 X-RAY
2 NEUTRON

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15 EQUIPMENT TYPE

EQUIPMENT TYPE

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BALTO SPOT X-RAY
NORELCO X-RAY 150 KV 24MA

17 SOURCE ENERGY

SOURCE ENERGY	1524 CM AL PANEL	5207 CM AL PANEL	3380 CM , 70 KV FOR	1.27 CM
1	30 KU FOR			
2	40 KU FOR			
3	45 KU FOR			
4				
5				
6				
7				
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18 SOURCE STRENGTH

SOURCE STRENGTH	20 MILLI-AMPS	3 MILLI-AMPS
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19 WINDOW MATERIAL

WINDOW MATERIAL
1 BERYLLIUM

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

20 TYPE OF FILM

TYPE OF FILM
1 KODAK , TYPE M

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

C-2

21 EXPOSURE TIME

EXPOSURE TIME
1 7 MIN. FOR 1524 CM AL
2 15 MIN. FOR 5207 CM AL
3 1.5-3.0 MIN. (THICK-ENERGY DEPEND.)
4 1.5-2.25 MIN. (THICK-ENERGY DEPEND.)
5
6
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22 SOURCE TO FILM DISTA

SOURCE TO FILM DISTA
1 117 CM.
2 122 CM.
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23 ANGLE OF INCIDENCE

ANGLE OF INCIDENCE
1 0.0 DEG (NORMAL)

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

24 DENSITOMETER FEEDING

DENSITOMETER READING

1 2.5-3.5

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

SPECIAL
KEY FOR ULTRASONICS
DATA

- 1 NDE METHOD
 - 2 COMPANY NAME
 - 3 PROGRAM ID
 - 4 MATERIAL
 - 5 DEFECT TYPE
 - 6 OPERATOR ID
 - 7 QUALIFICATION
 - 8 INSP. ENVIRONMENT
 - 9 INSP. PROCEDURE
 - 10 DATA RECORD TYPE
 - 11 MODE OF SCAN
 - 12 REFERENCE STANDARD
 - 13 DEFECT MATERIAL
 - 14 PART GEOMETRY
-
- 15 ULTRASONIC METHOD
 - 16 FREQUENCY
 - 17 XMITTER TYPE/SIZE
 - 18 RECEIVER TYPE/SIZE
 - 19 EQUIPMENT TYPE
 - 20 GAIN SET % OF SS
 - 21 ALARM SET % OF SS
 - 22 TYPE OF COUPLING
 - 23 ANGLE OF INCIDENCE
 - 24 INDEX INTERVAL

15 FREQUENCY

FREQUENCY	
1	1 MEG. HERTZ
2	2.25 MEG HZ.
3	5 MEG HZ.
4	10 MEG HZ.
5	15 MEG HZ.
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15 ULTRASONIC METHOD

ULTRASONIC METHOD	
1	SHEAR : PULSE ECHO
2	SHEAR : PITCH CATCH
3	DELTA SCAN
4	COMPRESSIONAL WAVE : PULSE ECHO
5	COMPRESSIONAL WAVE : THROUGH TRANS.
6	SURFACE WAVE
7	SHEAR + SURFACE : PULSE ECHO
8	SHEAR + SURFACE + LONG. : PULSE ECHO
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17 XMITTER TYPE/SIZE

XMITTER TYPE/SIZE
 1 FLAT FACE , .95 CM
 2 FLAT FACE , .635 CM
 3 FLAT FACE , 1.27 CM
 4
 5
 6
 7
 8
 9
 10
 11
 12
 13
 14
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 23
 24

18 RECEIVER TYPE/SIZE

RECEIVER TYPE/SIZE
 1 FLAT FACE , .95 CM
 2 FLAT FACE , .635 CM
 3 FLAT FACE , 1.27 CM
 4
 5
 6
 7
 8
 9
 10
 11
 12
 13
 14
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19 EQUIPMENT TYPE

20 GAIN SET % OF SS

EQUIPMENT TYPE
1 UM 715 , 10N PULSER/RECIEVER

GAIN SET % OF SS
1 80 % SCREEN SATURATION

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UM 715 , USIP 11 , 424D

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14
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24

22 TYPE OF COUPLING

TYPE OF COUPLING
1 WATER IMERSION
2 OIL IMERSION
3 WATER CONTACT
4 OIL CONTACT

21 ALARM SET % OF SS

ALARM SET % OF SS
1 33 % SCREEN SATURATION
2 50 % SCREEN SATURATION

3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

23 ANGLE OF INCIDENCE

	ANGLE OF INCIDENCE
1	27.25 DEG.
2	18.00 DEG.
3	27.00-27.75 DEG.
4	32.00 DEG.
5	90.0 DEG. (NORMAL)
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24 INDEX INTERVAL

	INDEX INTERVAL
1	.318 CM (.125 IN.)
2	.081 CM (.032 IN.)
3	.051 CM (.020 IN.)
4	.076 CM (.030 IN.)
5	
6	
7	
8	
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10	
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APPENDIX D

COMPUTER OUTPUT - NDE RELIABILITY DATA

The data for Figures D-1a, D-1b, and D-1c were obtained with an ultrasonic surface wave technique and at a frequency of 10 MHz. The abscissa is the surface length of a fatigue crack. The NDE technique (ultrasonics) is given on the upper left hand corner of the figures immediately after the date when the curves were plotted. Test 1, Test 2, or Test 3 is written on the same top line of the page. Test 1 refers to the range scheme where the lower one-sided confidence limit, P_1 , was calculated for equal flaw size intervals. In Figure D-1a the flaw size interval is 0.038 cm. Test 2 (Figure D-1b) refers to the use of the optimized probability method to calculate the P_1 . Test 3 (Figure D-1c) refers to the use of the overlapping sixty point scheme to calculate the P_1 . The top line of the computer output also contains the name of the company or the agency that published the report from which the data were taken. In Figure D-1 the company is Martin Marietta of Denver, Colorado. The test specimen material type is identified in the figure caption on the bottom of the page or in Table 5-1 of Section V where the data set number can be matched with the number in parenthesis in the upper right hand side of each figure.

The first column of the tabulated results in these figures lists the range numbers. The second column gives the minimum crack length of each range and the third column gives the maximum crack length of each range.* The fourth column gives the total number of measurements or observations (N) for each size range and the fifth column gives the number of detections (n) for each size range. The probability of detection at 50% and 95% confidence level** is given in the sixth and seventh columns respectively. The last two columns list the number of new measurements that must be made with no misses and with one miss, respectively, to achieve 90% probability of detection at a 95% confidence level. The zeroes in these last two columns indicate that either no measurements need to be made or the number is too large for practical consideration.

* Tabulated data give crack lengths in mils while the graphs give both mils and cm scales. This dual labeling is offered as a convenience for the design engineer.

** Hereafter POD90(CL95) will be used to refer to a 95 percent confidence that the true probability of detection equals or exceeds 90 percent.

All the reliability curves discussed in this appendix are presented in the above format. Additional information such as flaw, type, material alloy type, contract or report identification number, and other pertinent parameters associated with the data used to generate these reliability curves and tables are included wherever possible.

(a) Range Interval Method of Data Cumulation

02-JUL-75		ULTRASONIC BY LENGTH			TEST 1 - MARTIN (1)		RANGE		
RANGE	MIN LN	* MAX LN	* N	DET	50%	95%	0 MISS	1 MISS	
1	7	21	30	4	9	3	0	0	
2	25	36	40	15	30	20	0	0	
3	38	52	72	40	54	45	0	0	
4	54	67	120	98	81	74	0	0	
5	68	82	132	117	88	83	0	0	
6	83	97	87	72	82	74	0	0	
7	98	108	39	38	95	88	7	22	
8	115	126	33	31	91	82	28	43	
9	129	141	42	41	96	89	4	19	
10	146	153	18	17	90	78	23	43	
11	158	171	9	8	82	57	0	0	
12	182	184	9	8	82	57	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	241	247	12	11	86	66	0	0	
17	248	262	51	51	98	94	0	0	
18	268	275	9	9	92	71	3	0	
19	279	290	15	15	95	81	14	21	
20	295	306	15	15	95	81	14	21	
21	310	322	27	27	97	89	2	13	
22	323	335	30	30	97	90	0	15	
23	338	347	18	18	96	84	11	15	
24	362	362	3	3	79	36	0	0	
25	381	381	3	3	79	36	0	0	
26	393	393	3	3	79	36	0	0	
27	408	408	3	3	79	36	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	453	466	6	6	89	60	0	0	
32	475	979	90	89	98	94	0	0	

Crack Length (Mils) *

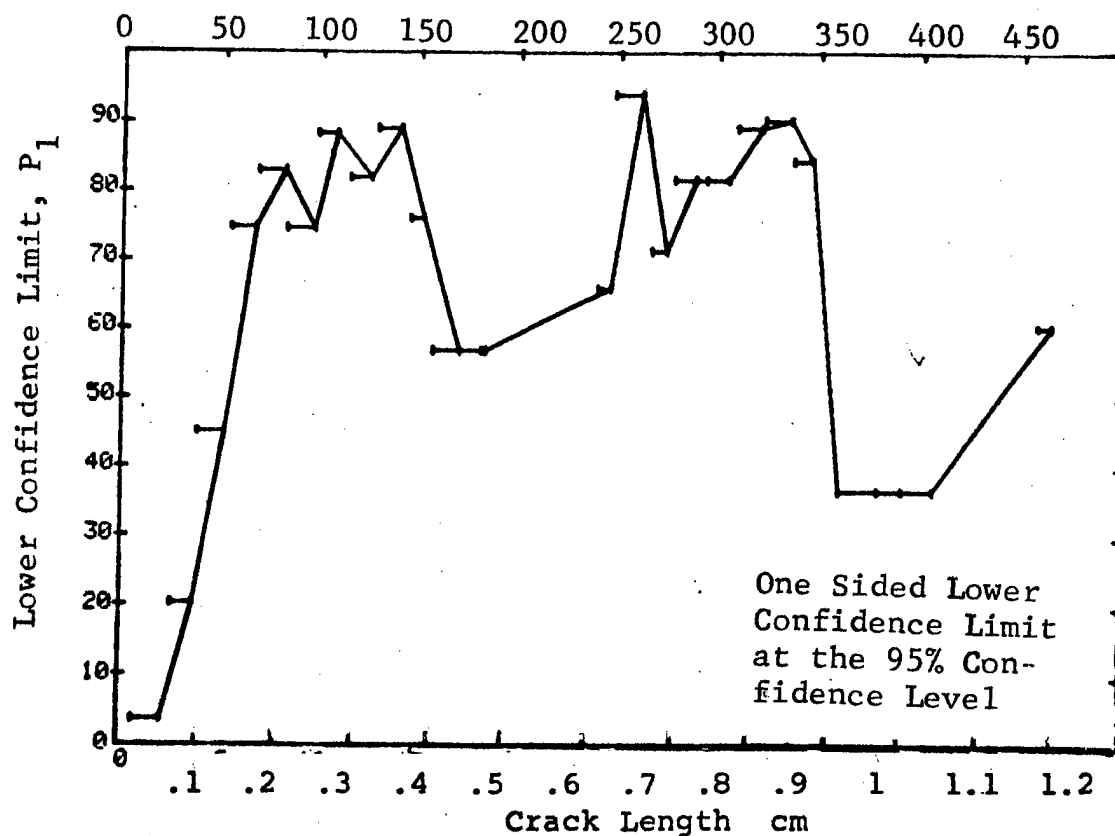


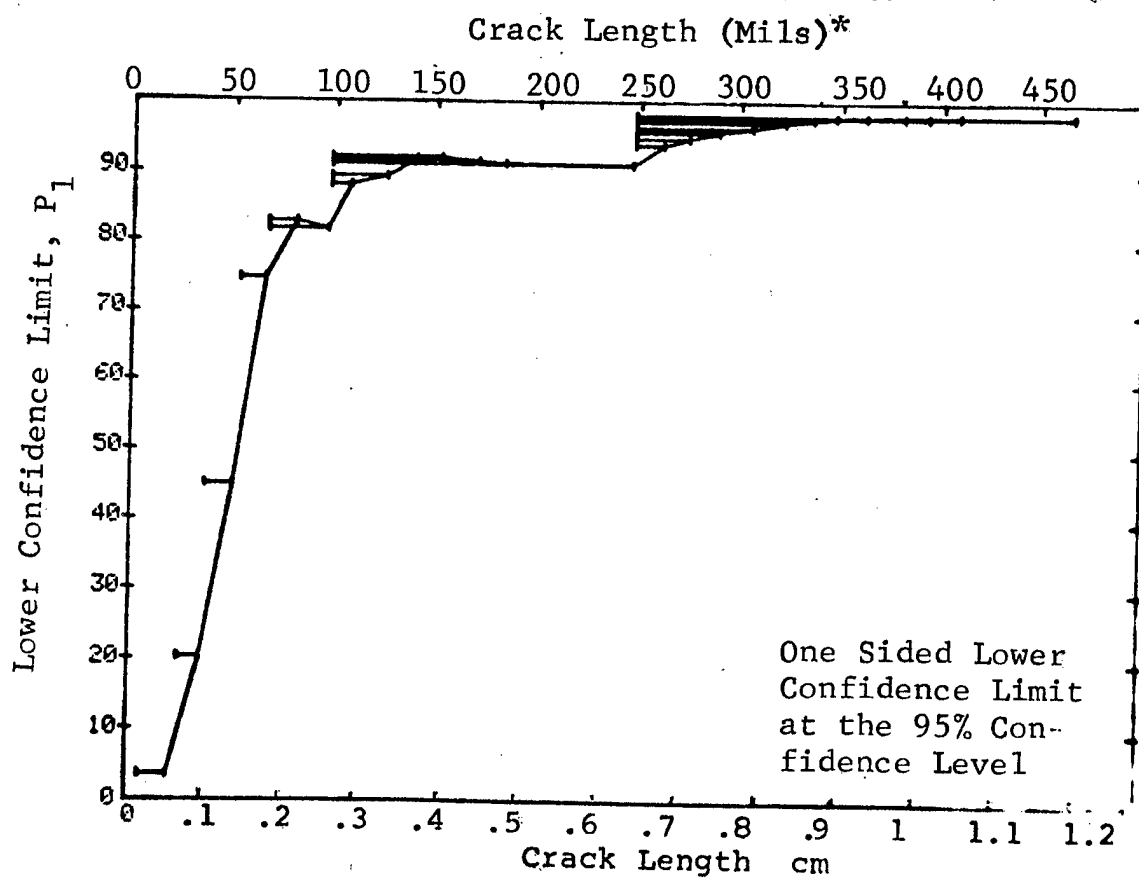
Figure D-1 Probability of Detection for 2219-T87 Al Using Ultrasonic Surface Waves. Fatigue Cracks in Flat Plates. Lab. Env.

D-8

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

(b) Optimum Probability Method of Data Cumulation

02-JUL-75	ULTRASONIC BY LENGTH			TEST 2, MARTIN (1)			MCD	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	MISS	1 MISS
1	7*	21	39	4	0	3	0	0
2	25	36	48	15	0	20	0	0
3	38	52	72	40	0	45	0	0
4	54	67	120	98	0	74	0	0
5	68	82	132	117	0	83	0	0
6	68	97	219	189	0	81	0	0
7	98	108	39	38	0	88	7	22
8	98	126	72	69	0	99	4	17
9	98	141	114	110	0	92	0	0
10	98	153	132	127	0	92	0	0
11	98	171	141	135	0	91	0	0
12	98	184	150	143	0	91	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	98	247	162	154	0	91	0	0
17	248	262	51	51	0	94	0	0
18	248	275	60	60	0	95	0	0
19	248	290	75	75	0	96	0	0
20	248	306	90	90	0	96	0	0
21	248	322	117	117	0	97	0	0
22	248	336	147	147	0	97	0	0
23	248	347	165	165	0	98	0	0
24	248	362	168	168	0	98	0	0
25	248	381	171	171	0	98	0	0
26	248	393	174	174	0	98	0	0
27	248	408	177	177	0	98	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	248	466	183	183	0	98	0	0
32	248	979	273	272	0	98	0	0



(c) Overlapping Sixty Point Method of Data Cumulation

02-JUL-75 ULTRASONIC BY LENGTH					TEST 3, MARTIN (1)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	7	20	33	4	11	4	0	0	
5	8	30	60	10	16	9	0	0	
6	21	40	60	16	25	17	0	0	
7	31	45	60	20	32	23	0	0	
8	40	51	60	33	54	43	0	0	
9	45	58	60	42	69	58	0	0	
10	52	61	60	43	70	60	0	0	
11	58	64	60	53	87	79	0	0	
12	62	67	60	56	92	85	0	0	
13	64	70	60	53	87	79	0	0	
14	67	73	60	52	85	77	0	0	
15	70	77	60	50	82	73	0	0	
16	74	80	60	52	85	77	0	0	
17	77	83	60	56	92	85	0	0	
18	80	87	60	53	87	79	0	0	
19	84	95	60	52	85	77	0	0	
20	90	102	60	51	83	75	0	0	
21	96	115	60	52	85	77	0	0	
22	103	129	60	58	95	89	1	1	
23	117	136	60	60	98	95	0	0	
24	129	158	60	58	95	89	1	1	
25	138	248	60	55	90	83	43	43	
26	162	258	60	57	93	87	16	16	
27	249	279	60	60	98	95	0	0	
28	258	310	60	60	98	95	0	0	
29	279	326	60	60	98	95	0	0	
30	310	340	60	60	98	95	0	0	
31	326	466	60	60	98	95	0	0	
32	342	500	60	60	98	95	0	0	

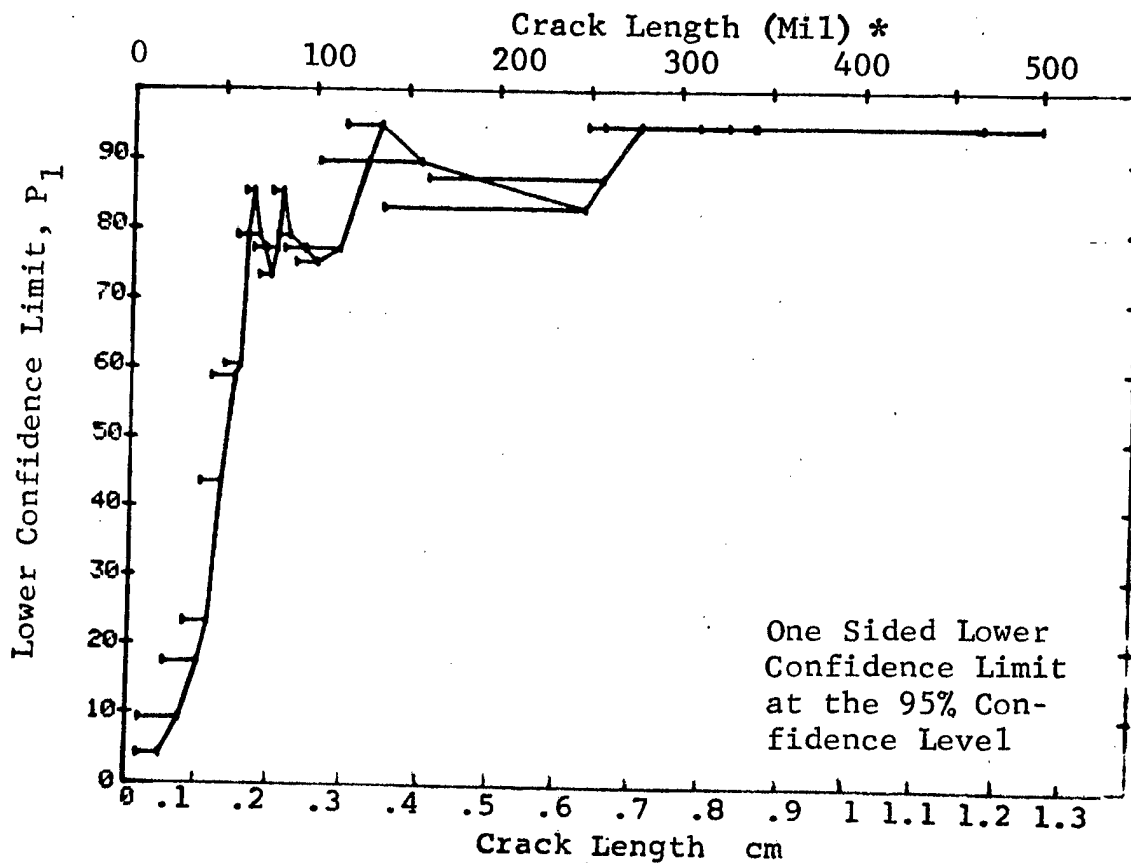


Figure D-1 (Concluded)

(a) Range Interval Method of Data Cumulation

02-JUL-75				TEST 1, PENET, MHPT, (2)				RANGE		
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	W	MI
1		7*		21	*	39	4	9	3	0
2		25		36		48	13	26	16	0
3		38		52		72	23	31	22	0
4		54		67		120	63	52	44	0
5		68		82		132	91	68	61	0
6		83		97		87	60	68	59	0
7		98		108		39	23	57	44	0
8		115		126		33	15	43	30	0
9		129		141		42	26	60	48	0
10		146		153		18	11	58	39	0
11		158		171		9	3	28	9	0
12		182		185		9	5	50	25	0
13		0		0		0	0	0	0	0
14		0		0		0	0	0	0	0
15		0		0		0	0	0	0	0
16	241		247		12	12	94	77	17	34
17	248		262		51	50	96	91	0	10
18	268		275		9	7	71	45	0	0
19	279		290		15	13	82	63	0	0
20	295		306		15	14	89	72	0	0
21	310		322		27	19	68	52	0	0
22	323		336		30	27	87	76	46	0
23	338		347		18	15	79	62	0	0
24	362		362		3	3	79	36	0	0
25	381		381		3	3	79	36	0	0
26	393		393		3	3	79	36	0	0
27	408		408		3	3	79	36	0	0
28	0		0		0	0	0	0	0	0
29	0		0		0	0	0	0	0	0
30	0		0		0	0	0	0	0	0
31	459		466		6	4	57	27	0	0
32	474		979		90	83	91	85	30	0

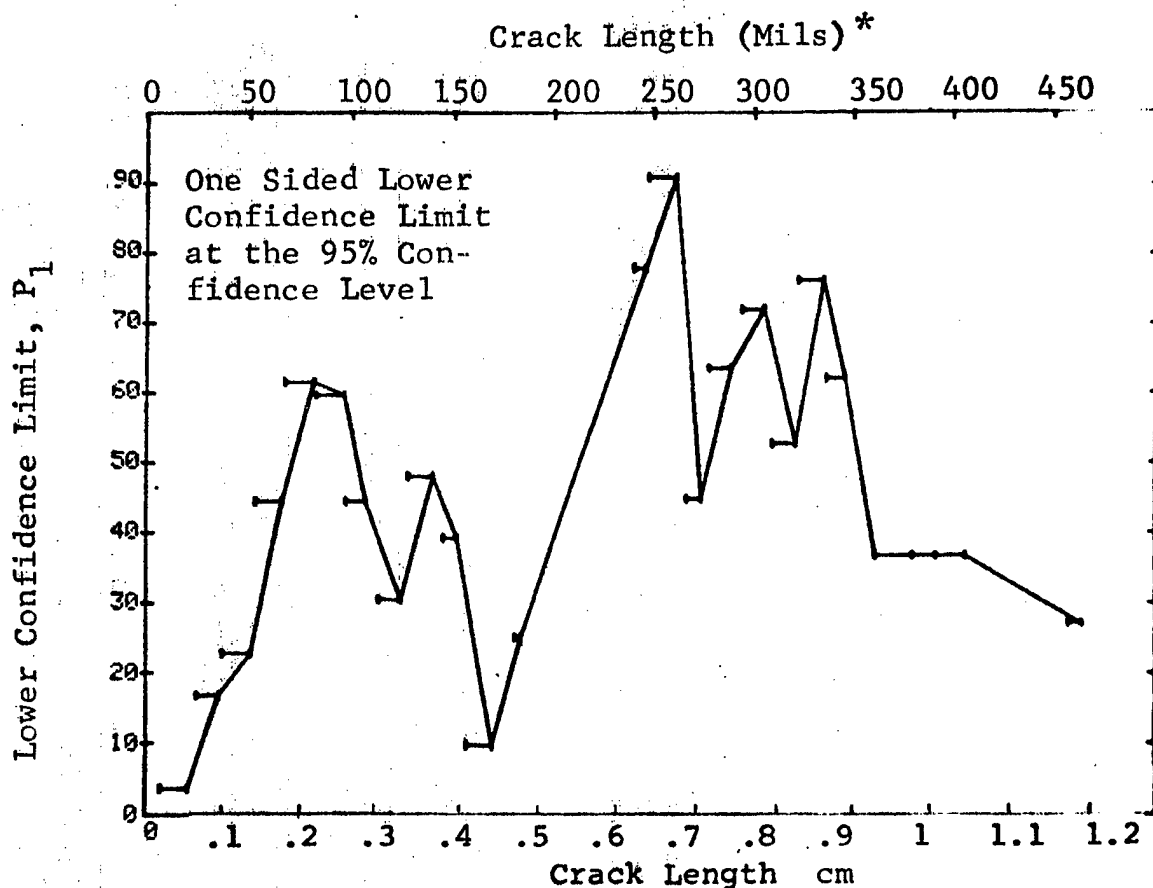


Figure D-2 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Fatigue Cracks in Flat Plates.

Lab. Env.

(b) Optimum Probability Method of Data Cumulation

02-JUL-75	PENETRANT		TEST 2		PENET		MARTIN (2)	MCD
RANGE	MIN LN	MAX LN	DET	50%	95%	0 MICS		
1	7	21 *	4	0	3	0		
2	25	36	13	0	16	0		
3	25	52	36	0	23	0		
4	54	67	63	0	44	0		
5	68	82	91	0	61	0		
6	68	97	151	0	63	0		
7	68	106	174	0	62	0		
8	54	126	252	0	57	0		
9	68	141	215	0	60	0		
10	68	153	226	0	59	0		
11	68	171	229	0	59	0		
12	68	185	234	0	59	0		
13	0	0	0	0	0	0		
14	0	0	0	0	0	0		
15	0	0	0	0	0	0		
16	241	247	12	0	77	0		
17	241	262	62	0	92	0		
18	241	275	69	0	89	4		
19	241	290	82	0	88	16		
20	241	306	96	0	88	0		
21	241	322	115	0	83	0		
22	241	336	142	0	84	0		
23	241	347	157	0	84	0		
24	241	362	160	0	84	0		
25	241	381	163	0	84	0		
26	241	393	166	0	84	0		
27	241	408	169	0	84	0		
28	0	0	0	0	0	0		
29	0	0	0	0	0	0		
30	0	0	0	0	0	0		
31	241	466	173	0	84	0		
32	241	979	256	0	86	0		

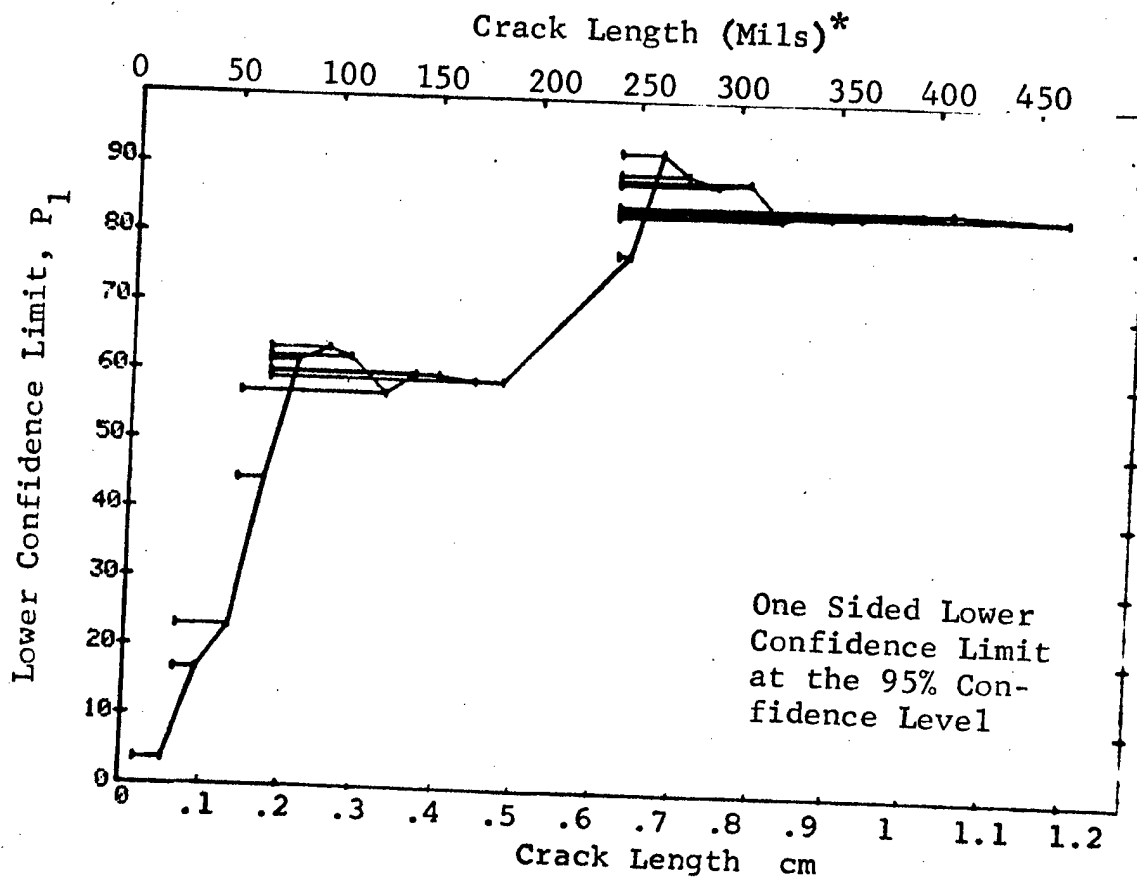


Figure D-2 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

02-JUL-75				TEST 3, MARTIN (2)			
RANGE	MIN	LN	%	DEF	50%	95%	9
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	7	20	33	2	5	1	0
6	8	30	60	11	17	10	0
7	21	40	60	15	24	16	0
8	31	45	60	15	24	16	0
9	40	51	60	21	34	24	0
10	45	58	60	24	39	29	0
11	52	61	60	28	45	35	0
12	58	64	60	34	55	45	0
13	62	67	60	32	52	41	0
14	64	70	60	35	57	46	0
15	67	73	60	38	62	51	0
16	70	77	60	31	50	40	0
17	74	80	60	40	65	55	0
18	77	83	60	56	92	85	29
19	80	87	60	55	90	83	40
20	84	95	60	41	67	57	0
21	90	102	60	29	47	37	0
22	96	115	60	31	50	40	0
23	103	129	60	34	55	45	0
24	117	136	60	34	55	45	0
25	129	158	60	37	60	50	0
26	138	248	60	40	65	55	0
27	162	256	60	51	83	75	94
28	249	279	60	57	93	87	16
29	258	310	60	52	85	77	82
30	279	326	60	49	80	71	0
31	310	340	60	49	80	71	0
32	326	466	60	52	85	77	0
33	342	500	60	53	87	79	0

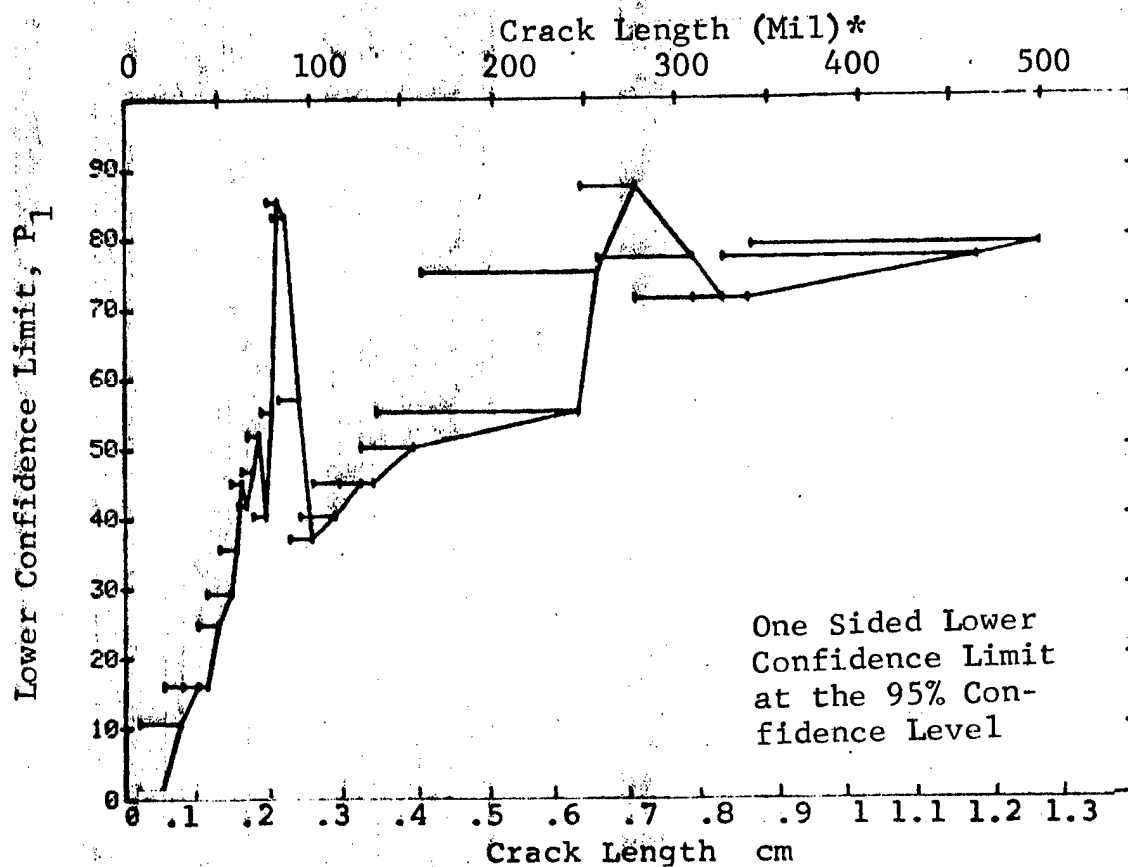


Figure D-2 (Concluded)

(a) Range Interval Method of Data Cumulation

02-JUL-75	EDDY CURRENT			TEST 1 EDDY CURRENT				(1) RANGE
RANGE	MIN	LN *	MAX LN *	N	DET	50%	95%	0 MILS
1	7	21	39	5	11	5	0	
2	25	36	48	10	20	11	0	
3	38	52	72	40	54	45	0	
4	54	67	120	85	70	63	0	
5	68	82	133	109	81	75	0	
6	83	97	87	78	88	82	67	20
7	98	108	39	39	98	92	0	50
8	115	126	33	30	88	78	43	47
9	129	141	42	39	91	82	34	20
10	146	153	18	18	96	84	11	0
11	158	171	9	9	92	71	0	0
12	182	185	9	7	71	45	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	241	247	12	11	86	66	0	0
17	248	262	51	51	98	94	0	0
18	268	275	9	9	92	71	0	0
19	279	290	14	13	88	70	0	0
20	295	306	15	14	89	72	0	0
21	310	322	27	26	93	83	19	34
22	323	336	30	30	97	90	0	16
23	338	347	18	16	85	68	0	0
24	362	362	3	3	79	36	0	0
25	381	381	3	3	79	36	0	0
26	393	393	3	3	79	36	0	0
27	408	408	3	3	79	36	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	459	466	6	6	89	60	0	0
32	475	979	90	85	93	88	13	20

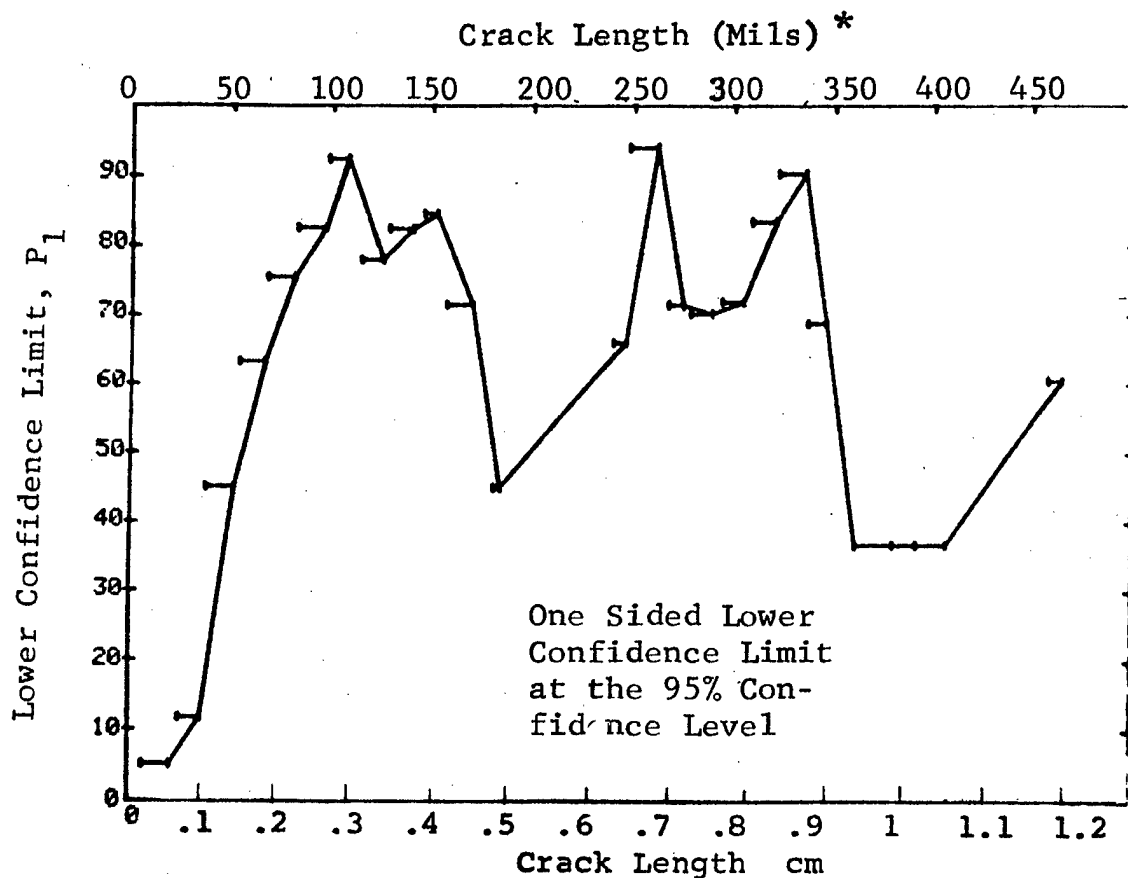


Figure D-3 Probability of Detection for 2219-T87 Al Using Eddy Current. Fatigue Cracks in Flat Plates. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

07-JUL-75			EDDY CURRENT			TEST 2, MARTIN, (3)			MCD	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS		
1	7*	21*	39	5	0	5	0	0		
2	25	86	48	10	0	11	0	0		
3	38	52	72	40	0	45	0	0		
4	54	67	120	84	0	62	0	0		
5	68	82	133	109	0	75	0	0		
6	83	97	87	78	0	82	67	80		
7	98	108	39	39	0	92	0	7		
8	98	126	72	69	0	89	4	17		
9	98	141	113	107	0	89	0	0		
10	98	153	131	125	0	91	0	0		
11	98	171	140	134	0	91	0	0		
12	98	185	149	141	0	90	0	0		
13	0	0	0	0	0	0	0	0		
14	0	0	0	0	0	0	0	0		
15	0	0	0	0	0	0	0	0		
16	98	247	161	152	0	90	0	0		
17	248	262	51	51	0	94	0	0		
18	248	275	60	60	0	95	0	0		
19	248	290	74	73	0	93	0	0		
20	248	306	89	87	0	93	0	0		
21	248	322	116	113	0	93	0	0		
22	248	336	146	143	0	94	0	0		
23	248	347	164	159	0	93	0	0		
24	248	362	167	162	0	93	0	0		
25	248	381	170	165	0	93	0	0		
26	248	393	173	168	0	94	0	0		
27	248	408	176	171	0	94	0	0		
28	0	0	0	0	0	0	0	0		
29	0	0	0	0	0	0	0	0		
30	0	0	0	0	0	0	0	0		
31	248	466	182	177	0	94	0	0		
32	248	979	272	261	0	93	0	0		

Crack Length (Mils)*

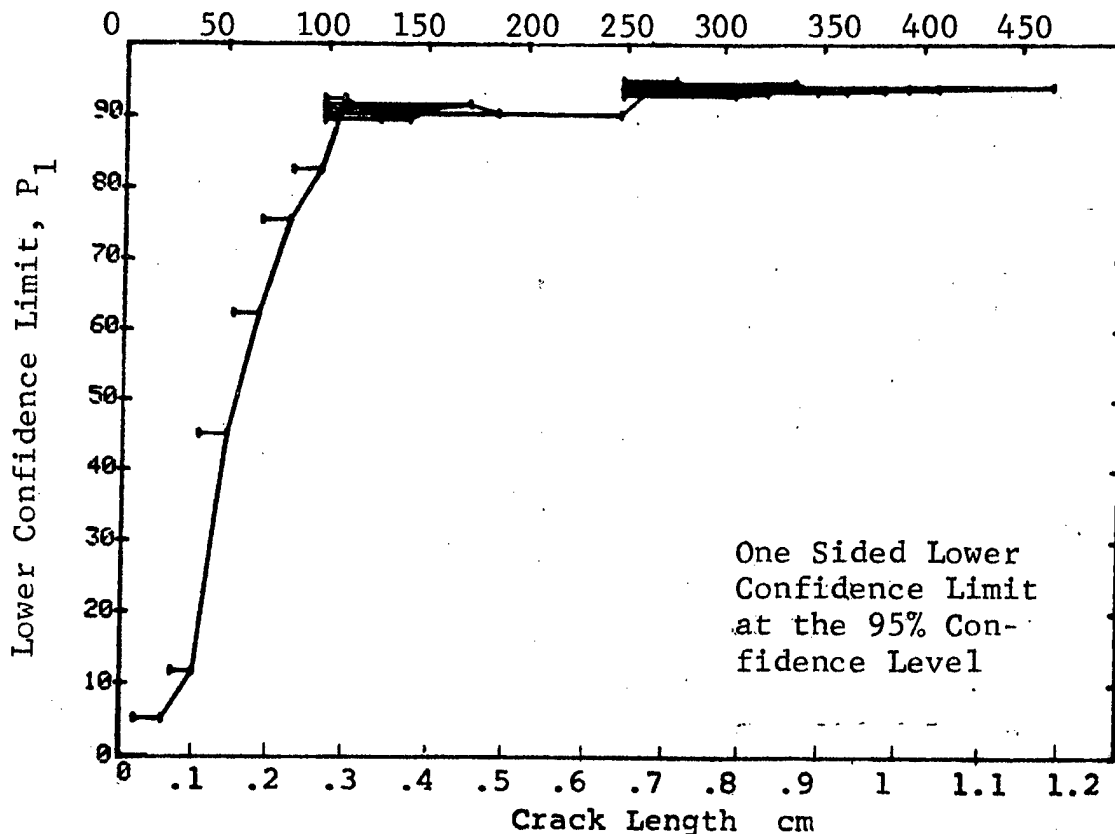


Figure D-3 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

02-JUL-75				TEST 3 EDDY CURRENT DATA (3)						
RANGE	MIN LN	* MAX LN	* N	DET	50%	95%	0 MIC	100%	150%	
1	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	
4	7	20	33	4	11	4	0	0	0	
5	8	30	60	11	17	10	0	0	0	
6	21	40	60	14	22	14	0	0	0	
7	31	45	60	22	35	26	0	0	0	
8	40	51	60	33	54	43	0	0	0	
9	45	58	60	36	59	48	0	0	0	
10	52	61	60	38	62	51	0	0	0	
11	58	64	60	44	72	62	0	0	0	
12	62	67	60	47	77	67	0	0	0	
13	64	70	60	46	75	65	0	0	0	
14	67	73	60	43	70	60	0	0	0	
15	70	77	60	43	70	60	0	0	0	
16	74	80	60	52	85	77	82	24	24	
17	77	83	60	57	93	87	16	16	16	
18	80	87	60	54	88	81	56	56	56	
19	83	95	60	55	90	83	43	43	43	
20	87	102	60	56	92	85	29	29	29	
21	95	115	60	54	88	81	56	56	56	
22	102	129	60	56	92	85	29	29	29	
23	115	136	60	58	95	89	1	1	1	
24	129	158	60	58	95	89	1	1	1	
25	136	248	60	56	92	85	29	29	29	
26	158	258	60	57	93	87	16	16	16	
27	248	279	60	60	98	95	0	0	0	
28	258	310	60	58	95	89	1	1	1	
29	279	326	60	57	93	87	16	16	16	
30	310	340	60	57	93	87	16	16	16	
31	326	466	60	58	95	89	1	1	1	
32	342	500	60	58	95	89	1	1	1	

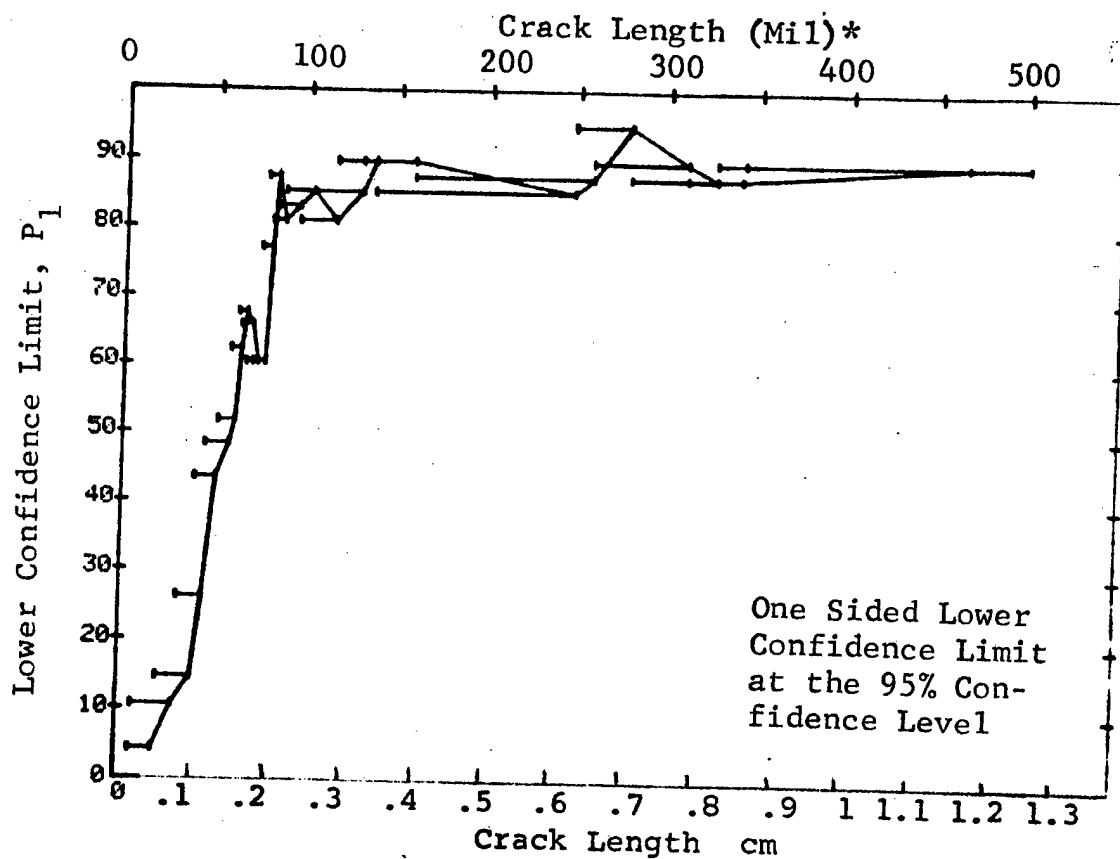


Figure D-3 (Concluded)

(a) Range Interval Method of Data Cumulation

02-JUL-75 RADIOGRAPHY				TEST 1 X-RAY MARTIN 4			
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MICS
1	7	21	39	1	1	0	0
2	25	36	48	0	0	0	0
3	38	52	71	2	2	0	0
4	54	67	116	2	1	0	0
5	68	82	134	2	1	0	0
6	83	97	96	1	0	0	0
7	98	108	39	1	1	0	0
8	115	126	33	0	0	0	0
9	129	141	42	1	1	0	0
10	146	153	18	1	3	0	0
11	158	171	9	0	0	0	0
12	182	185	9	1	7	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	241	247	12	0	0	0	0
17	248	262	51	4	7	2	0
18	268	275	9	0	0	0	0
19	279	290	16	0	0	0	0
20	295	306	14	1	4	0	0
21	310	322	27	2	6	1	0
22	323	336	30	1	2	0	0
23	338	347	18	0	0	0	0
24	362	362	3	0	0	0	0
25	381	381	3	0	0	0	0
26	393	393	3	0	0	0	0
27	408	408	3	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	459	466	6	1	10	0	0
32	475	979	94	71	74	67	0

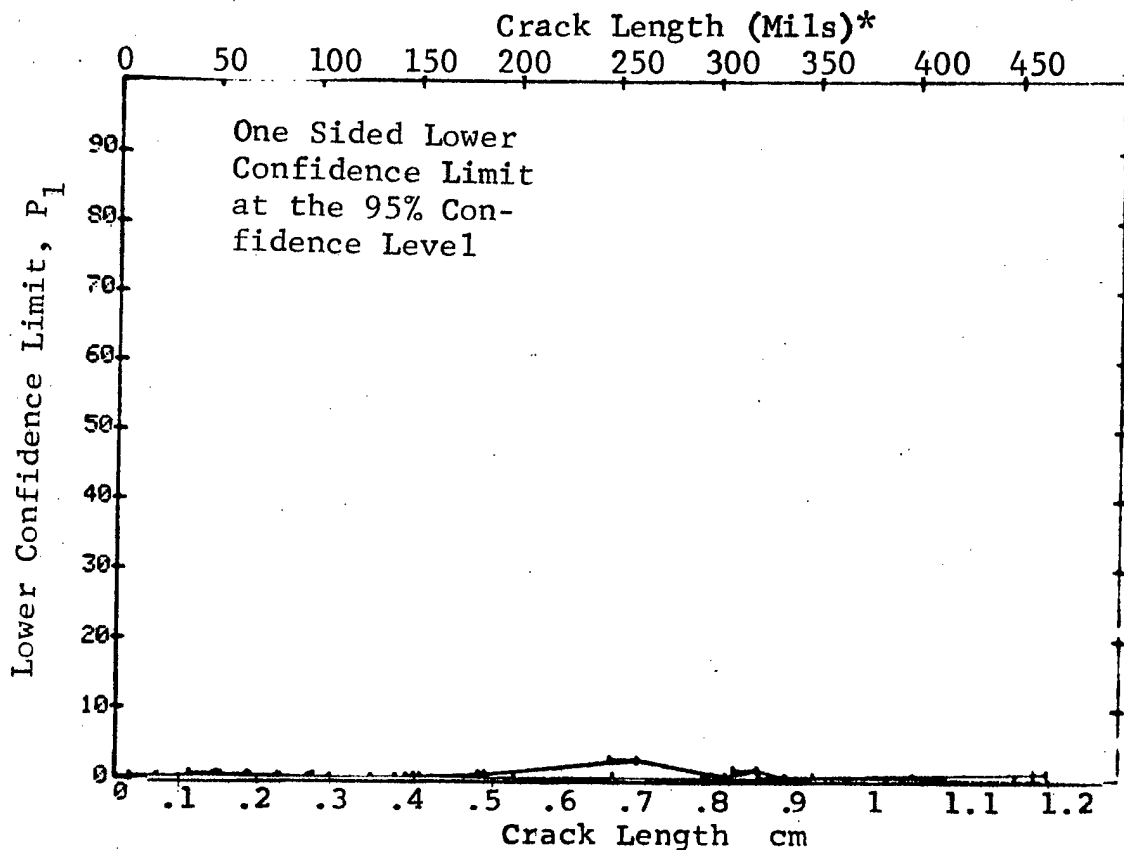


Figure D-4 Probability of Detection for 2219-T87 Al Using X-ray. Fatigue Cracks in Flat Plates. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

02-JUL-75				TEST 2, X-RAY, MARTIN 14					
RANGE	MIN LN.	* MAX LN *	N	DET	50%	95%	0 MISS	1.00	
1	7	21	39	1	0	0	0	0	
2	7	35	87	1	0	0	0	0	
3	7	52	158	3	0	0	0	0	
4	38	67	187	4	0	0	0	0	
5	38	82	321	6	0	0	0	0	
6	38	97	407	7	0	0	0	0	
7	38	108	446	8	0	0	0	0	
8	38	126	479	8	0	0	0	0	
9	38	141	521	9	0	0	0	0	
10	38	153	539	10	0	1	0	0	
11	38	171	548	10	0	0	0	0	
12	38	185	557	11	0	1	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	38	247	569	11	0	1	0	0	
17	182	262	72	5	0	0	0	0	
18	182	275	81	5	0	0	0	0	
19	146	290	124	6	0	0	0	0	
20	146	306	138	7	0	0	0	0	
21	182	322	138	8	0	0	0	0	
22	182	336	168	9	0	0	0	0	
23	146	347	213	10	0	0	0	0	
24	146	362	216	10	0	0	0	0	
25	146	381	219	10	0	0	0	0	
26	146	393	222	10	0	0	0	0	
27	146	408	225	10	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	146	466	231	11	0	0	0	0	
32	475	979	94	71	0	0	0	0	

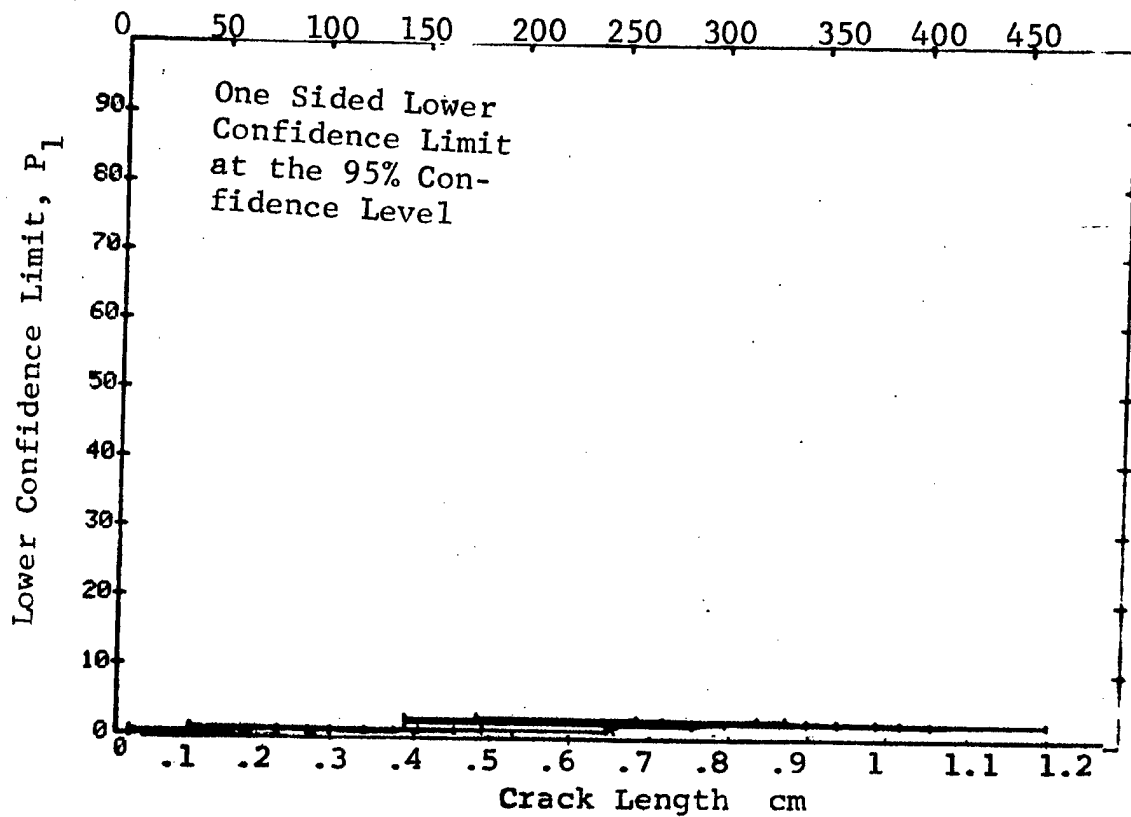


Figure D-4 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

02-JUL-75				TEST 3, X-RAY				MARTIN	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	2 MISS
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	7	30	59	1	1	0	0	0	0
6	20	38	60	0	0	0	0	0	0
7	30	45	60	1	1	0	0	0	0
8	38	50	60	2	2	0	0	0	0
9	45	58	60	1	1	0	0	0	0
10	51	61	60	1	1	0	0	0	0
11	58	64	60	1	1	0	0	0	0
12	61	67	60	1	1	0	0	0	0
13	64	70	60	1	1	0	0	0	0
14	67	74	60	1	1	0	0	0	0
15	70	77	60	1	1	0	0	0	0
16	74	80	60	1	1	0	0	0	0
17	77	83	60	1	1	0	0	0	0
18	80	87	60	1	1	0	0	0	0
19	83	95	60	1	1	0	0	0	0
20	87	102	60	1	1	0	0	0	0
21	95	115	60	1	1	0	0	0	0
22	103	129	60	1	1	0	0	0	0
23	117	136	60	1	1	0	0	0	0
24	129	158	60	1	1	0	0	0	0
25	138	248	60	2	2	0	0	0	0
26	162	258	60	5	7	3	0	0	0
27	249	279	60	4	6	2	0	0	0
28	258	310	60	1	1	0	0	0	0
29	279	326	60	3	4	1	0	0	0
30	310	340	60	3	4	1	0	0	0
31	326	466	60	2	2	0	0	0	0
32	342	500	60	26	42	20	0	0	0

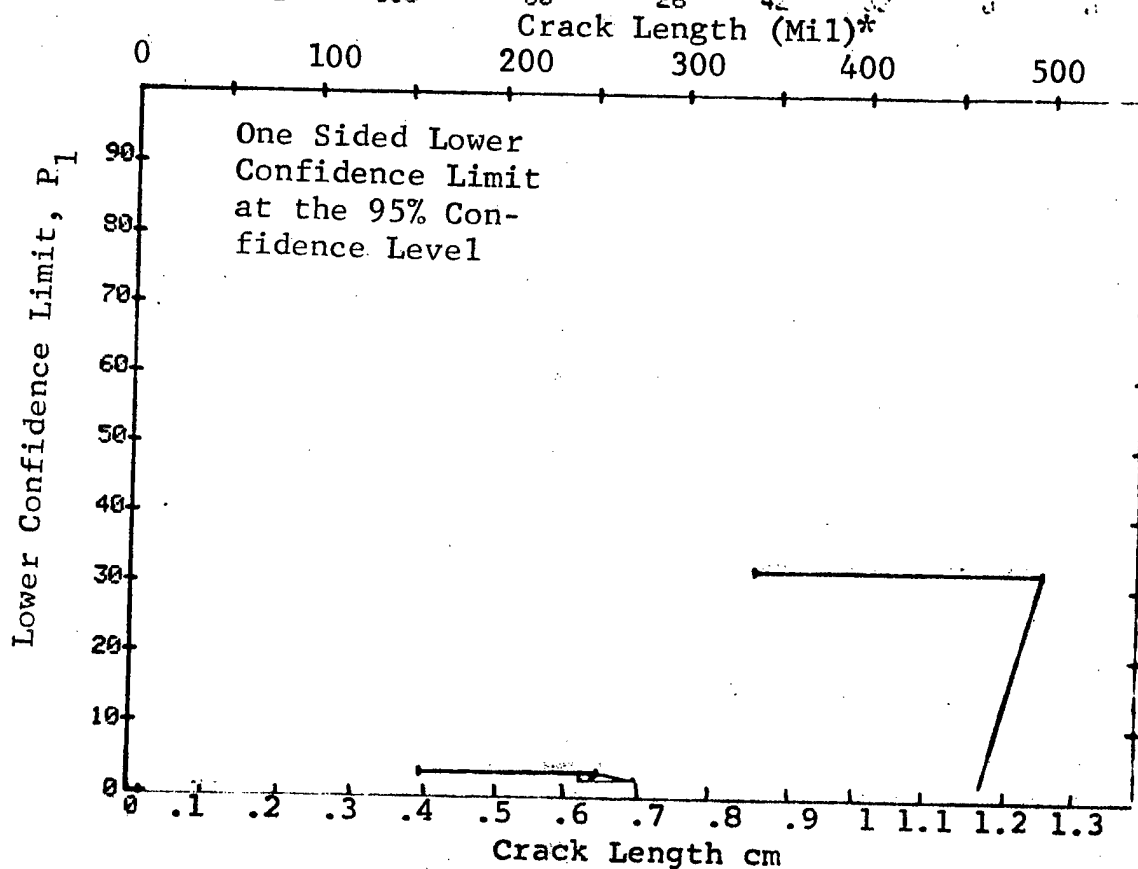


Figure D-4 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75			ULTRASONIC BY LENGTH		TEST 1, MARTIN 15			RANGE	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	MISS	1 MISS	
1	7	* 21 *	39	12	29	18	0	0	
2	25	36	48	35	71	60	0	0	
3	38	52	72	58	79	71	0	0	
4	54	67	120	101	83	77	0	0	
5	66	82	132	119	89	84	0	0	
6	83	97	87	76	86	79	92	100	
7	98	108	39	33	83	71	0	0	
8	115	126	33	27	79	67	0	0	
9	129	141	42	37	86	76	61	74	
10	146	153	18	16	85	68	0	0	
11	158	171	9	7	71	45	0	0	
12	182	185	9	9	92	71	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	241	247	12	11	86	66	0	0	
17	248	262	51	51	98	94	0	0	
18	268	275	9	9	92	71	0	0	
19	279	290	15	14	89	72	0	0	
20	295	306	15	15	95	81	14	31	
21	310	322	27	25	90	78	34	42	
22	323	336	29	28	94	84	17	32	
23	338	347	18	16	85	68	0	0	
24	362	362	3	3	79	36	0	0	
25	381	381	3	3	79	36	0	0	
26	393	393	3	3	79	36	0	0	
27	408	408	3	3	79	36	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	459	466	6	6	89	60	0	0	
32	475	979	90	83	91	85	30	50	

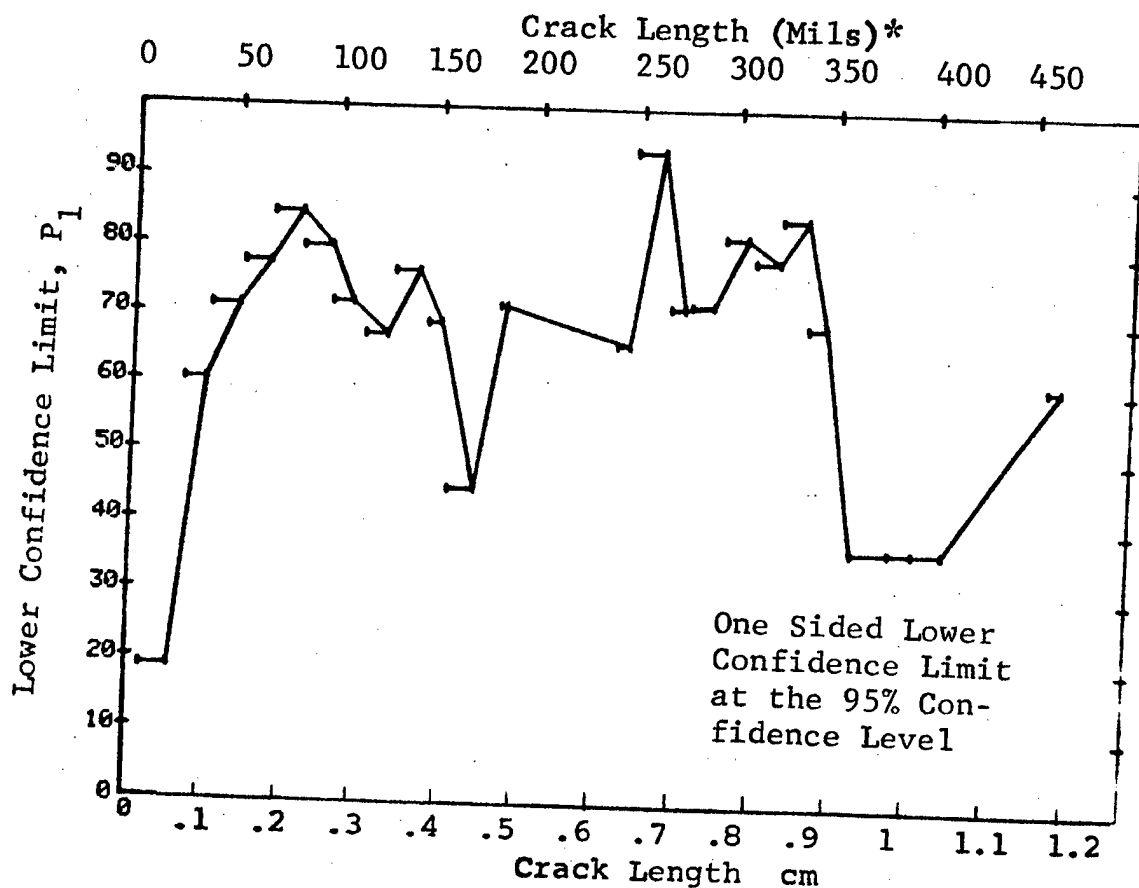


Figure D-5. Probability of Detection for 2219-T87 Al Using Ultrasonic Surface Waves. Etched Fatigue Cracks in Flat Plates. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75 ULTRASONIC BY LENGTH				TEST 2, MARTIN (5)			MCD	
RANGE	MIN LN	* MAX LN	* N	DET	50%	95%	0 MISS	1 MISS
1	7	21	33	12	0	18	0	0
2	25	36	48	35	0	60	0	0
3	38	52	72	58	0	71	0	0
4	38	67	192	159	0	77	0	0
5	68	82	132	119	0	84	0	0
6	68	97	219	195	0	84	0	0
7	68	108	258	228	0	84	0	0
8	68	126	291	255	0	83	0	0
9	68	141	333	292	0	84	0	0
10	68	153	351	308	0	84	0	0
11	68	171	360	315	0	84	0	0
12	68	185	369	324	0	84	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	68	247	381	335	0	84	0	0
17	248	262	51	51	0	94	0	0
18	248	275	60	60	0	95	0	0
19	248	290	75	74	0	93	0	0
20	248	306	90	89	0	94	0	0
21	248	322	117	114	0	93	0	0
22	248	336	146	142	0	93	0	0
23	182	347	185	178	0	93	0	0
24	182	362	188	181	0	93	0	0
25	182	381	191	184	0	93	0	0
26	182	393	194	187	0	93	0	0
27	182	408	197	190	0	93	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	182	466	203	196	0	93	0	0
32	182	979	293	279	0	93	0	0

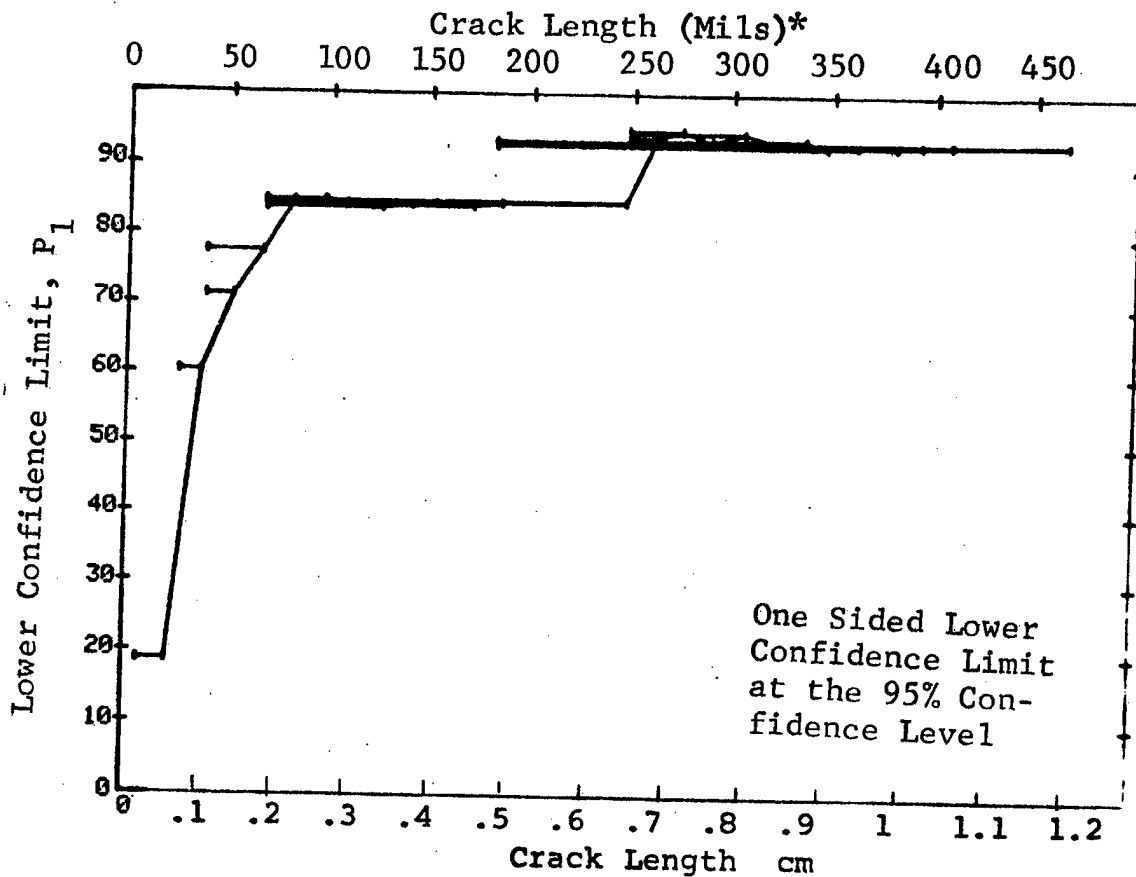


Figure D-5 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75			ULTRASONIC BY LENGTH			TEST 3, MARTIN 150				
RANGE	MIN LN	* MAX LN	N	DET	50%	95%	MISS	1 MISS		
1	0	0	0	0	0	0	0	0		
2	0	0	0	0	0	0	0	0		
3	0	0	0	0	0	0	0	0		
4	7	20	32	8	23	13	0	0		
5	7	30	60	29	47	37	0	0		
6	20	40	60	42	69	58	0	0		
7	30	45	60	43	70	60	0	0		
8	40	51	60	48	79	69	0	0		
9	45	58	60	47	77	67	0	0		
10	51	61	60	49	80	71	0	0		
11	58	64	60	57	93	87	16	29		
12	61	67	60	53	87	79	69	82		
13	64	70	60	51	83	75	94	100		
14	67	73	60	53	87	79	69	82		
15	70	77	60	50	82	73	0	0		
16	73	80	60	53	87	79	69	82		
17	77	83	60	59	97	92	0	1		
18	80	87	60	55	90	83	42	56		
19	83	95	60	53	87	79	69	82		
20	87	102	60	51	83	75	94	100		
21	95	115	60	47	77	67	0	0		
22	102	129	60	51	83	75	94	100		
23	115	136	60	53	87	79	69	82		
24	129	158	60	53	87	79	69	82		
25	136	248	60	54	88	81	56	73		
26	158	258	60	57	93	87	16	1		
27	248	279	60	60	98	95	0	0		
28	258	310	60	59	97	93	0	0		
29	279	326	60	57	93	87	16	1		
30	310	340	60	56	92	85	16	1		
31	326	466	60	57	93	87	16	1		
32	342	500	60	56	92	85	16	1		

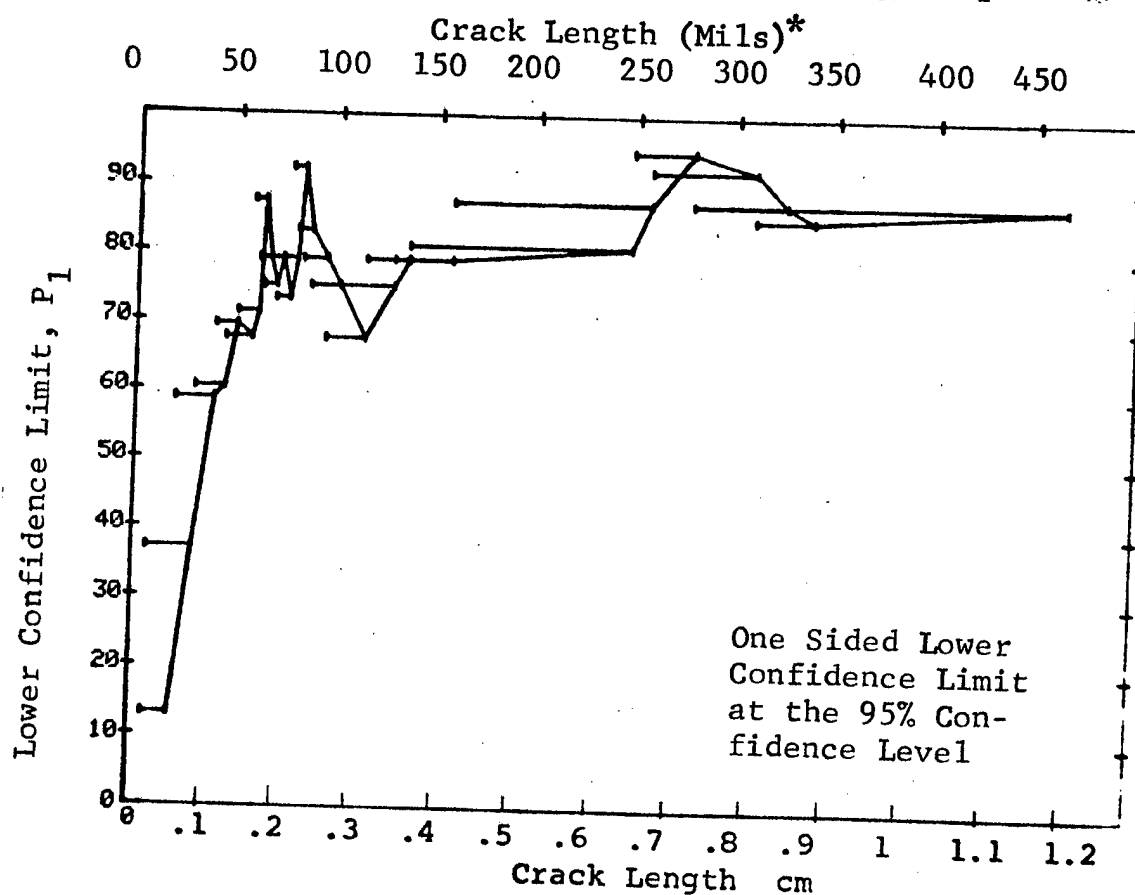


Figure D-5 (Concluded)

(a) Range Interval Method of Data Cumulation

02-JUL-75	PENETRANT		TEST 1 . PENET .		MILITARY		RANGE
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MIL
1	7 *	21 *	39	10	24	14	0
2	25	36	48	31	63	51	0
3	38	52	72	57	78	69	0
4	54	67	119	98	81	75	0
5	68	82	132	113	85	79	0
6	83	97	87	79	90	84	55
7	98	108	39	39	98	92	0
8	115	126	33	27	79	67	0
9	129	141	42	41	96	89	4
10	146	153	18	16	85	68	0
11	158	171	9	9	92	71	0
12	182	185	9	9	92	71	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	241	247	12	11	86	66	0
17	248	262	51	51	98	94	0
18	268	275	9	9	92	71	0
19	279	290	15	15	95	81	14
20	295	306	15	15	95	81	14
21	310	322	27	25	90	78	34
22	323	336	30	30	97	90	0
23	338	347	18	16	85	68	0
24	362	362	3	3	79	36	0
25	381	381	3	3	79	36	0
26	393	393	3	2	58	13	0
27	408	408	3	3	79	36	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	459	466	6	6	89	60	0
32	475	979	91	91	99	96	0

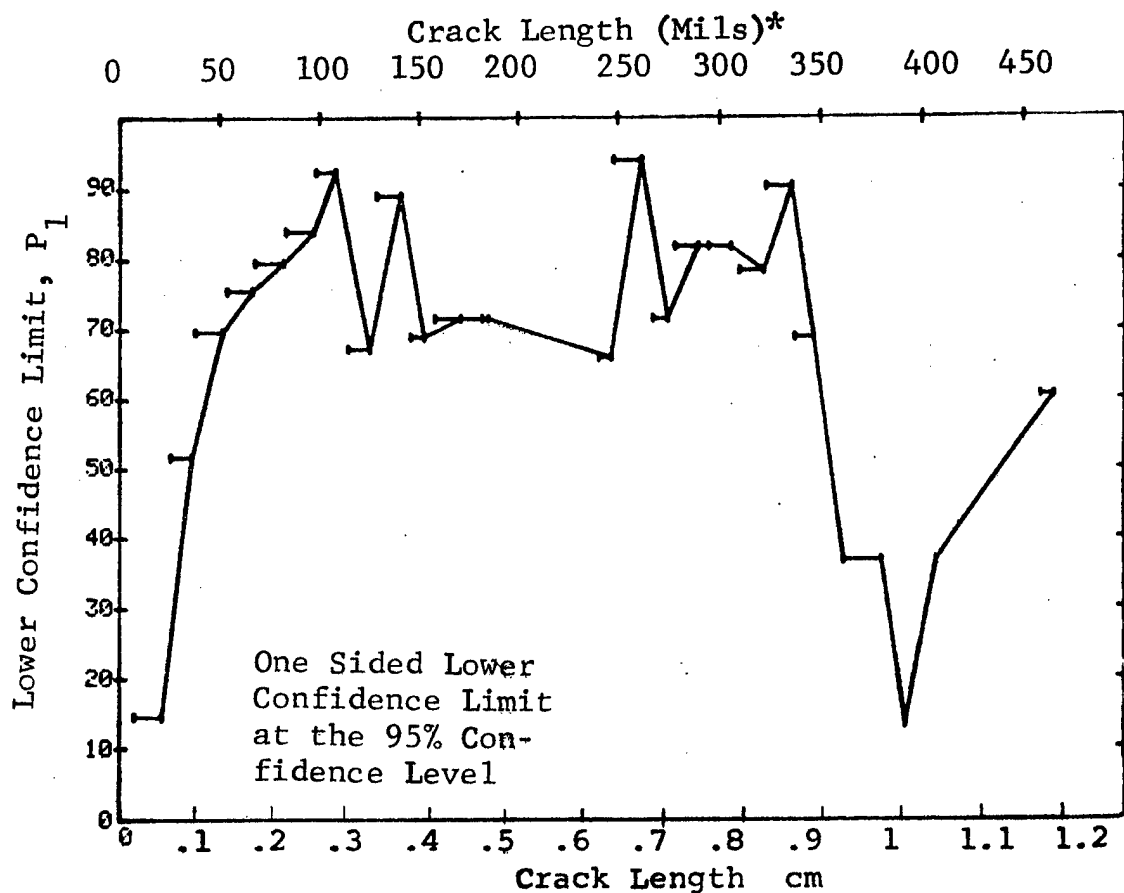


Figure D-6 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

02-JUL-75				PENETRANT			TEST 2, PENET			MAR 10 1976		MCD
RANGE	MIN	LN	MAX LN *	N	DET	50%	95%	0	100%	0	100%	1 MIN
1		7	21	39	10	0	14	0	0	0	0	0
2	25	36	48	48	31	0	51	0	0	0	0	0
3	38	52	72	72	57	0	69	0	0	0	0	0
4	38	67	191	191	155	0	75	0	0	0	0	0
5	54	82	251	251	211	0	79	0	0	0	0	0
6	83	97	87	87	79	0	84	55	67	0	0	0
7	98	108	39	39	39	0	92	0	0	0	0	0
8	83	126	159	159	145	0	86	0	0	0	0	0
9	129	141	42	42	41	0	89	4	19	0	0	0
10	83	153	219	219	202	0	88	0	0	0	0	0
11	129	171	69	69	66	0	89	7	20	0	0	0
12	129	185	78	78	75	0	90	0	11	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	129	247	90	90	86	0	90	0	13	0	0	0
17	248	262	51	51	51	0	94	0	0	0	0	0
18	248	275	60	60	60	0	95	0	0	0	0	0
19	248	290	75	75	75	0	96	0	0	0	0	0
20	248	306	90	90	90	0	96	0	0	0	0	0
21	158	322	147	144	144	0	94	0	0	0	0	0
22	248	336	147	145	145	0	95	0	0	0	0	0
23	158	347	195	190	190	0	94	0	0	0	0	0
24	158	362	198	193	193	0	94	0	0	0	0	0
25	158	381	201	196	196	0	94	0	0	0	0	0
26	158	393	204	198	198	0	94	0	0	0	0	0
27	158	408	207	201	201	0	94	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	158	466	213	207	207	0	94	0	0	0	0	0
32	408	979	100	100	100	0	97	0	0	0	0	0

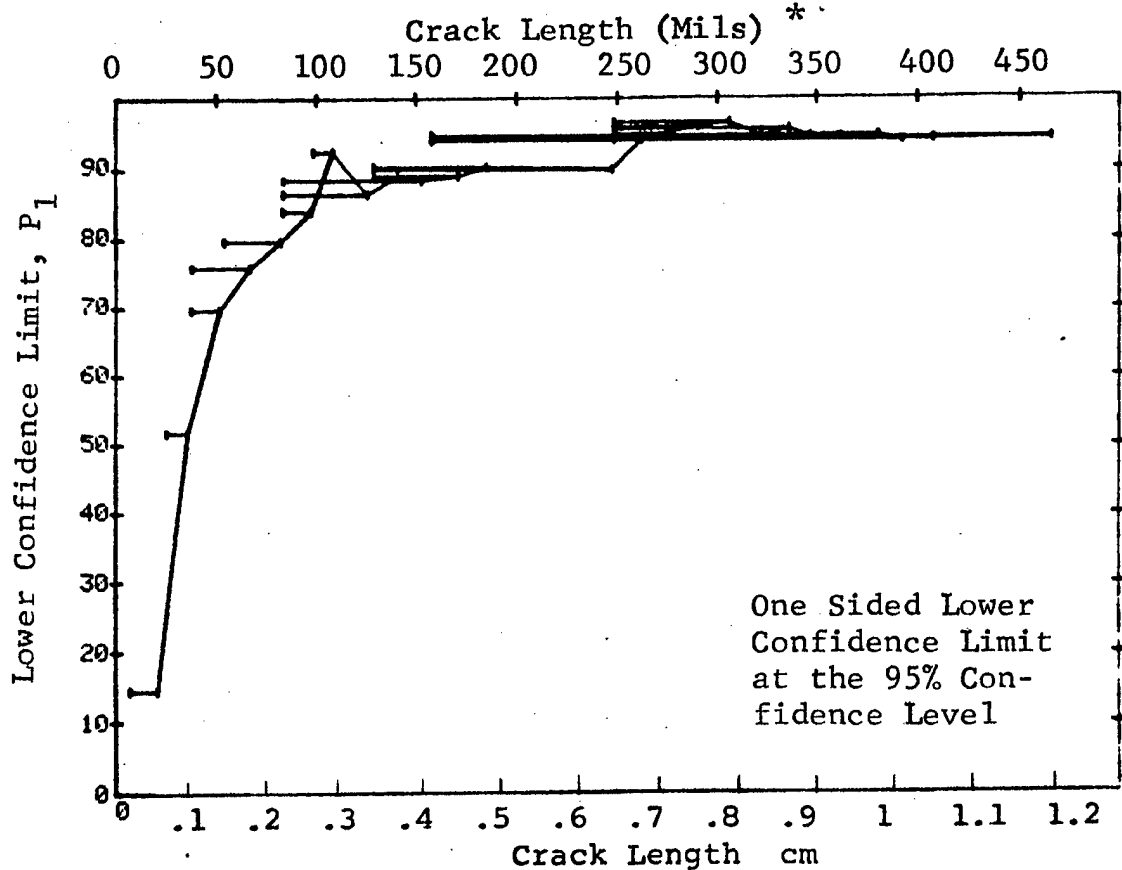


Figure D-6 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

02-JUL-75				TEST 3, PENET, MFT11(6)			
RANGE	MIN LN	* MAX LN	N	DET	50%	95%	0 MID
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	7	20	32	7	20	10	0
5	7	30	60	24	39	29	0
6	20	40	60	38	62	51	0
7	30	45	60	42	69	53	0
8	40	51	60	47	77	67	0
9	45	58	60	48	79	69	0
10	51	61	60	48	79	69	0
11	58	64	60	53	87	79	69
12	62	67	60	50	82	73	0
13	64	70	60	48	79	69	0
14	67	73	60	48	79	69	0
15	70	77	60	48	79	69	0
16	74	80	60	53	87	79	69
17	77	83	60	58	95	82	82
18	80	87	60	57	93	87	16
19	84	95	60	56	92	85	29
20	90	102	60	55	90	83	43
21	96	115	60	53	87	79	69
22	103	129	60	54	88	81	56
23	117	136	60	56	92	85	29
24	129	158	60	57	93	87	16
25	138	248	60	57	93	87	16
26	162	258	60	58	97	92	0
27	249	279	60	60	98	95	0
28	258	310	60	60	98	95	0
29	279	326	60	58	95	87	16
30	310	340	60	56	92	85	29
31	326	466	60	57	93	87	16
32	342	500	60	59	97	92	0

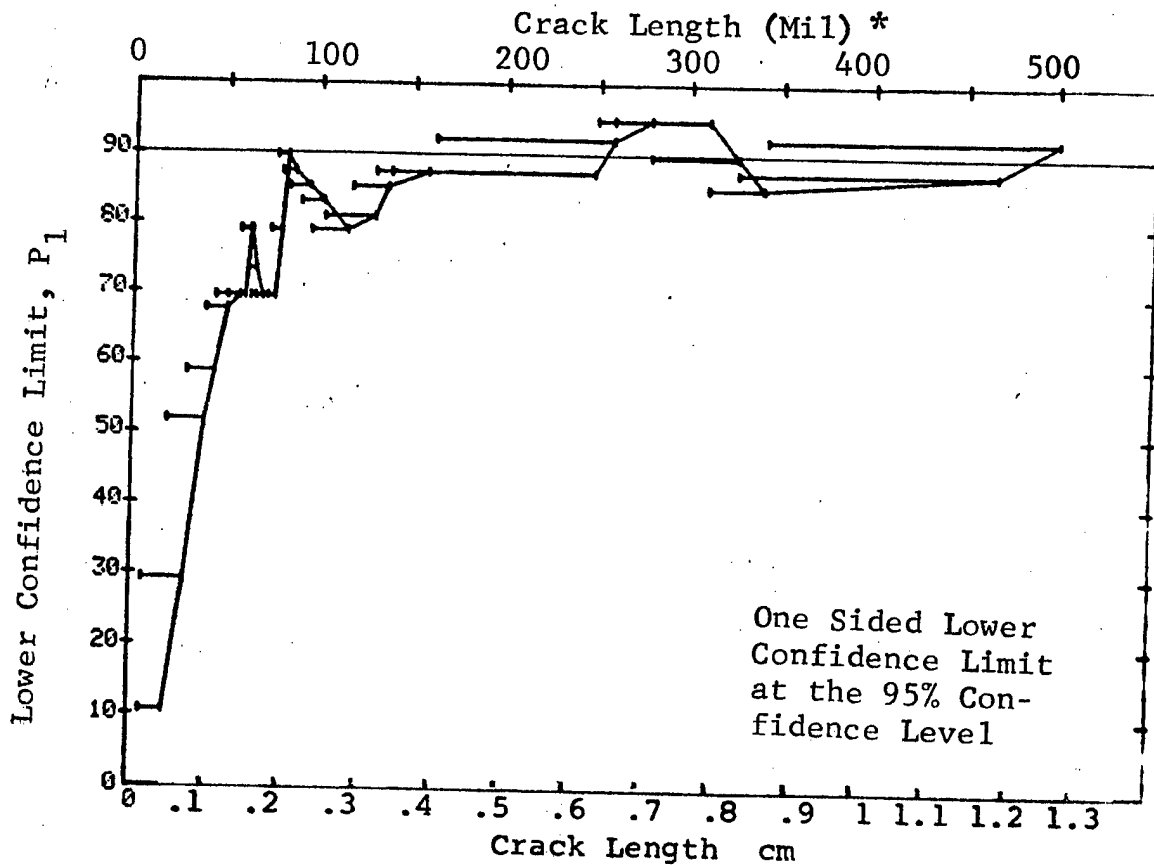


Figure D-6 (Concluded)

(a) Range Interval Method of Data Cumulation

32-JUL-75	EDDY CURRENT			TEST 1	MARTIN (7)			
RANGE	MIN LN	* MAX LN	N	DEFT	50%	95%	0 MISS	1 MISS
1	7	31*	39	6	14	6	0	0
2	25	36	48	6	11	5	0	0
3	38	52	72	17	23	15	0	0
4	54	67	121	62	50	43	0	0
5	68	82	131	80	60	53	0	0
6	83	97	87	69	78	70	0	0
7	98	108	39	31	77	66	0	0
8	115	126	34	30	86	75	55	69
9	129	141	42	38	88	79	47	61
10	146	153	18	16	85	68	0	0
11	158	171	9	9	92	71	0	0
12	182	185	9	7	71	45	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	241	247	12	11	86	66	0	0
17	248	262	51	47	90	82	38	52
18	268	275	9	9	92	71	0	0
19	279	290	15	14	89	72	0	0
20	295	306	15	13	82	63	0	0
21	310	322	27	26	93	83	19	34
22	323	338	30	29	94	85	15	71
23	338	347	18	15	79	62	0	0
24	362	362	3	3	79	36	0	0
25	381	381	3	3	79	36	0	0
26	393	393	3	3	79	36	0	0
27	408	408	3	2	58	13	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	459	466	6	6	89	60	0	0
32	475	979	90	86	94	90	0	13

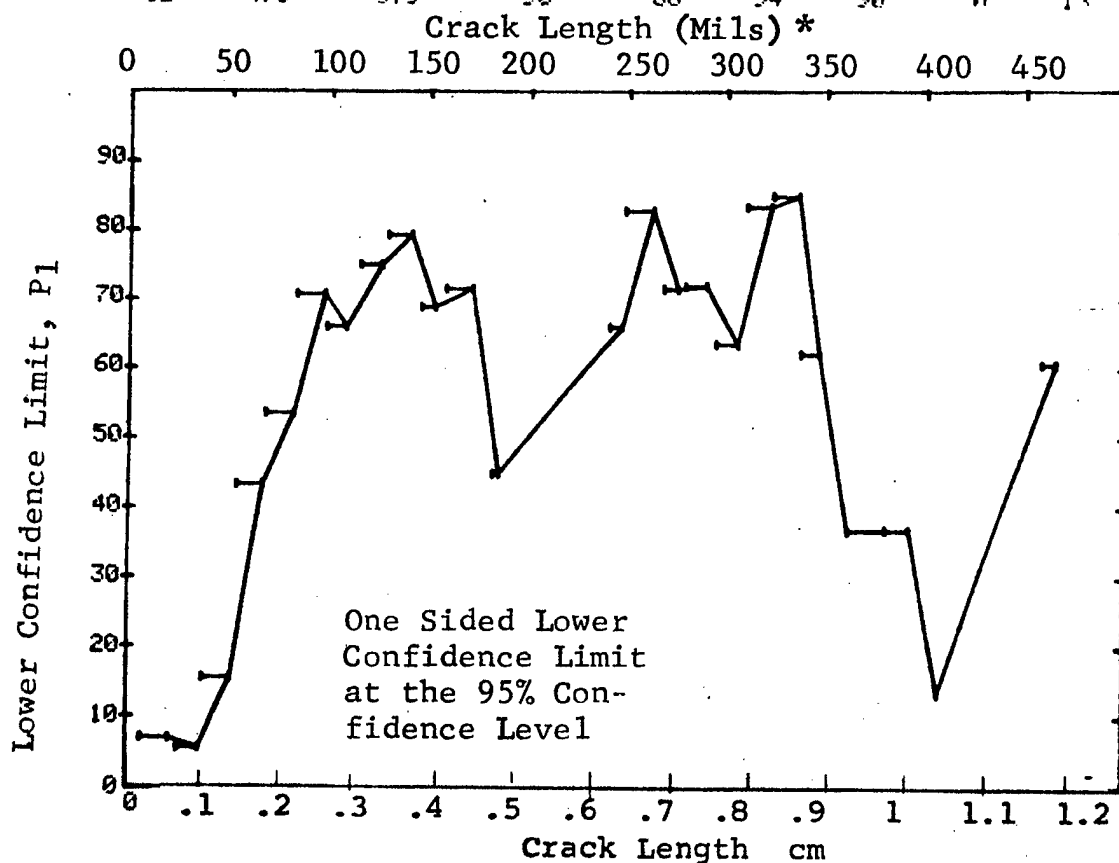


Figure D-7 Probability of Detection for 2219-T87 Al Using Eddy Current. Etched Fatigue Cracks in Flat Plates. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

22-JUL-75		EDDY CURRENT		SEP 11	TEST 2		MARTIN (7)	
RANGE	MIN LN	* MIN LN	* MIN LN	N	DFT	50%	95%	0 MISS
1				21	39	0	0	0
2				36	107	0	0	0
3				52	72	0	0	0
4	38			67	121	0	15	0
5	54			82	131	0	43	0
6	68			97	87	0	53	0
7	83			108	69	0	70	0
8	83			126	100	0	72	0
9	83			141	130	0	75	0
10	115			76	68	0	81	66
11	115			94	84	0	82	73
12	115			103	93	0	84	73
13	0			112	100	0	83	0
14	0			0	0	0	0	0
15	0			0	0	0	0	0
16	0			0	0	0	0	0
17	115			247	111	0	83	0
18	115			262	158	0	85	0
19	129			275	137	0	86	0
20	129			290	151	0	87	0
21	129			306	164	0	88	0
22	241			322	120	0	88	0
23	241			338	149	0	89	0
24	241			347	164	0	88	0
25	241			362	167	0	88	0
26	241			381	170	0	88	0
27	241			393	173	0	89	0
28	241			408	175	0	88	0
29	0			0	0	0	0	0
30	0			0	0	0	0	0
31	0			0	0	0	0	0
32	241			466	181	0	89	0
	310			979	173	0	90	0

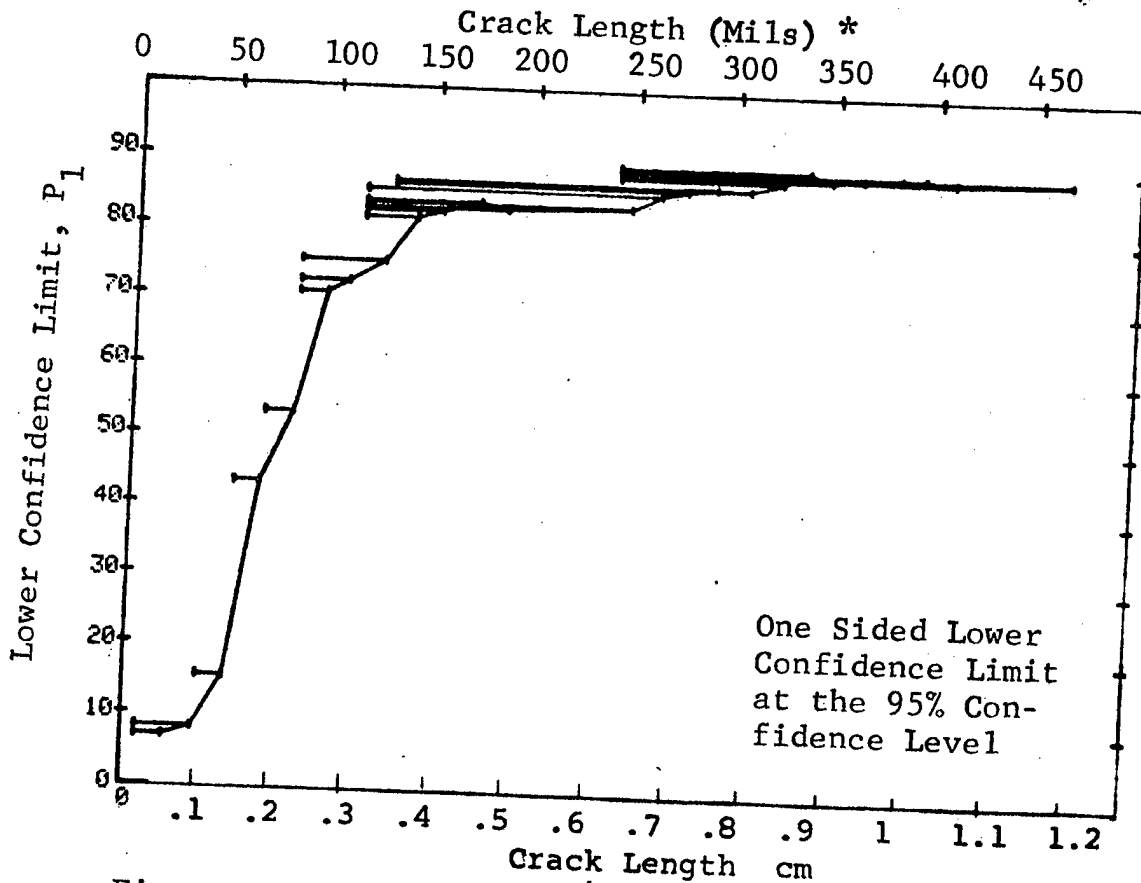


Figure D-7 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

22-JUL-75	EDDY CURRENT SCO II			TEST 3	MARTIN (7)				
RANGE	MIN LN	* MAX LN	* N	DET	50%	95%	0 MISS	1 MISS	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	7	21	34	5	13	5	0	0	
5	8	31	60	9	14	8	0	0	
6	21	40	60	9	14	8	0	0	
7	31	45	60	8	12	6	0	0	
8	40	52	60	14	22	14	0	0	
9	45	58	60	19	30	21	0	0	
10	52	61	60	26	42	32	0	0	
11	58	64	60	38	62	51	0	0	
12	62	67	60	35	57	46	0	0	
13	64	70	60	27	44	33	0	0	
14	67	74	60	30	49	38	0	0	
15	70	77	60	32	52	41	0	0	
16	74	80	60	37	60	50	0	0	
17	77	84	60	49	80	71	0	0	
18	80	90	60	50	82	73	0	0	
19	84	96	60	46	75	65	0	0	
20	90	103	60	45	74	64	0	0	
21	96	115	60	46	75	65	0	0	
22	103	129	60	52	85	77	80	1	
23	117	136	60	55	90	83	40	1	
24	129	158	60	55	90	83	40	1	
25	138	248	60	54	88	81	56	1	
26	162	258	60	54	88	81	56	1	
27	249	279	60	57	93	87	16	1	
28	258	310	60	56	92	85	26	1	
29	279	326	60	56	92	85	26	1	
30	310	340	60	56	92	85	26	1	
31	326	466	60	55	90	83	40	1	
32	342	500	60	57	93	87	16	1	

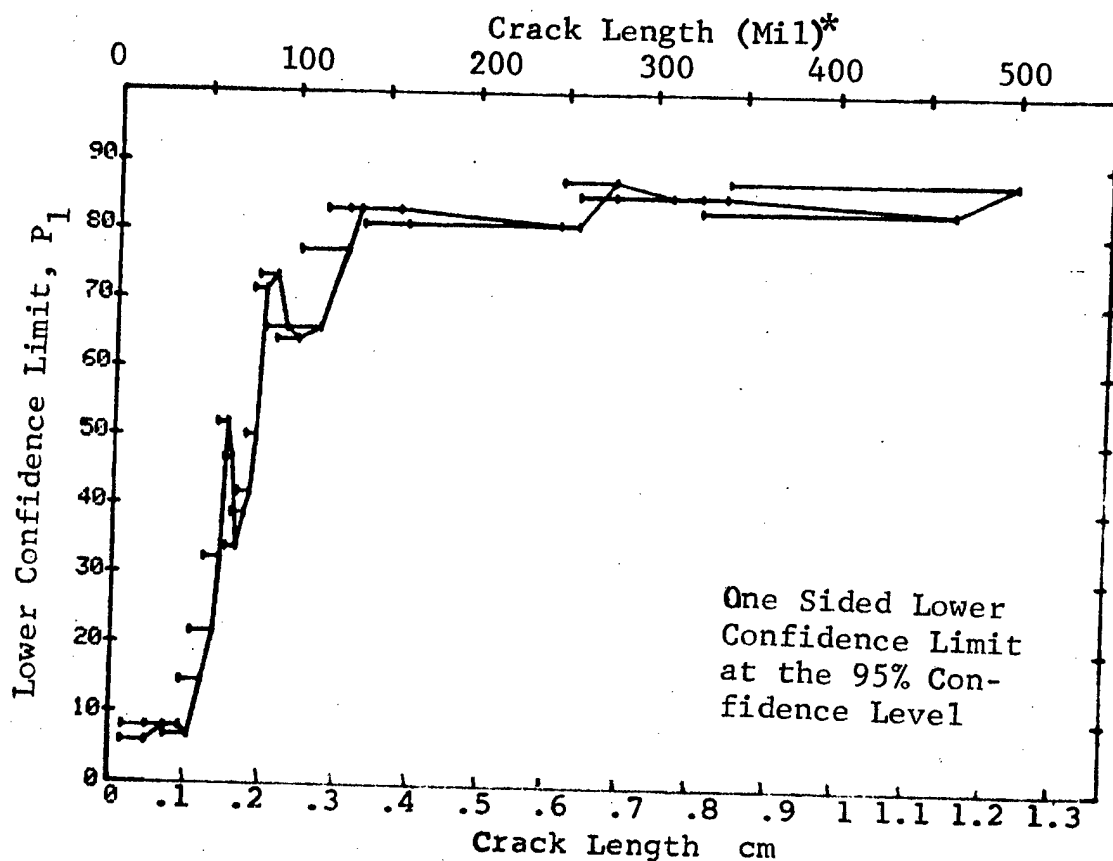


Figure D-7 (Concluded)

(a) Range Interval Method of Data Cumulation

02-JUL-75 RADIOGRAPHY				TEST 1 X-RAY MARTIN 2.8			
RANGE	MIN LN	* MAX LN	N	DFT	50%	95%	0 MISS
1	7	21	39	1	1	0	0
2	23	36	49	8	15	8	0
3	38	52	72	18	24	16	0
4	54	67	120	41	33	27	0
5	68	82	131	60	45	38	0
6	83	97	87	54	61	52	0
7	98	108	39	15	37	25	0
8	115	126	33	7	20	10	0
9	129	141	42	11	25	15	0
10	146	153	18	11	58	39	0
11	158	171	9	6	60	34	0
12	182	185	9	3	28	9	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	241	247	12	12	94	77	17
17	248	262	51	50	96	91	0
18	268	275	9	9	92	71	0
19	279	290	15	13	82	63	0
20	295	306	15	12	76	56	0
21	310	322	27	13	46	31	0
22	323	336	30	23	74	60	0
23	338	347	18	15	79	62	0
24	362	362	3	1	20	1	0
25	381	381	3	2	50	13	0
26	393	393	3	3	79	36	0
27	408	408	3	3	79	36	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	459	466	6	6	89	60	0
32	475	979	90	88	97	93	0

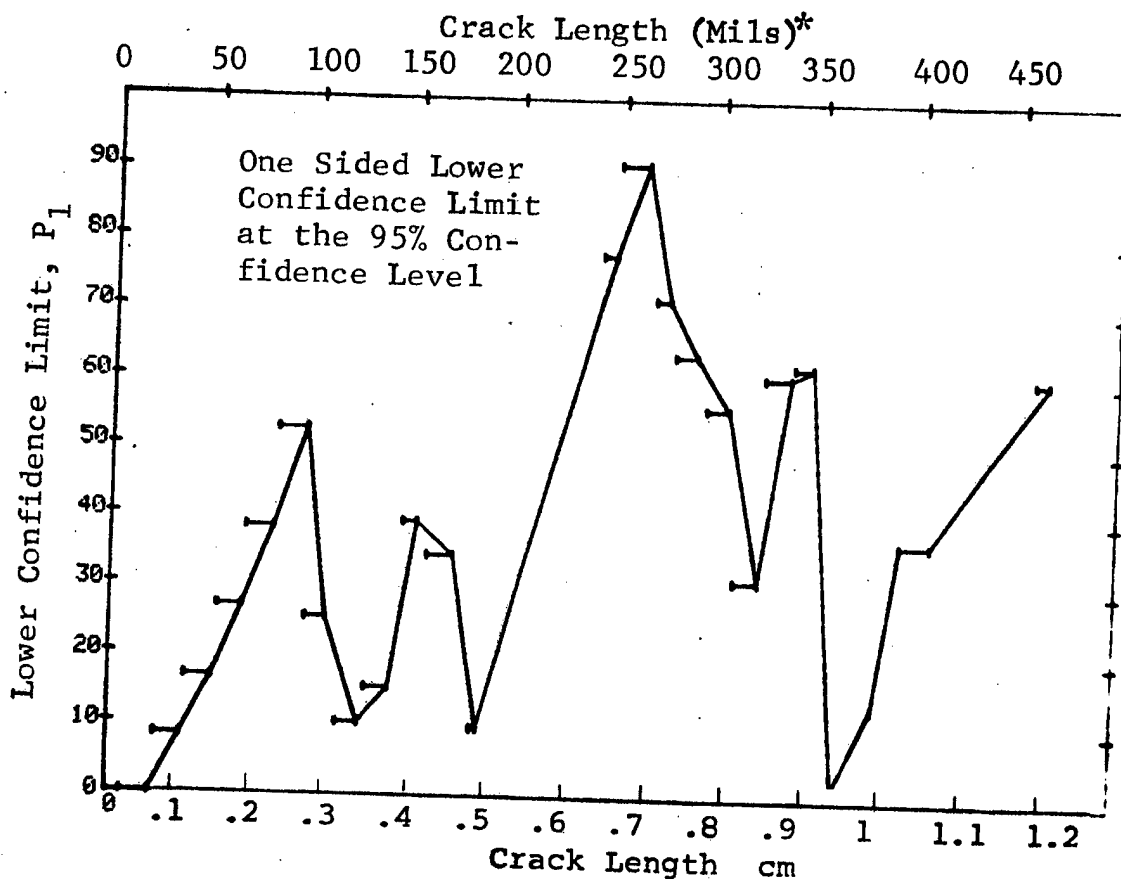


Figure D-8 Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75				TEST 2, X-RAY, MARTIN (8)			
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MILS
1	7	21*	39	1	0	0	0
2	23	36	49	8	0	0	0
3	38	52	72	18	0	16	0
4	54	67	120	41	0	27	0
5	68	82	131	60	0	38	0
6	83	97	87	54	0	52	0
7	83	108	126	69	0	47	0
8	68	126	290	136	0	41	0
9	68	141	332	147	0	39	0
10	68	153	350	158	0	40	0
11	146	171	27	17	0	45	0
12	68	185	368	167	0	41	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	241	247	12	12	0	77	0
17	241	262	63	62	0	92	0
18	241	275	72	71	0	93	0
19	241	290	87	84	0	91	0
20	241	306	102	96	0	88	0
21	241	322	129	109	0	78	0
22	241	336	159	132	0	77	0
23	241	347	177	147	0	77	0
24	241	362	180	148	0	76	0
25	241	381	183	150	0	76	0
26	241	393	186	153	0	77	0
27	241	406	189	156	0	77	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	241	466	195	162	0	78	0
32	393	979	102	100	0	93	0

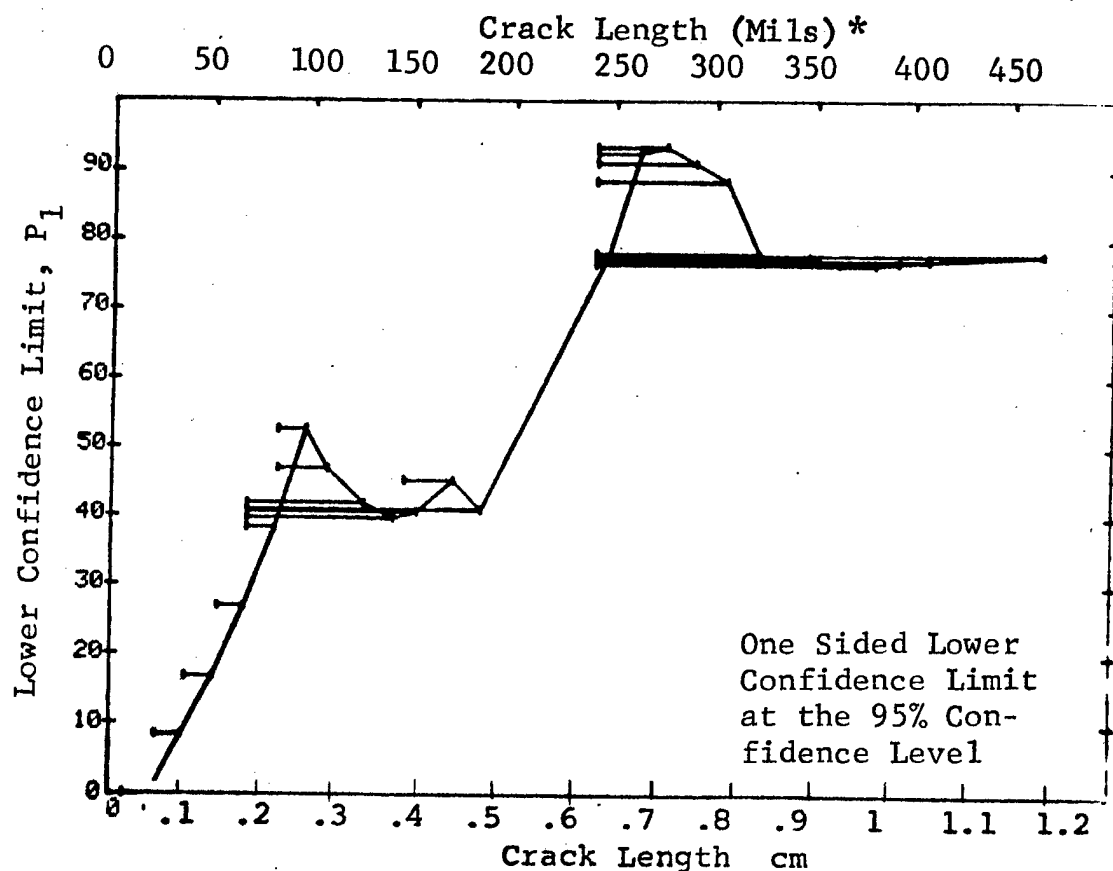


Figure D-8 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

02-JUL-75				TEST 3 X-RAY, MARTIN (8)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 NIPS	1 NIPS
1	0*	0*	0	0	0	0	0	0
2	0	10	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	7	20	32	0	0	0	0	0
6	20	30	60	7	11	5	0	0
7	30	40	60	10	16	9	0	0
8	40	45	60	8	12	6	0	0
9	45	50	60	13	20	13	0	0
10	51	59	60	16	25	17	0	0
11	58	61	60	21	34	24	0	0
12	61	64	60	26	42	32	0	0
13	64	67	60	19	36	21	0	0
14	67	70	60	23	37	27	0	0
15	70	73	60	28	45	35	0	0
16	73	77	60	18	29	20	0	0
17	77	80	60	25	40	30	0	0
18	80	83	60	41	67	57	0	0
19	83	87	60	45	74	64	0	0
20	87	95	60	37	60	50	0	0
21	95	102	60	27	44	33	0	0
22	102	115	60	21	34	24	0	0
23	115	129	60	18	29	20	0	0
24	129	136	60	16	25	17	0	0
25	136	158	60	21	34	24	0	0
26	158	248	60	36	59	48	0	0
27	248	258	60	51	83	75	94	100
28	258	279	60	59	97	92	0	1
29	279	310	60	55	90	83	43	56
30	310	326	60	40	65	50	0	0
31	326	340	60	36	59	48	0	0
32	340	466	60	48	79	69	0	0
		500	60	55	90	83	43	56

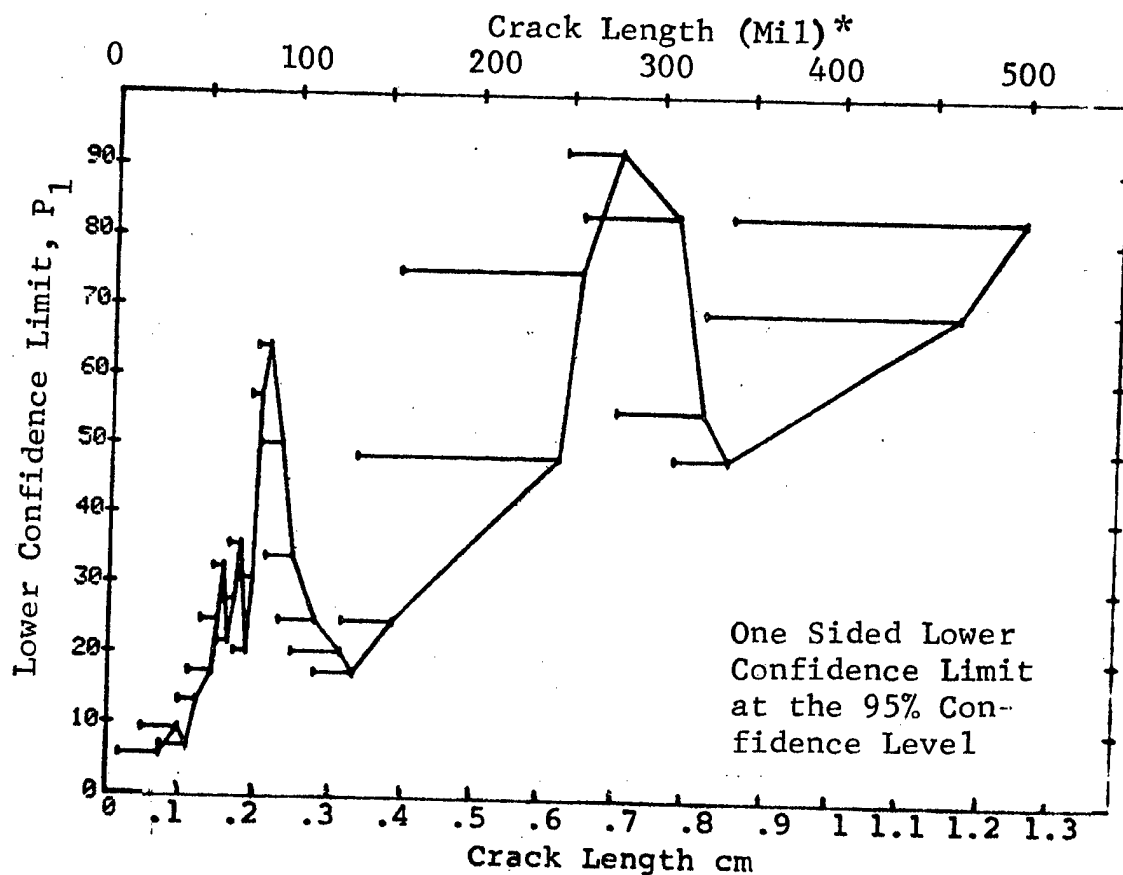


Figure D-8 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75		ULTRASONIC		N	TEST 1, ROCKWELL CO., 101 (9)				
RANGE	MIN LN	MAX LN	MIN LN		DET	500.	400.	0 MISS	1 MISS
1	7	22	*	13	4	27	11	0	0
2	25	36		48	11	58	39	0	0
3	38	52		23	19	79	64	0	0
4	54	67		46	32	68	56	0	0
5	68	82		53	38	70	59	0	0
6	83	97		39	27	67	54	0	0
7	98	111		17	13	73	53	0	0
8	115	126		17	13	73	53	0	0
9	129	141		19	16	81	64	0	0
10	143	157		15	13	82	63	0	0
11	158	171		3	3	79	36	0	0
12	182	185		3	2	50	13	0	0
13	190	197		2	1	29	2	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	241	247		4	4	84	47	0	0
17	248	262		17	17	96	83	12	29
18	268	275		3	3	79	36	0	0
19	279	290		7	7	90	65	0	0
20	295	306		6	5	73	41	0	0
21	310	322		10	10	93	74	0	0
22	323	336		12	12	94	77	17	34
23	338	352		11	10	85	63	0	0
24	356	362		4	4	84	47	0	0
25	370	381		5	5	87	54	0	0
26	384	393		2	2	70	22	0	0
27	408	408		1	0	0	0	0	0
28	426	426		1	1	50	5	0	0
29	442	442		1	1	50	5	0	0
30	444	444		1	1	50	5	0	0
31	458	472		8	8	91	68	0	0
32	474	979		59	57	95	89	2	17

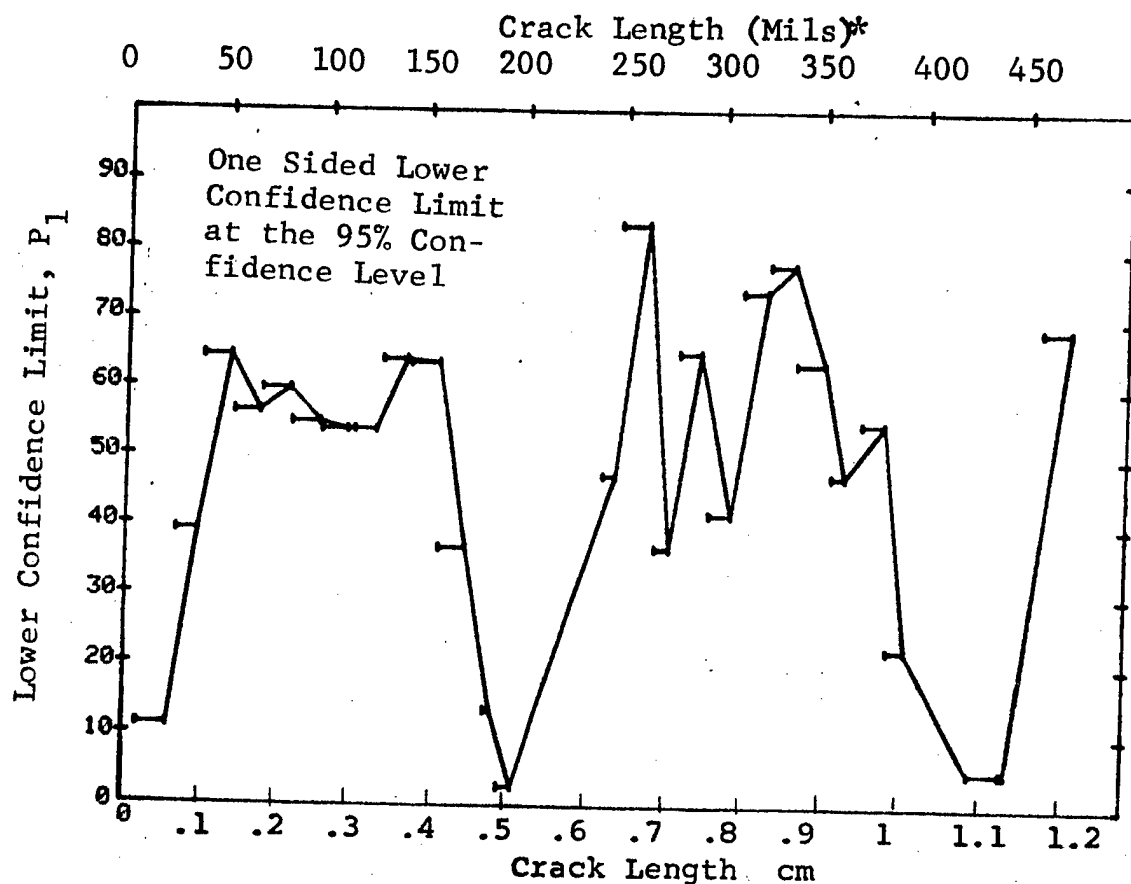


Figure D-9 Probability of Detection for 2219-T87 Al Using Ultrasonic Shear Wave. Etched-Fatigue Cracks in Flat Plates Measured by Operator O. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75		ULTRASONIC		N	TEST 2		ROCKWELL SC		(9)	
RANGE	MIN LN	MAX LN	*		DET	50%	95%	0 MISS	1 MISS	
1		22	*	13	4	0	11	0	0	
2	25	35		18	11	0	39	0	0	
3	38	52		23	19	0	64	0	0	
4	38	67		69	51	0	63	0	0	
5	38	82		122	89	0	65	0	0	
6	38	97		161	116	0	65	0	0	
7	38	111		178	129	0	66	0	0	
8	38	126		195	142	0	67	0	0	
9	38	141		214	158	0	68	0	0	
10	129	157		34	29	0	71	0	0	
11	129	171		37	32	0	73	0	0	
12	129	185		40	34	0	72	0	0	
13	98	197		76	61	0	71	0	0	
14	0	0		0	0	0	0	0	0	
15	0	0		0	0	0	0	0	0	
16	129	247		46	39	0	73	0	0	
17	241	262		21	21	0	86	0	0	25
18	241	275		24	24	0	88	0	0	22
19	241	290		31	31	0	90	0	0	15
20	241	306		37	36	0	87	0	0	24
21	241	322		47	46	0	90	0	0	14
22	241	336		59	58	0	92	0	0	2
23	241	352		70	68	0	91	0	0	6
24	241	362		74	72	0	91	0	0	2
25	241	381		79	77	0	92	0	0	0
26	241	393		81	79	0	92	0	0	0
27	241	408		82	79	0	90	0	0	7
28	241	426		83	80	0	90	0	0	6
29	241	442		84	81	0	91	0	0	5
30	241	444		85	82	0	91	0	0	4
31	241	472		93	90	0	91	0	0	0
32	241	979		152	147	0	93	0	0	0

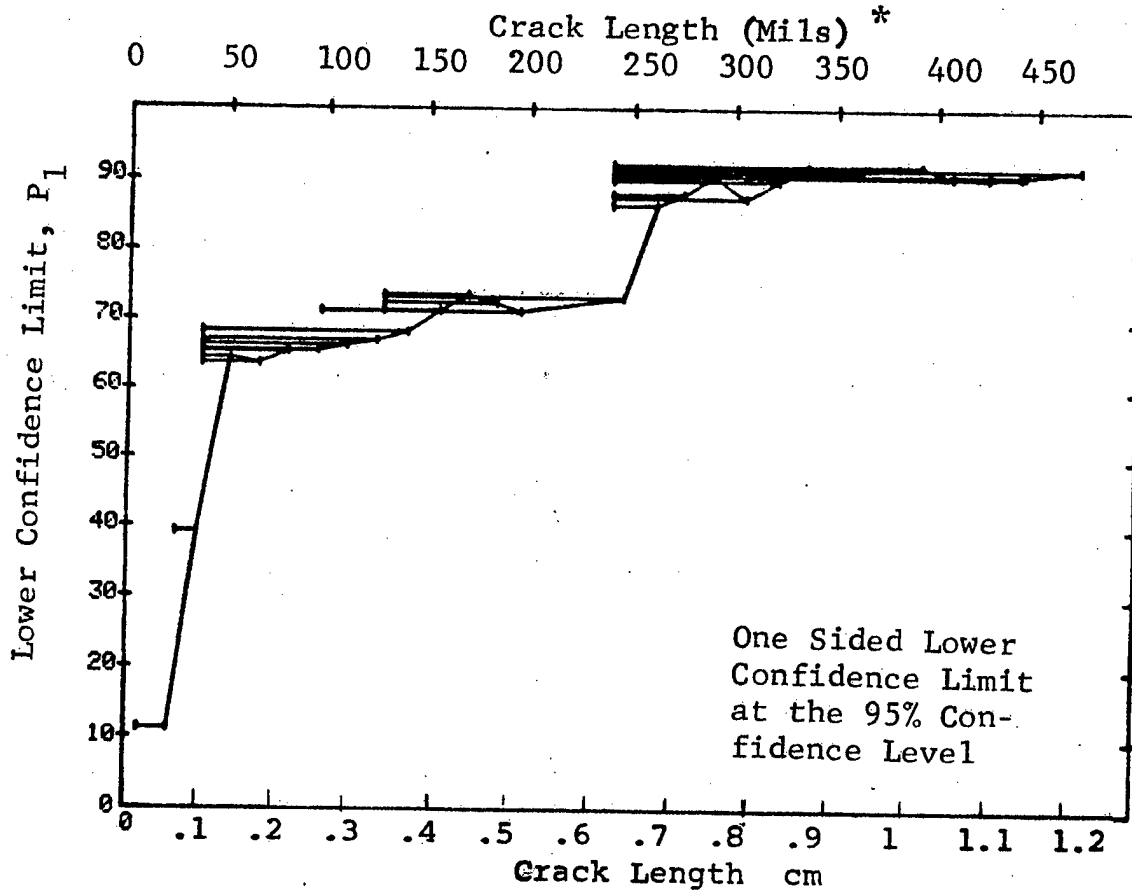


Figure D-9 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75 ULTRASONIC					TEST 3 - ROCKWELL C-10 (9)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0	*	0	*	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	7	49	52	33	62	51	0	0	0
22	31	63	60	44	72	62	0	0	0
23	51	70	60	40	65	55	0	0	0
24	64	79	60	44	72	62	0	0	0
25	70	87	60	44	72	62	0	0	0
26	79	105	60	40	65	55	0	0	0
27	88	131	60	45	74	64	0	0	0
28	105	162	60	50	82	73	0	0	0
29	132	275	60	54	88	81	56	69	
30	171	330	60	57	93	87	16	29	
31	279	442	60	57	93	87	16	29	
32	331	500	60	56	92	85	29	43	

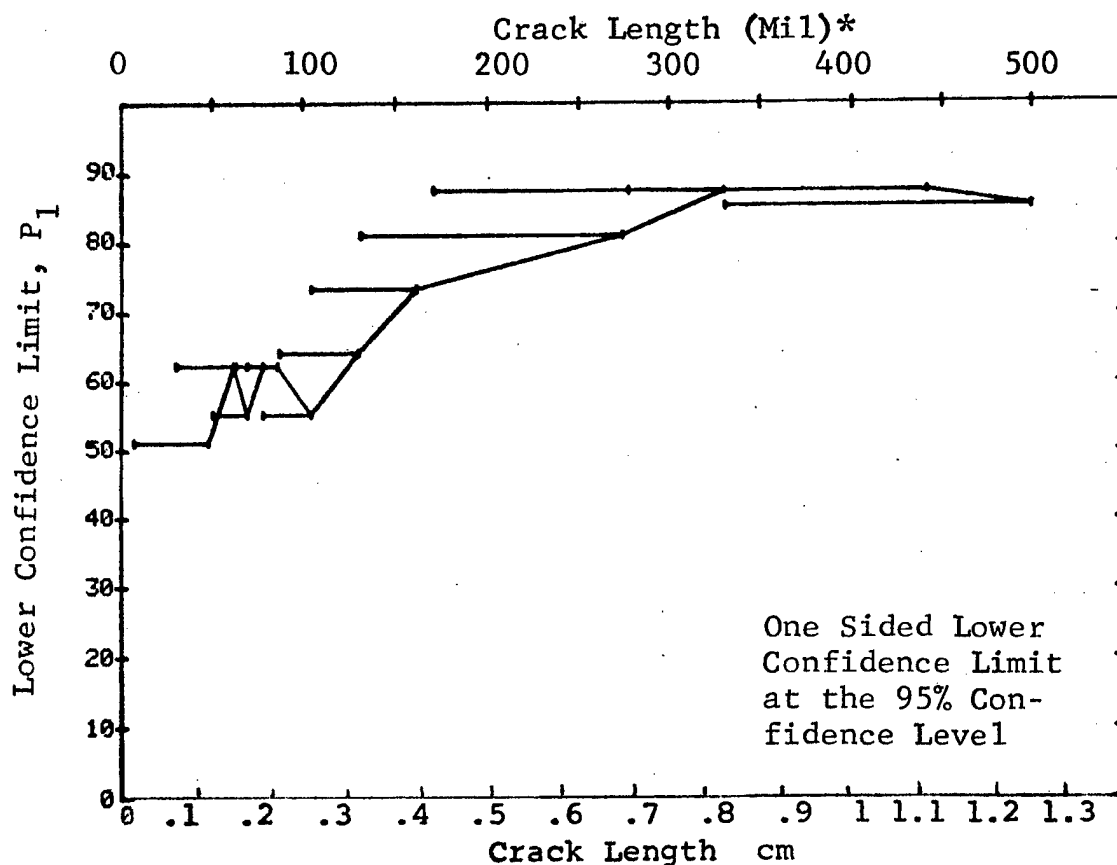


Figure D-9 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75				ULTRASONIC		TEST 1, ROCKWELL C, 10'						(10)
RANGE	MIN	LN	* MAX	LN *	N	DET	50%	95%	0 MISS	1 MISS		
1		7		22		13	4	27	11	0	0	
2	25		36		18	15	79	62	0	0		
3	38		52		23	19	79	64	0	0		
4	54		67		46	39	83	73	0	0		
5	68		82		53	51	94	88	0	23		
6	83		97		39	39	98	92	0	7		
7	98		111		17	16	90	75	29	44		
8	115		126		17	17	96	83	12	29		
9	129		141		19	19	96	85	10	27		
10	143		157		15	15	95	81	14	31		
11	158		171		3	3	79	36	0	0		
12	182		185		3	3	79	36	0	0		
13	190		197		2	2	70	22	0	0		
14	207		207		1	1	50	5	0	0		
15	0		0		0	0	0	0	0	0		
16	241		247		4	4	84	47	0	0		
17	248		262		17	17	96	83	12	29		
18	268		275		3	3	79	36	0	0		
19	279		290		6	6	89	60	0	0		
20	295		306		6	6	89	60	0	0		
21	310		322		10	10	93	74	0	0		
22	323		336		12	12	94	77	17	34		
23	338		352		11	11	93	76	18	35		
24	356		362		4	4	84	47	0	0		
25	370		381		5	5	87	54	0	0		
26	384		393		2	2	70	22	0	0		
27	408		408		1	1	50	5	0	0		
28	426		426		1	1	50	5	0	0		
29	442		442		1	1	50	5	0	0		
30	444		450		2	2	70	22	0	0		
31	458		472		7	7	90	65	0	0		
32	474		979		59	59	98	95	0	0		

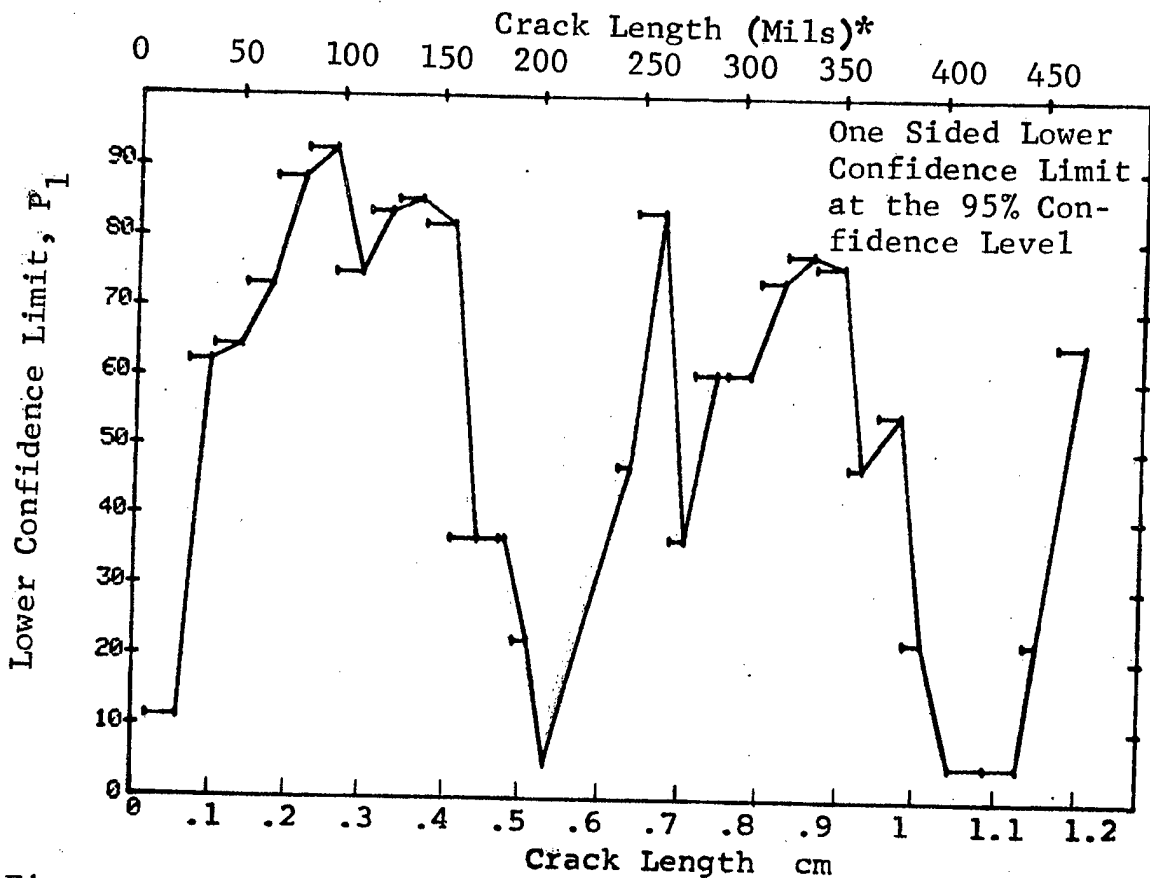


Figure D-10 Probability of Detection for 2219-T87 Al Using Ultrasonic Shear Wave. Etched-Fatigue Cracks in Flat Plates Measured by Operator P. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75		ULTRASONIC		TEST 2, RODWELL SC		P		(10)
RANGE	MIN	LN	N	DET	50%	95%	0 MISS	1 MISS
1		7	13	4	0	11	0	0
2	25	18	18	15	0	63	0	0
3	25	52	41	34	0	70	0	0
4	25	67	87	73	0	75	0	0
5	68	82	53	51	0	88	8	23
6	68	97	92	90	0	93	0	0
7	68	111	109	106	0	93	0	0
8	68	126	126	123	0	93	0	0
9	83	141	92	91	0	94	0	0
10	83	157	107	106	0	95	0	0
11	83	171	110	109	0	95	0	0
12	83	185	113	112	0	95	0	0
13	83	197	115	114	0	95	0	0
14	83	207	116	115	0	95	0	0
15	0	0	0	0	0	0	0	0
16	83	247	120	119	0	96	0	0
17	83	262	137	136	0	96	0	0
18	83	275	140	139	0	96	0	0
19	83	290	146	145	0	96	0	0
20	115	306	96	96	0	96	0	0
21	115	322	106	106	0	97	0	0
22	115	336	118	118	0	97	0	0
23	115	352	129	129	0	97	0	0
24	115	362	133	133	0	97	0	0
25	115	381	138	138	0	97	0	0
26	115	393	140	140	0	97	0	0
27	115	408	141	141	0	97	0	0
28	115	426	142	142	0	97	0	0
29	115	442	143	143	0	97	0	0
30	115	450	145	145	0	97	0	0
31	115	472	152	152	0	98	0	0
32	115	979	211	211	0	98	0	0

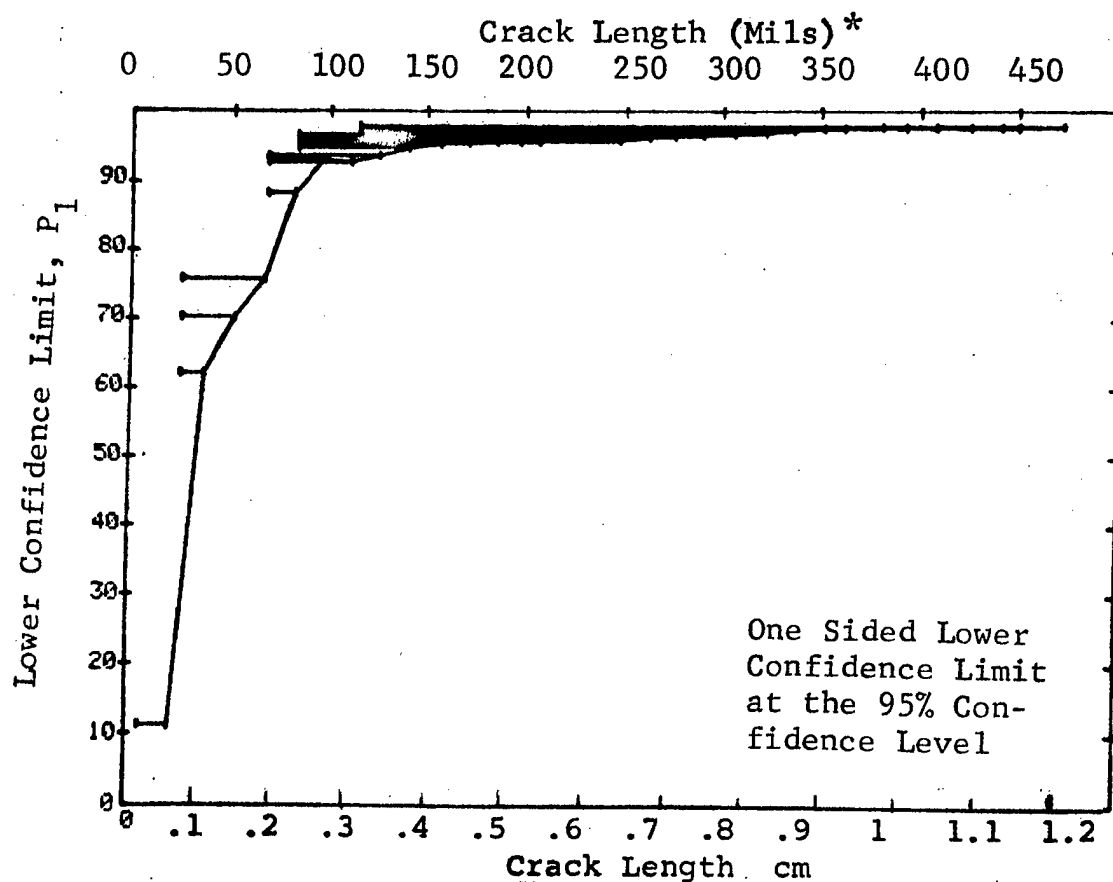


Figure D-10 (Continued)

for

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75			ULTRASONIC			TEST 3, ROCKWELL SC, F (10)					
RANGE	MIN	LN	* MAX	LN	*	N	DET	50%	95%	0 MISS	1 MISS
1		0	*	0	*	0	0	0	0	0	0
2		0		0		0	0	0	0	0	0
3		0		0		0	0	0	0	0	0
4		0		0		0	0	0	0	0	0
5		0		0		0	0	0	0	0	0
6		0		0		0	0	0	0	0	0
7		0		0		0	0	0	0	0	0
8		0		0		0	0	0	0	0	0
9		0		0		0	0	0	0	0	0
10		0		0		0	0	0	0	0	0
11		0		0		0	0	0	0	0	0
12		0		0		0	0	0	0	0	0
13		0		0		0	0	0	0	0	0
14		0		0		0	0	0	0	0	0
15		0		0		0	0	0	0	0	0
16		0		0		0	0	0	0	0	0
17		0		0		0	0	0	0	0	0
18		0		0		0	0	0	0	0	0
19		0		0		0	0	0	0	0	0
20		0		0		0	0	0	0	0	0
21		7		49		52	36	68	57	0	0
22		31		63		60	51	83	75	94	100
23		51		70		60	52	85	77	82	94
24		64		79		60	55	90	83	43	56
25		70		87		60	59	97	92	0	1
26		79		105		60	60	98	95	0	0
27		88		131		60	59	97	92	0	1
28		105		162		60	59	97	92	0	1
29		132		269		60	60	98	95	0	0
30		171		330		60	60	98	95	0	0
31		275		442		60	60	98	95	0	0
32		331		500		60	60	98	95	0	0

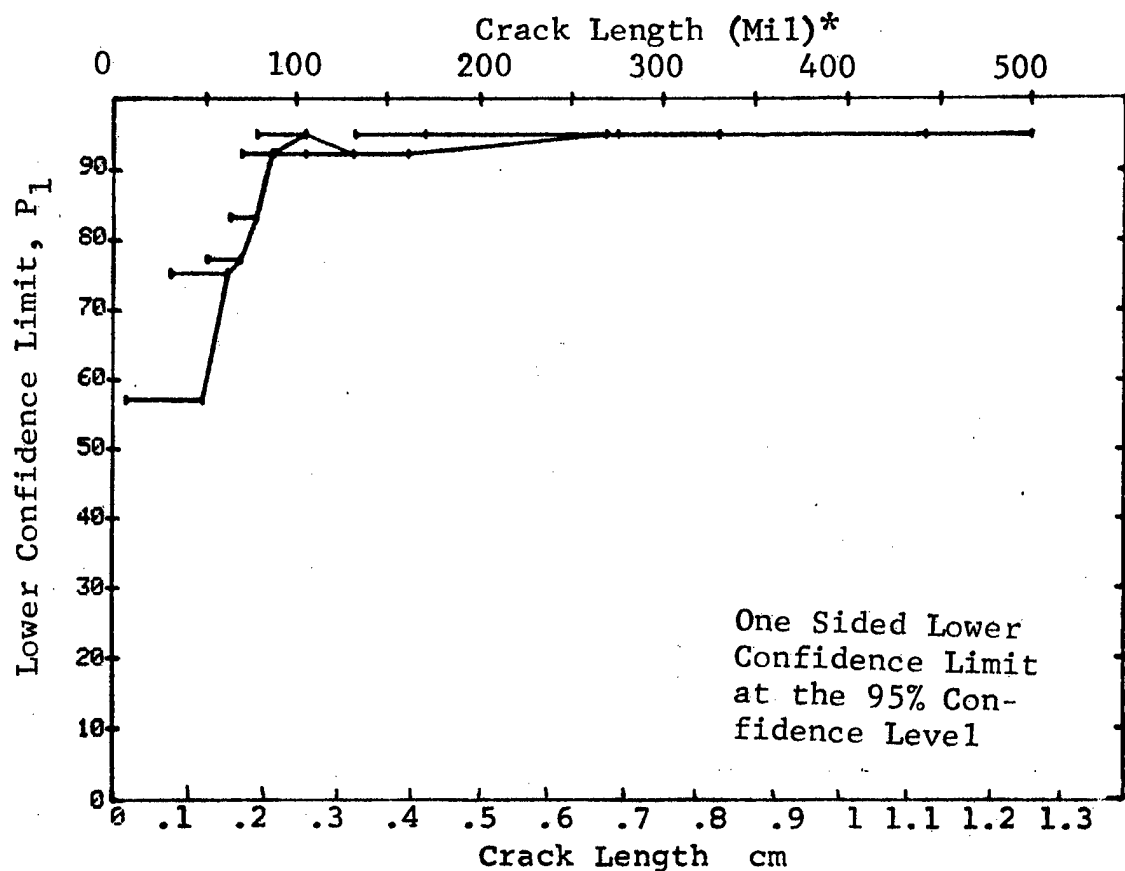


Figure D-10 (Concluded)

(b) Optimum Probability Method of Data Cumulation

03-JUL-75		ULTRASONIC		N	TEST 1 - ROCKWELL SC		SC		(11)	
RANGE	MIN LN	MAX LN			DET	50%	95%	0 MISS	1 MISS	
1	7	22*	13	3	20	6	0	0	0	
2	25	16	18	9	47	29	0	0	0	
3	38	52	24	18	72	56	0	0	0	
4	54	67	46	37	79	68	0	0	0	
5	68	82	53	46	85	76	76	89	0	
6	83	97	39	31	77	66	0	0	0	
7	98	111	17	13	73	53	0	0	0	
8	115	126	17	16	90	75	29	44	0	
9	129	141	19	14	70	52	0	0	0	
10	143	157	15	10	63	42	0	0	0	
11	158	171	3	2	50	13	0	0	0	
12	182	185	3	3	79	36	0	0	0	
13	190	197	2	2	70	22	0	0	0	
14	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	0	
16	241	247	4	4	84	47	0	0	0	
17	248	262	17	17	96	83	12	29	0	
18	268	275	3	3	79	36	0	0	0	
19	279	290	7	7	90	65	0	0	0	
20	295	306	6	6	89	60	0	0	0	
21	310	322	10	10	93	74	0	0	0	
22	323	336	12	12	94	77	17	34	0	
23	338	352	11	10	85	63	0	0	0	
24	356	362	4	4	84	47	0	0	0	
25	370	381	5	4	68	34	0	0	0	
26	384	393	2	2	70	22	0	0	0	
27	408	408	1	1	50	5	0	0	0	
29	426	426	1	1	50	5	0	0	0	
29	442	442	1	1	50	5	0	0	0	
30	444	444	1	1	50	5	0	0	0	
31	458	472	7	7	90	65	0	0	0	
32	474	979	59	55	92	85	30	44	0	

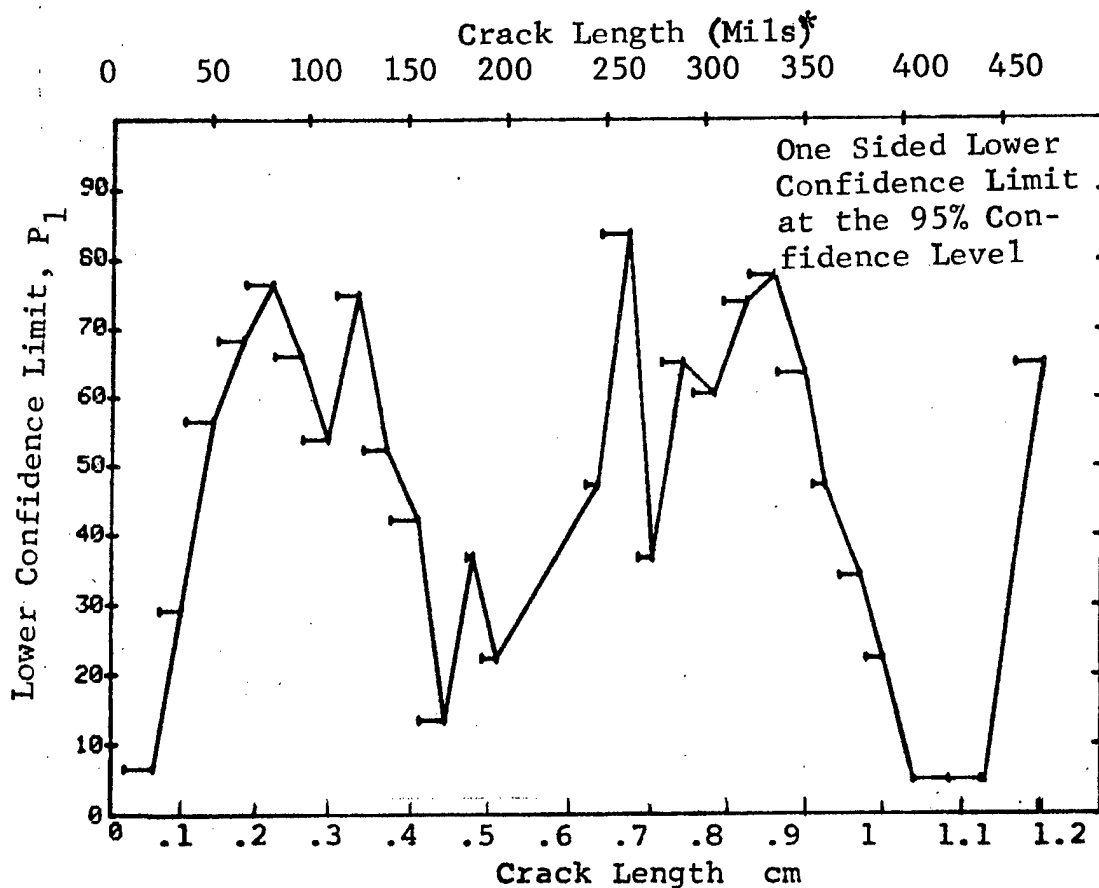


Figure D-11 Probability of Detection for 2219-T87 Al Using Ultrasonic Shear Waves. Etched Fatigue Cracks in Flat Plates Measured by Operator Q. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75		ULTRASONIC		TEST 2 - ROCKWELL SC - '0' (11)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7	22 *	13	3	0	6	0	0
2	25	36	18	9	0	29	0	0
3	38	52	24	18	0	56	0	0
4	38	67	70	55	0	68	0	0
5	68	82	53	46	0	76	0	0
6	54	97	138	114	0	76	0	0
7	54	111	155	127	0	76	0	0
8	68	126	126	106	0	77	0	0
9	54	141	191	157	0	77	0	0
10	54	157	206	167	0	76	0	0
11	54	171	209	169	0	75	0	0
12	54	185	212	172	0	76	0	0
13	54	197	214	174	0	76	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	54	247	218	178	0	76	0	0
17	182	262	26	26	0	89	3	20
18	182	275	29	29	0	90	0	17
19	182	290	36	36	0	92	0	10
20	182	306	42	42	0	93	0	4
21	182	322	52	52	0	94	0	0
22	182	336	64	64	0	95	0	0
23	182	352	75	74	0	93	0	0
24	182	362	79	78	0	94	0	0
25	182	381	84	82	0	92	0	0
26	182	393	86	84	0	92	0	0
27	182	408	87	85	0	92	0	0
28	182	426	88	86	0	93	0	0
29	182	442	89	87	0	93	0	0
30	182	444	90	88	0	93	0	0
31	182	472	97	95	0	93	0	0
32	182	979	156	150	0	92	0	0

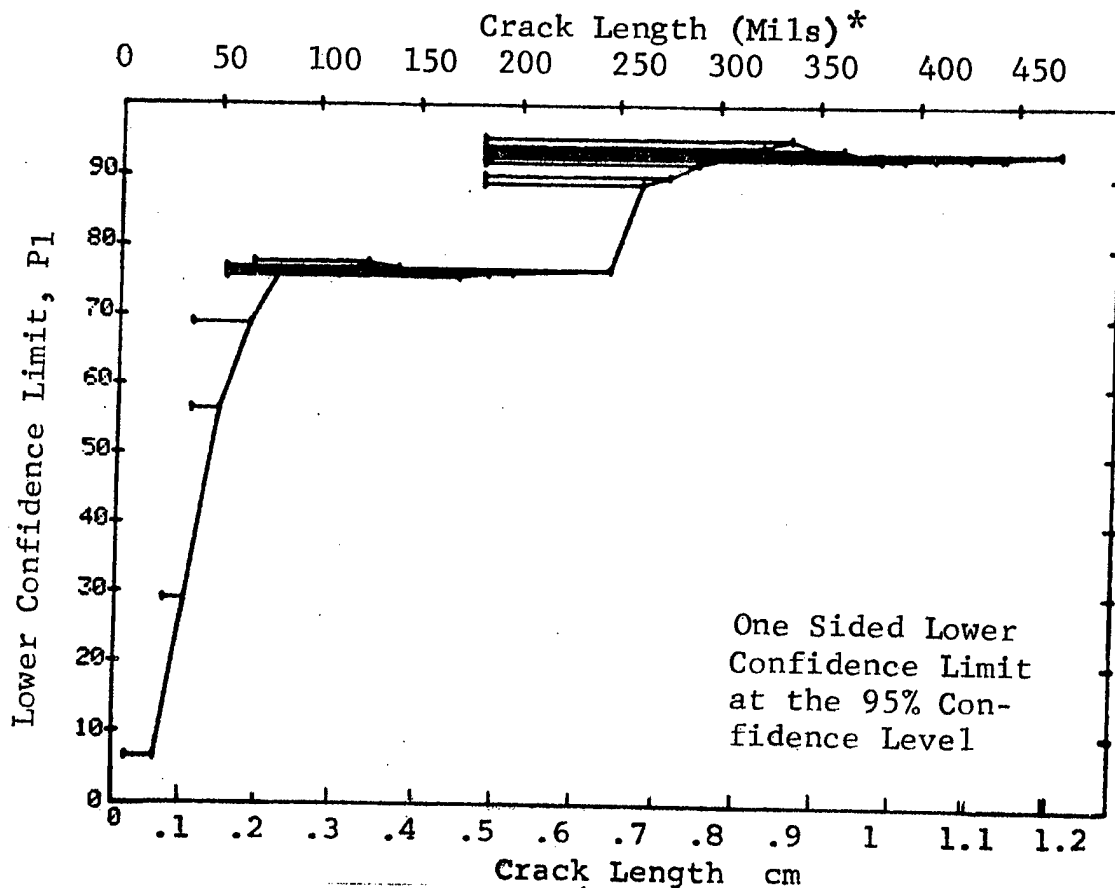


Figure D-11 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75		ULTRASONIC			TEST 3, ROCKWELL SC, '0' (11)					
RANGE	MIN LN	* MAX LN	*	N	DET	50%	95%	0 MISS	1 MISS	
1	0	0	*	0	0	0	0	0	0	
2	0	0		0	0	0	0	0	0	
3	0	0		0	0	0	0	0	0	
4	0	0		0	0	0	0	0	0	
5	0	0		0	0	0	0	0	0	
6	0	0		0	0	0	0	0	0	
7	0	0		0	0	0	0	0	0	
8	0	0		0	0	0	0	0	0	
9	0	0		0	0	0	0	0	0	
10	0	0		0	0	0	0	0	0	
11	0	0		0	0	0	0	0	0	
12	0	0		0	0	0	0	0	0	
13	0	0		0	0	0	0	0	0	
14	0	0		0	0	0	0	0	0	
15	0	0		0	0	0	0	0	0	
16	0	0		0	0	0	0	0	0	
17	0	0		0	0	0	0	0	0	
18	0	0		0	0	0	0	0	0	
19	0	0		0	0	0	0	0	0	
20	0	0		0	0	0	0	0	0	
21	7	49		52	27	50	39	0	0	
22	31	63		60	46	75	65	0	0	
23	49	69		60	50	82	73	0	0	
24	63	79		60	50	82	73	0	0	
25	70	87		60	51	83	75	94	100	
26	79	104		60	49	80	71	0	0	
27	87	131		60	49	80	71	0	0	
28	105	158		60	47	77	67	0	0	
29	131	269		60	50	82	73	0	0	
30	162	329		60	59	97	92	0	1	
31	275	426		60	58	95	89	1	16	
32	330	500		60	57	93	87	16	29	

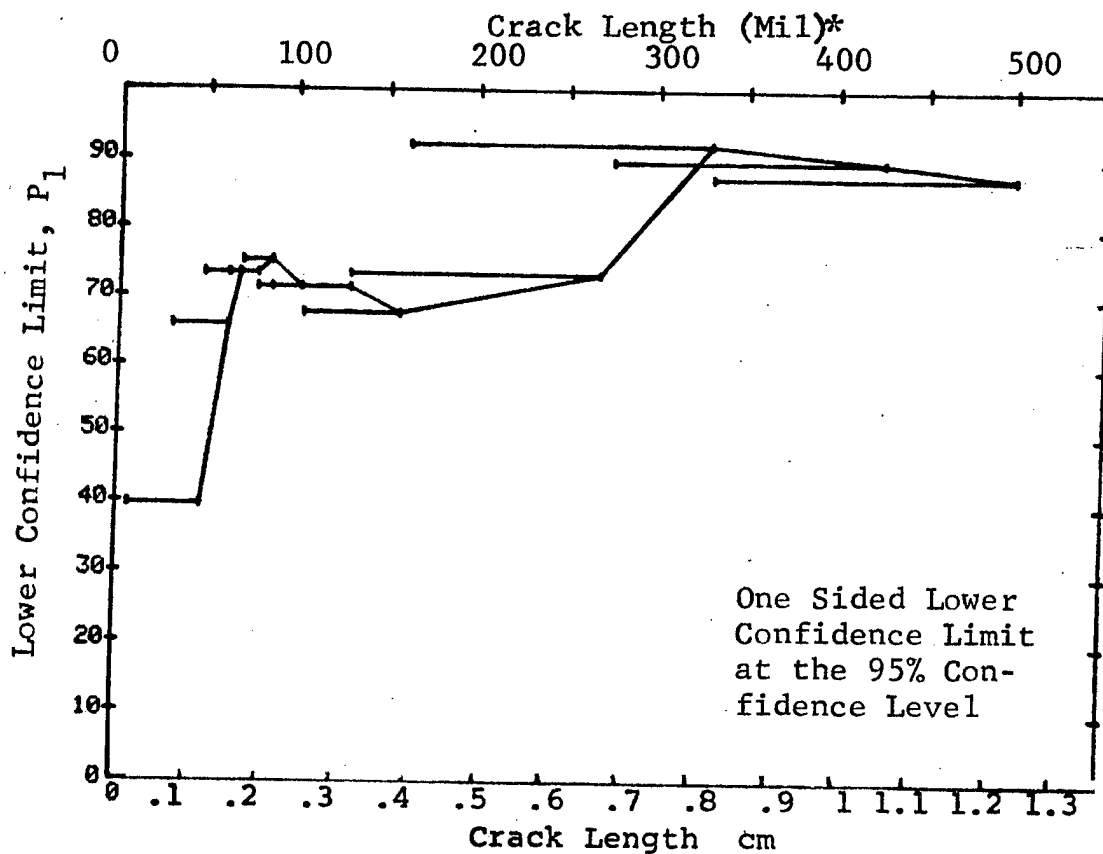


Figure D-11 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75		ULTRASONIC		N	TEST 1, (12)		ROCKWELL SC		R
RANGE	MIN LN	MAX LN	22 *		DET	50%	95%	0 MISS	
1	7	22	*	13	6	42	22	0	0
2	25	36		18	13	69	50	0	0
3	38	52		22	18	79	63	0	0
4	54	67		47	42	88	78	56	82
5	68	82		53	47	87	78	63	78
6	83	97		39	37	93	84	22	37
7	98	111		17	15	84	67	0	0
8	115	126		17	16	90	75	29	44
9	129	141		19	18	91	77	27	42
10	143	157		15	12	76	56	0	0
11	158	171		3	2	50	13	0	0
12	182	185		3	3	79	36	0	0
13	190	197		2	2	70	22	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	241	247		4	4	84	47	0	0
17	248	262		17	17	96	83	12	26
18	268	275		3	3	79	36	0	0
19	279	290		7	7	90	65	0	0
20	295	306		6	6	89	60	0	0
21	310	322		10	8	74	49	0	0
22	323	336		12	12	94	77	17	34
23	338	352		11	8	67	43	0	0
24	356	362		4	4	84	47	0	0
25	370	381		5	4	68	34	0	0
26	384	393		2	2	70	22	0	0
27	408	408		1	1	50	5	0	0
28	426	426		1	1	50	5	0	0
29	442	442		1	1	50	5	0	0
30	444	444		1	1	50	5	0	0
31	458	472		8	8	91	68	0	0
32	474	979		59	55	92	85	30	44

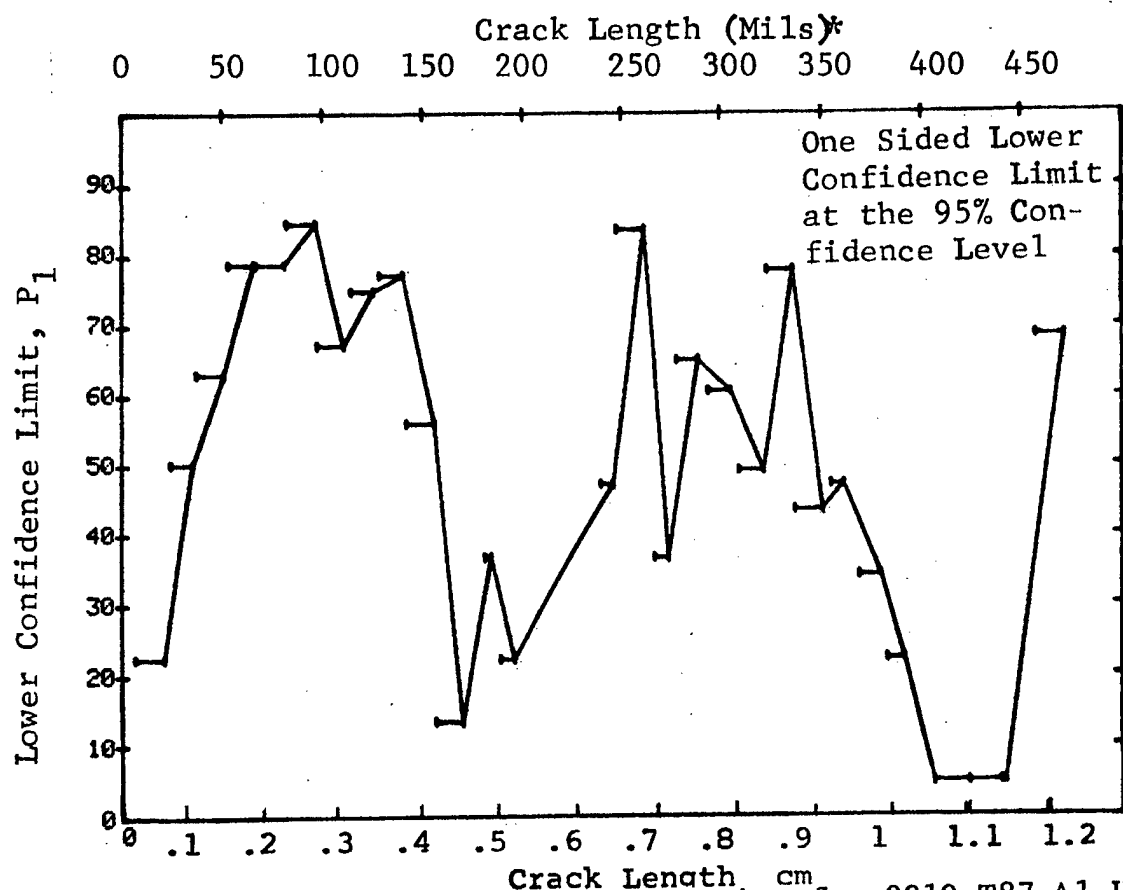


Figure D-12 Probability of Detection for 2219-T87 Al Using Ultrasonic Shear Waves. Etched Fatigue Cracks in Flat Plates Measured by Operator R. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75		ULTRASONIC		N	TEST 2, (12)		ROCKWELL 90 R	
RANGE	MIN LN	7*	MAX LN		DET	50%	95%	0 MISS 1 MISS
1		25	22*	13	6	0	22	0
2		25	36	18	13	0	50	0
3		25	32	40	31	0	64	0
4		54	67	47	42	0	78	0
5		54	82	100	89	0	82	79
6		54	97	139	126	0	85	0
7		54	111	156	141	0	85	0
8		83	126	73	68	0	86	30
9		83	141	92	86	0	87	24
10		68	157	160	145	0	85	0
11		54	171	210	189	0	85	0
12		54	185	213	192	0	86	0
13		68	197	168	152	0	85	0
14		0	0	0	0	0	0	0
15		0	0	0	0	0	0	0
16		54	247	219	198	0	86	0
17		182	262	26	26	0	89	3
18		182	275	29	29	0	90	0
19		182	290	36	36	0	92	0
20		182	306	42	42	0	93	0
21		182	322	52	50	0	88	9
22		182	336	64	62	0	90	0
23		83	352	185	170	0	87	0
24		83	362	189	174	0	88	0
25		83	381	194	178	0	87	0
26		83	393	196	180	0	87	0
27		83	408	197	181	0	87	0
28		83	426	198	182	0	87	0
29		68	442	252	230	0	87	0
30		83	444	200	184	0	88	0
31		83	472	208	192	0	85	0
32		182	979	157	147	0	89	0

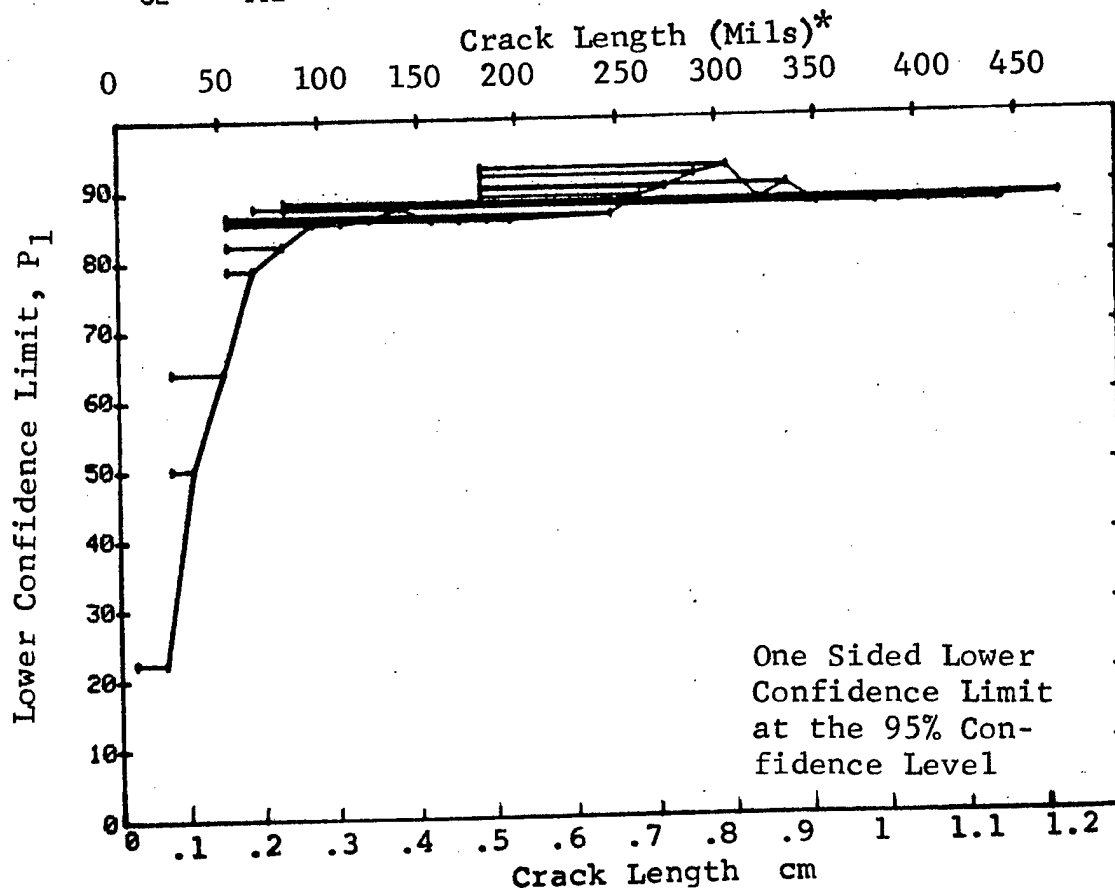


Figure D-12 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75	ULTRASONIC			N	TEST 3. (12)		ROCKWELL SC		R
RANGE	MIN	LN	* MAX LN *		DET	50%	95%	0 MISS	
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	7	51	52	36	68	57	0	0	0
22	31	63	60	49	80	71	0	0	0
23	52	70	60	51	83	75	94	100	82
24	64	79	60	53	87	79	69	82	29
25	70	87	60	57	93	87	16	43	43
26	79	105	60	56	92	85	29	43	69
27	88	131	60	56	92	85	29	43	56
28	105	162	60	54	88	81	56	69	16
29	132	275	60	55	90	83	43	69	56
30	171	330	60	58	95	89	1	16	69
31	279	442	60	54	88	81	56	69	69
32	331	500	50	54	88	81	56	69	69

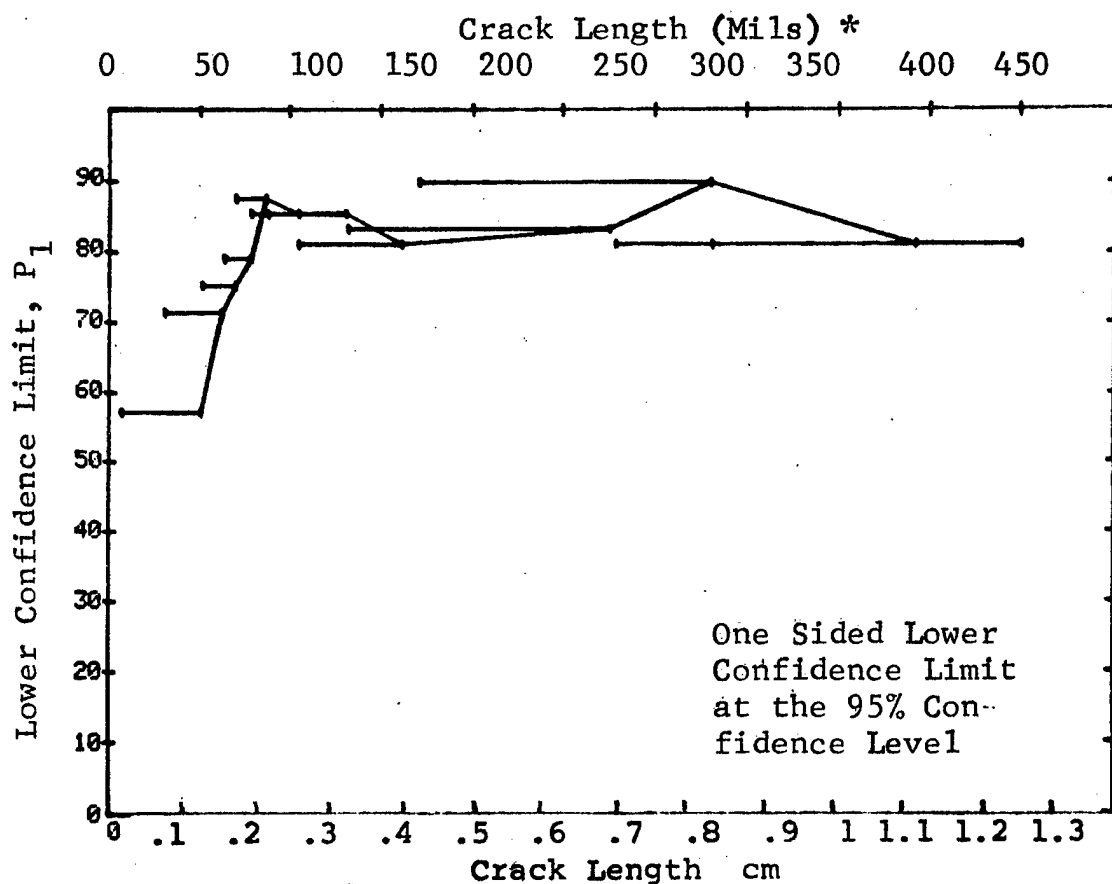


Figure D-12 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75	ULTRASONIC		TEST 1 (13) ROCKWELL SC S						
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	7	22	13	4	27	11	0	0	
2	25	36	18	13	69	50	0	0	
3	38	52	23	17	71	54	0	0	
4	54	67	46	38	81	70	0	0	
5	68	82	53	50	93	86	23	36	
6	83	97	39	36	90	81	37	50	
7	98	111	17	17	96	83	12	23	
8	115	126	17	16	90	75	29	44	
9	129	141	19	18	91	77	27	42	
10	143	157	15	14	89	72	0	0	
11	158	171	3	3	79	36	0	0	
12	182	185	3	3	79	36	0	0	
13	190	197	2	2	70	22	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	241	247	4	3	61	24	0	0	
17	248	262	17	17	96	83	12	29	
18	268	275	3	3	79	36	0	0	
19	279	290	7	6	77	47	0	0	
20	295	306	6	6	89	60	0	0	
21	310	322	10	10	93	74	0	0	
22	323	336	12	10	78	56	0	0	
23	338	352	11	10	85	63	0	0	
24	356	362	4	4	84	47	0	0	
25	370	381	5	4	68	34	0	0	
26	384	393	2	2	70	22	0	0	
27	408	408	1	1	50	5	0	0	
28	426	426	1	1	50	5	0	0	
29	442	442	1	1	50	5	0	0	
30	444	444	1	1	50	5	0	0	
31	458	472	8	8	91	68	0	0	
32	474	979	59	59	98	95	0	0	

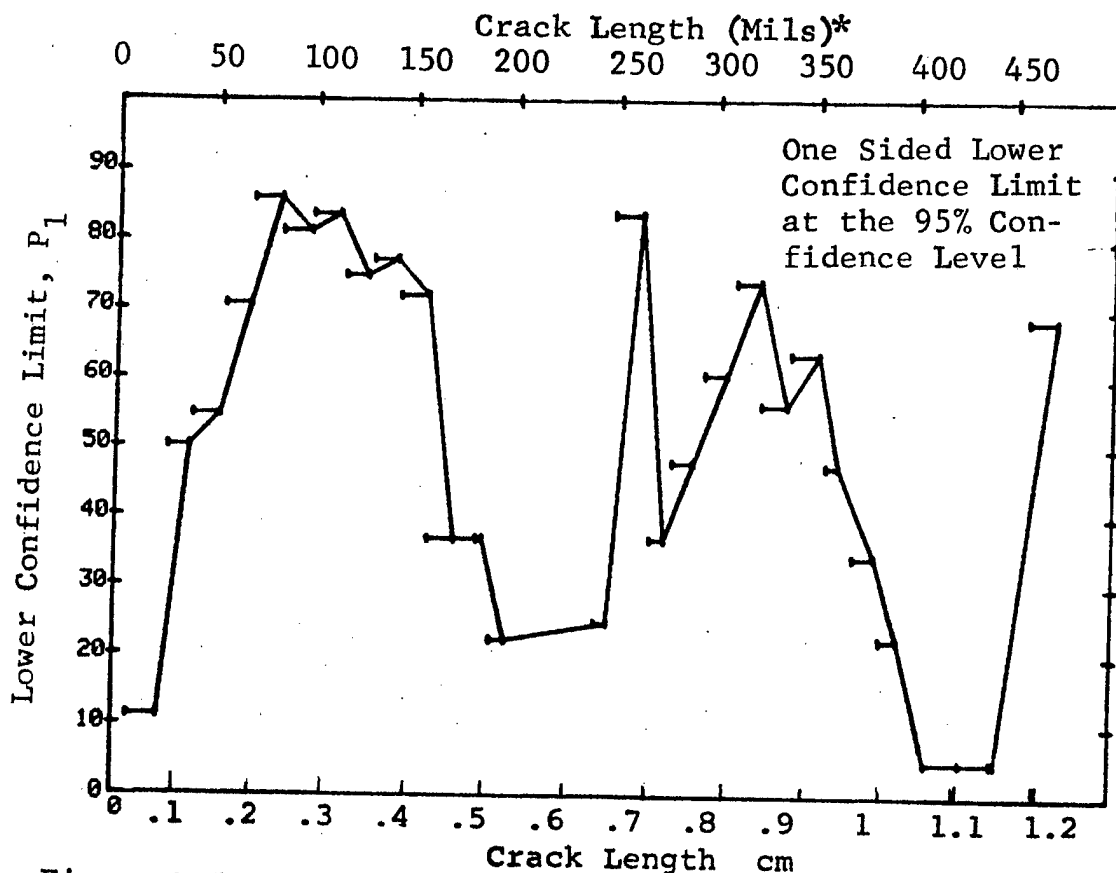


Figure D-13 Probability of Detection for 2219-T87 Al Using Ultrasonic Shear Waves. Etched Fatigue Cracks in Flat Plates Measured by Operator S. Lab. Env. D-39

(b) Optimum Probability Method of Data Cumulation

24-JUL-75		ULTRASONIC		N	TEST 2, (13)		ROCKWELL SC		S
RANGE	MIN LN	* MAX LN	* 22 *		DET	50%	95%	0 MISS	
1	7	22	13		4	0	11	0	0
2	25	36	18		13	0	50	0	0
3	25	52	41		30	0	59	0	0
4	54	67	46		38	0	70	0	0
5	68	82	53		50	0	86	23	36
6	68	97	92		86	0	87	24	37
7	68	111	109		103	0	89	0	0
8	68	126	126		119	0	89	0	0
9	68	141	145		137	0	90	0	0
10	68	157	160		151	0	90	0	0
11	68	171	163		154	0	90	0	0
12	68	185	166		157	0	90	0	0
13	68	197	168		159	0	90	0	0
14	0	0	0		0	0	0	0	0
15	0	0	0		0	0	0	0	0
16	68	247	172		162	0	90	0	0
17	68	262	189		179	0	91	0	0
18	68	275	192		182	0	91	0	0
19	68	290	199		188	0	91	0	0
20	68	306	205		194	0	91	0	0
21	68	322	215		204	0	91	0	0
22	68	336	227		214	0	91	0	0
23	68	352	238		224	0	90	0	0
24	68	362	242		228	0	91	0	0
25	68	381	247		232	0	90	0	0
26	68	393	249		234	0	90	0	0
27	68	408	250		235	0	90	0	0
28	68	426	251		236	0	90	0	0
29	68	442	252		237	0	90	0	0
30	68	444	253		238	0	91	0	0
31	68	472	261		246	0	91	0	0
32	384	979	73		73	0	95	0	0

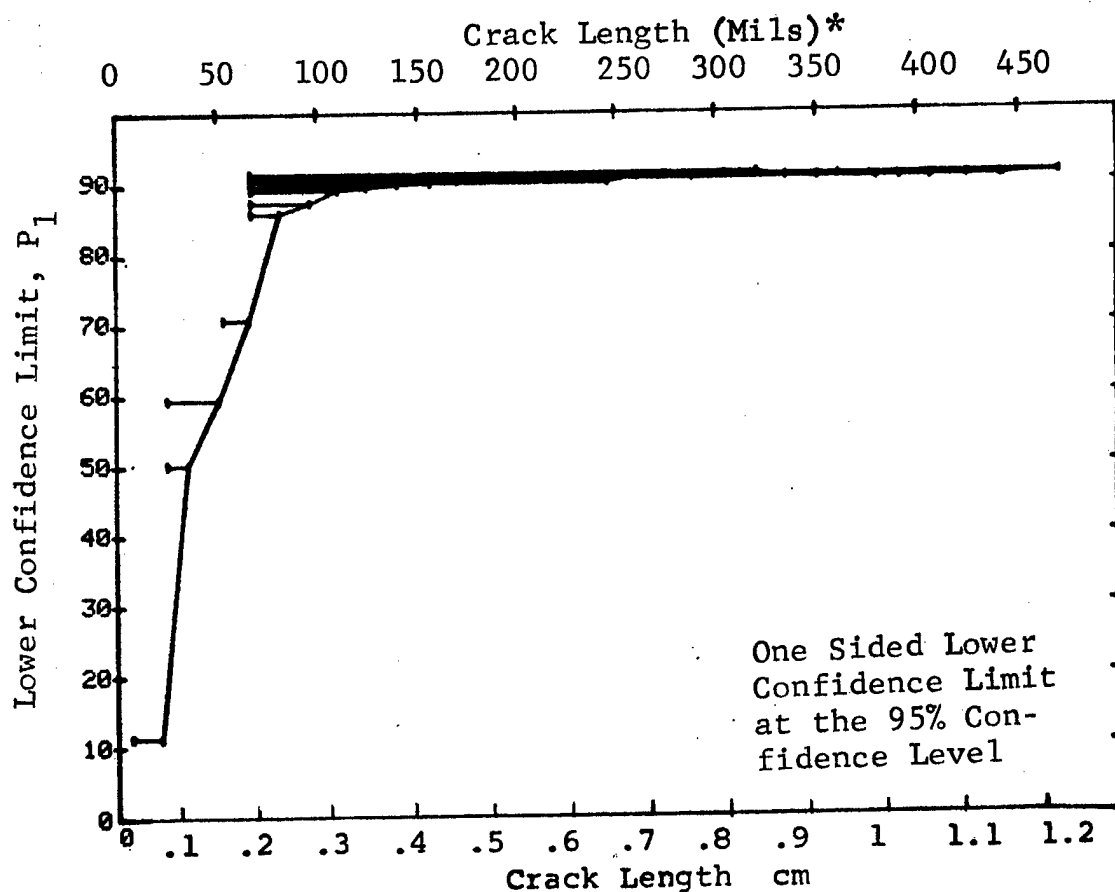


Figure D-13 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75	ULTRASONIC			TEST 3, 7(13)			ROCKWELL 60 s		
RANGE	MIN LN	* MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	7	49	52	32	60	49	0	0	
22	31	63	60	46	75	65	0	0	
23	51	70	60	51	83	75	94	100	
24	64	79	60	54	88	81	56	69	
25	70	87	60	57	93	87	16	29	
26	79	105	60	57	93	87	16	29	
27	88	131	60	56	92	85	29	43	
28	105	162	60	57	93	87	16	29	
29	132	275	60	58	95	89	1	16	
30	171	330	60	58	95	89	1	16	
31	279	442	60	55	90	83	43	56	
32	331	500	60	56	92	85	29	43	

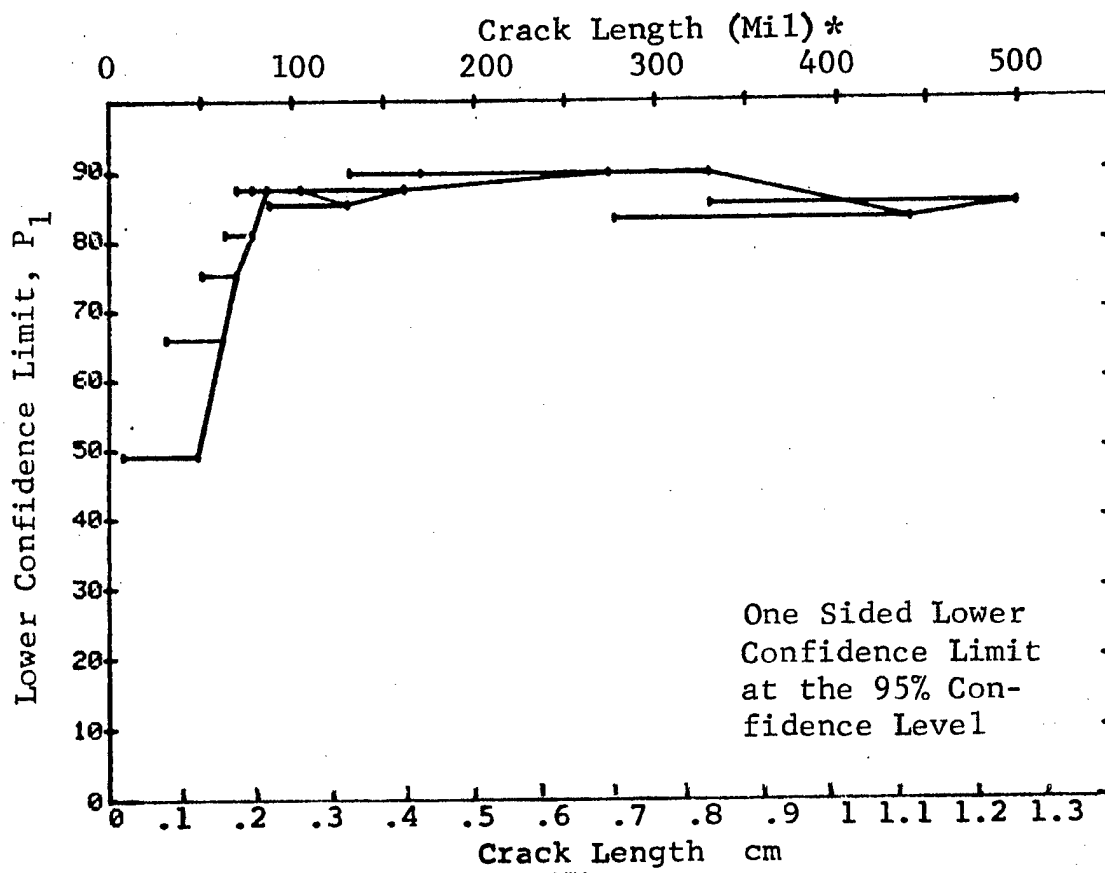


Figure D-13 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 1, (14)		ROCKWELL SC		H
RANGE	MIN LN	* MAX LN *			DET	50%	95%	0 MISS	
1	7	22		13	4	27	11	0	0
2	25	36		18	9	47	29	0	0
3	38	52		23	21	88	75	38	53
4	54	67		46	39	83	73	0	0
5	68	82		53	47	87	78	63	75
6	83	97		38	37	95	83	8	23
7	98	111		17	17	96	83	12	29
8	115	126		17	15	84	67	0	0
9	129	141		19	18	91	77	27	42
10	143	157		15	14	89	72	0	0
11	158	171		3	3	79	36	0	0
12	182	185		3	3	79	36	0	0
13	190	197		2	2	70	22	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	241	247		4	4	84	47	0	0
17	248	262		17	17	96	83	12	29
18	268	275		3	3	79	36	0	0
19	279	290		7	7	90	65	0	0
20	295	306		6	6	89	60	0	0
21	310	322		10	10	93	74	0	0
22	323	336		12	11	86	66	0	0
23	338	352		11	11	93	76	18	35
24	356	362		4	4	84	47	0	0
25	370	381		5	4	68	34	0	0
26	384	393		2	2	70	22	0	0
27	408	408		1	1	50	5	0	0
28	426	426		1	1	50	5	0	0
29	442	442		1	1	50	5	0	0
30	444	444		1	1	50	5	0	0
31	458	472		8	8	91	68	0	0
32	474	979		59	59	98	95✓	0	0

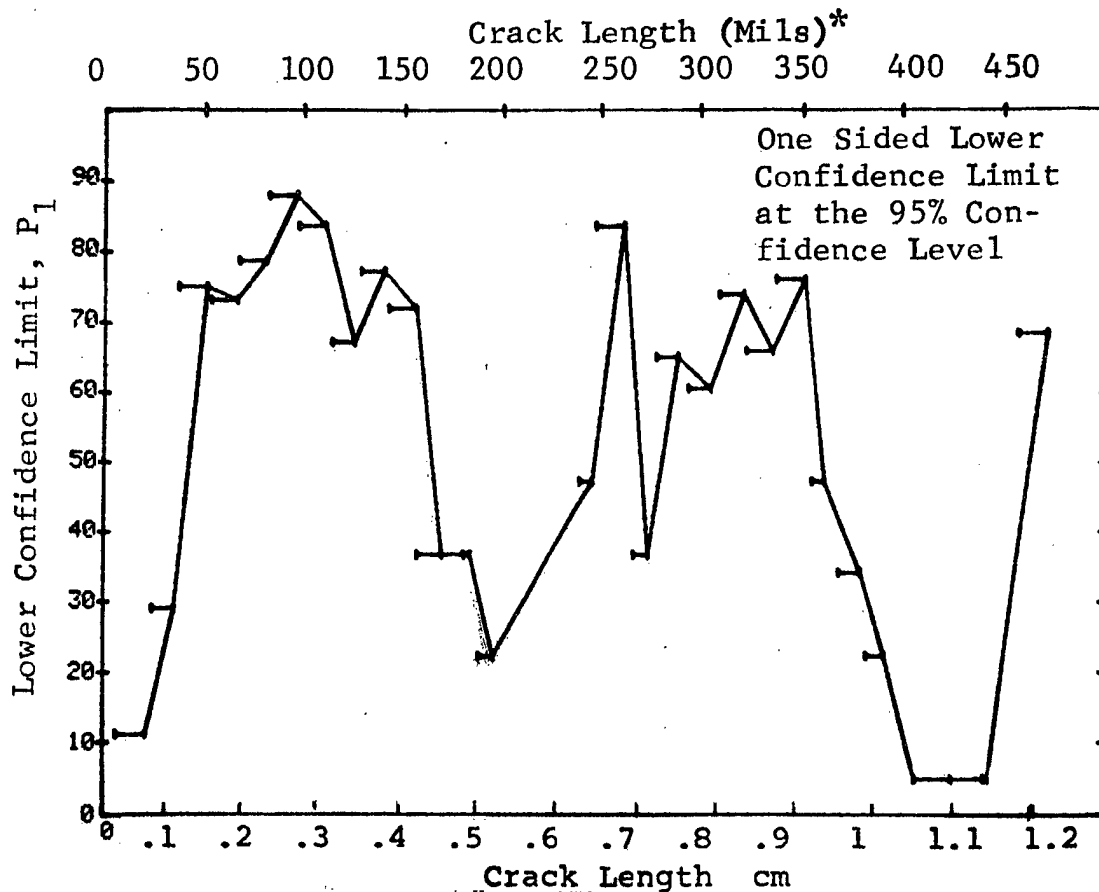


Figure D-14 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates Measured by Operator H. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75			PENETRANT		N	TEST 2, (14)		ROCKWELL C		H
RANGE	MIN	LN	MAX	LN		DET	50%	95%	0 MISS	
1		7 *	22 *		13	4	0	11	0	0
2	25		36		18	9	0	29	0	0
3	38		52		23	21	0	75	0	0
4	38		67		69	60	0	78	0	0
5	38		82		122	107	0	81	0	0
6	83		97		38	37	0	88	8	23
7	83		111		55	54	0	91	0	6
8	83		126		72	69	0	89	4	17
9	83		141		91	87	0	90	0	12
10	83		157		106	101	0	90	0	0
11	83		171		109	104	0	90	0	0
12	83		185		112	107	0	90	0	0
13	83		197		114	109	0	90	0	0
14	0		0		0	0	0	0	0	0
15	0		0		0	0	0	0	0	0
16	83		247		118	113	0	91	0	0
17	83		262		135	130	0	92	0	0
18	83		275		138	133	0	92	0	0
19	83		290		145	140	0	92	0	0
20	158		306		45	45	0	93	0	1
21	158		322		55	55	0	94	0	0
22	83		336		173	167	0	93	0	0
23	158		352		78	77	0	94	0	0
24	158		362		82	81	0	94	0	0
25	83		381		193	186	0	93	0	0
26	83		393		195	188	0	93	0	0
27	83		408		196	189	0	93	0	0
28	83		426		197	190	0	93	0	0
29	83		442		198	191	0	93	0	0
30	83		444		199	192	0	93	0	0
31	158		472		101	99	0	93	0	0
32	158		979		160	158	0	96	0	0

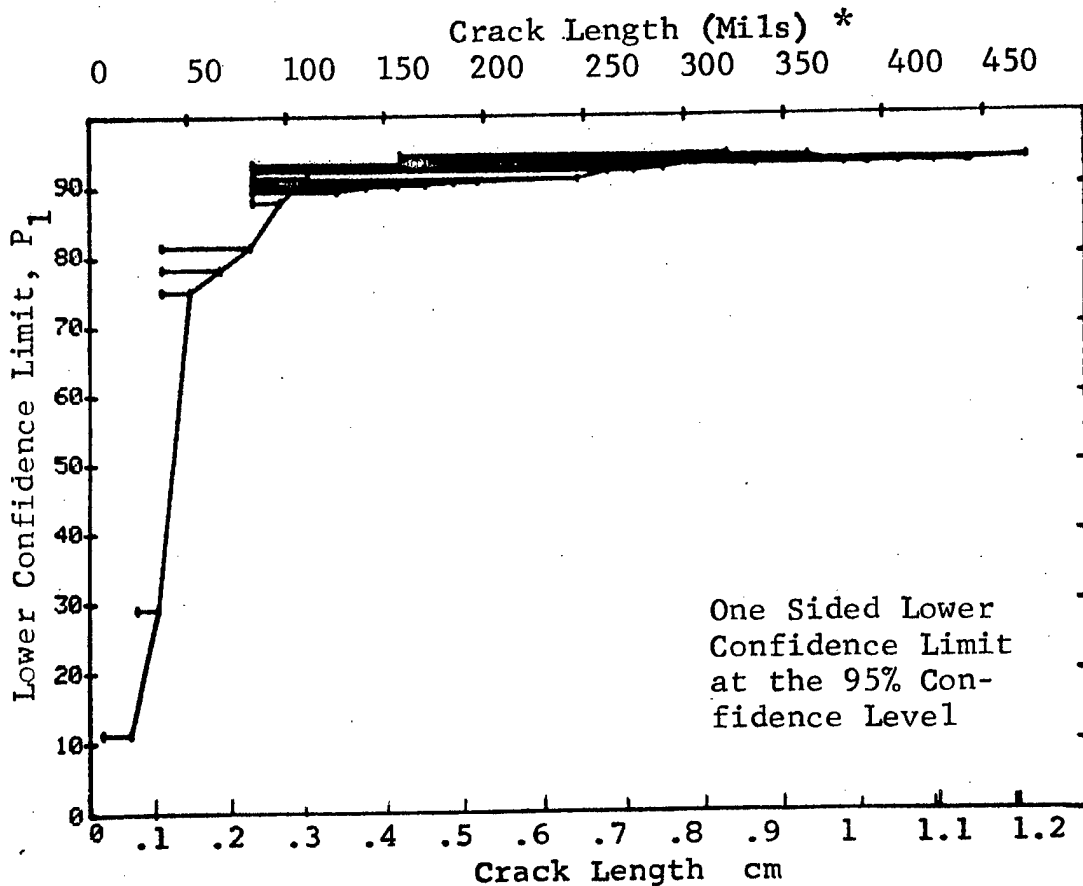


Figure D-14 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75	PENETRANT		TEST 3, (14)			ROCKWELL		H
RANGE	MIN LN	MAX LN	DET	50%	95%	0 MISS	1 MISS	
1	0	0 *	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	7	49	51	31	59	48	0	0
22	30	63	60	50	82	73	0	0
23	49	69	60	50	82	73	0	0
24	63	79	60	54	88	81	56	69
25	70	87	60	56	92	85	29	43
26	79	105	60	56	92	85	29	43
27	87	131	60	58	95	89	1	16
28	105	162	60	56	92	85	29	43
29	132	275	60	58	95	89	1	16
30	171	330	60	59	97	92	0	1
31	279	442	60	58	95	89	1	16
32	331	500	60	55	97	92	0	1

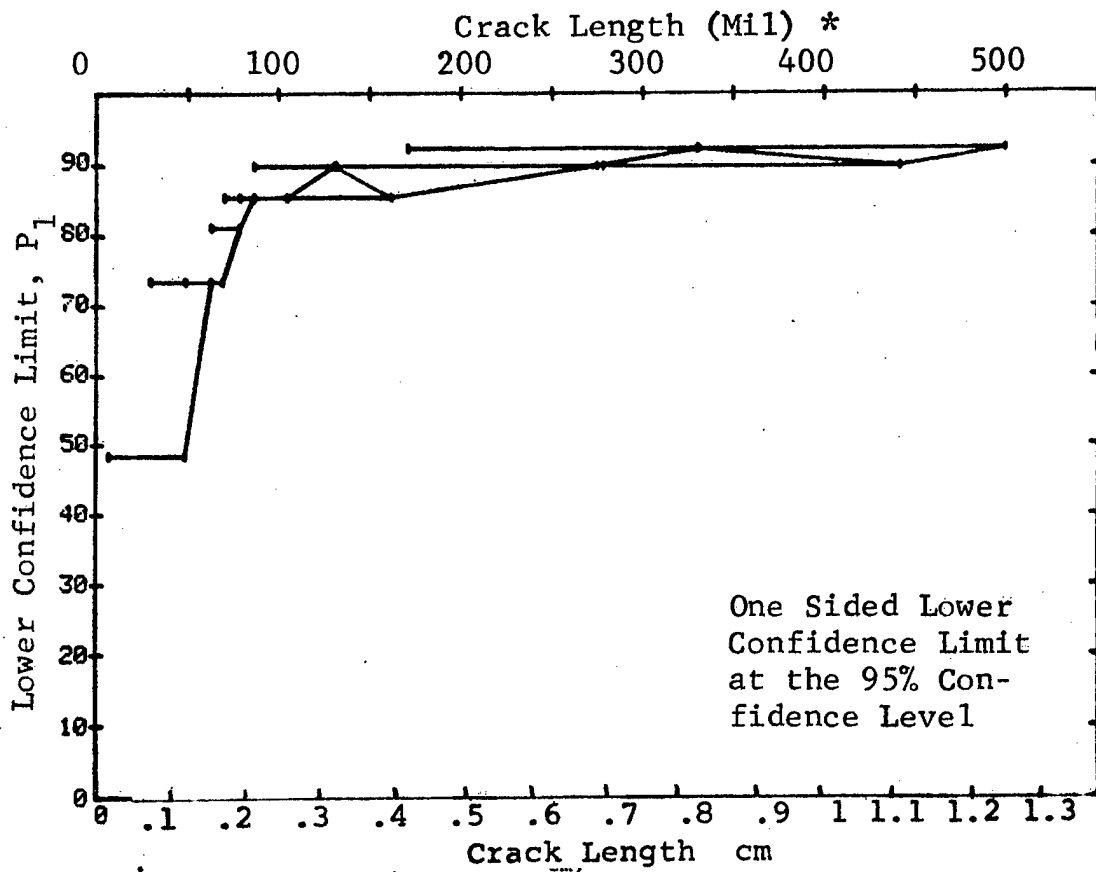


Figure D-14 (Concluded)

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(a) Range Interval Method of Data Cumulation

24-JUL-75	PENETRANT		TEST 1, (15)		ROCKWELL SC		I MISS	
RANGE	MIN LN	* MAX LN *	DET	50%	95%	0 MI	1 MISS	
1	7	22 *	0	0	0	0	0	
2	25	36	9	47	29	0	0	
3	38	52	17	71	54	0	0	
4	54	67	32	68	56	0	0	
5	68	82	44	81	72	0	0	
6	83	97	35	88	78	50	64	
7	98	111	15	84	67	0	0	
8	115	126	14	78	60	0	0	
9	129	141	18	91	77	27	42	
10	143	157	13	82	63	0	0	
11	158	171	3	79	36	0	0	
12	182	185	3	79	36	0	0	
13	190	197	1	29	2	0	0	
14	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	
16	241	247	4	84	47	0	0	
17	248	262	17	96	83	12	29	
18	268	275	3	79	36	0	0	
19	279	290	7	90	65	0	0	
20	295	306	6	89	60	0	0	
21	310	322	10	93	74	0	0	
22	323	336	12	94	77	17	34	
23	338	352	11	93	76	18	35	
24	356	362	4	84	47	0	0	
25	370	381	5	87	54	0	0	
26	384	393	2	70	22	0	0	
27	408	408	1	50	5	0	0	
28	426	426	1	50	5	0	0	
29	442	442	1	50	5	0	0	
30	444	444	1	50	5	0	0	
31	458	472	6	91	60	0	0	
32	474	979	58	97	92	0	0	

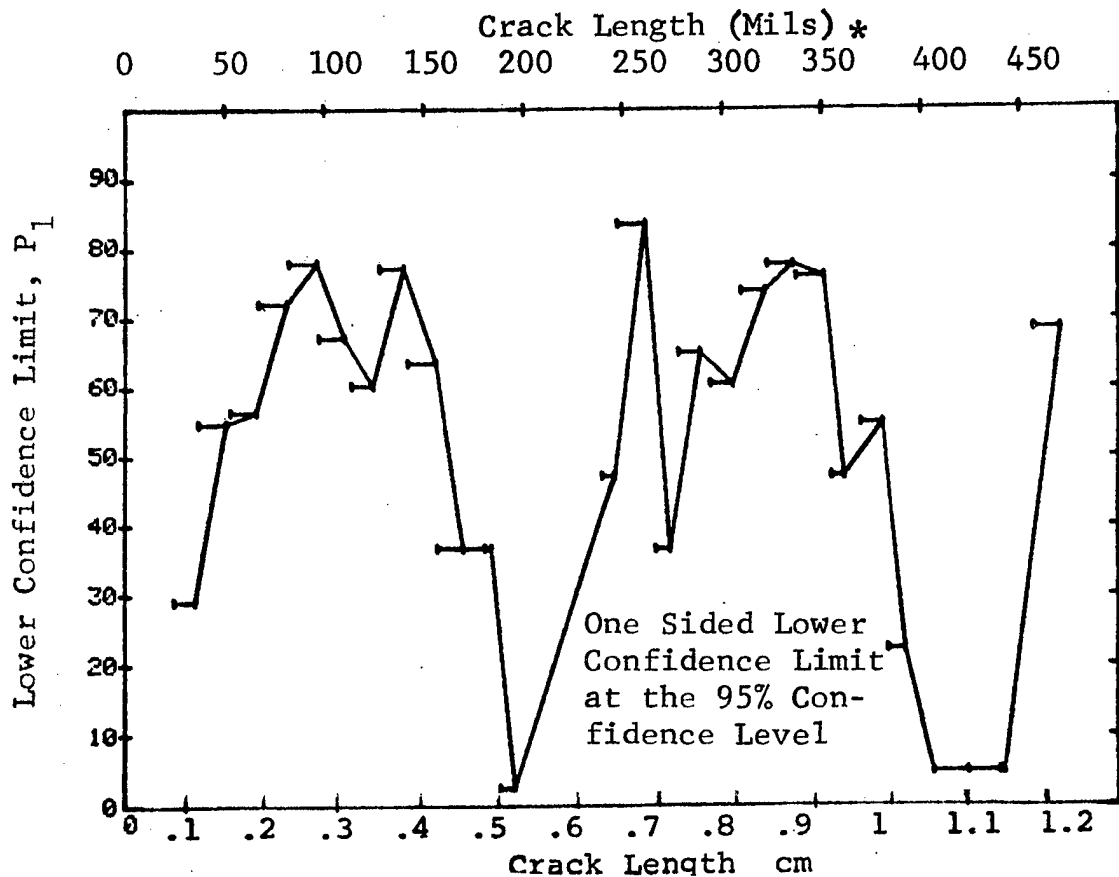


Figure D-15 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates Measured by Operator I. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 2, (15)		ROCKWELL SC I	
RANGE	MIN LN	MAX LN	*		DET	50%	95%	0 01
1	7	22 *		13	0	0	0	0
2	25	36		18	0	0	29	0
3	38	52		23	17	0	54	0
4	38	67		69	49	0	60	0
5	68	82		53	44	0	72	0
6	68	97		92	79	0	78	0
7	83	111		56	50	0	79	0
8	68	126		126	103	0	79	0
9	83	141		92	82	0	82	75
10	83	157		107	95	0	82	0
11	83	171		110	98	0	82	0
12	83	185		113	101	0	83	0
13	83	197		115	102	0	82	0
14	0	0		0	0	0	0	0
15	0	0		0	0	0	0	0
16	83	247		119	106	0	83	0
17	241	262		21	21	0	86	25
18	241	275		24	24	0	88	5
19	241	290		31	31	0	90	15
20	241	306		37	37	0	92	0
21	241	322		47	47	0	93	0
22	241	336		59	59	0	95	0
23	241	352		70	70	0	95	0
24	241	362		74	74	0	96	0
25	241	381		79	79	0	96	0
26	241	393		81	81	0	96	0
27	241	408		82	82	0	96	0
28	241	426		83	83	0	96	0
29	241	442		84	84	0	96	0
30	241	444		85	85	0	96	0
31	241	472		93	93	0	96	0
32	241	979		152	151	0	96	0

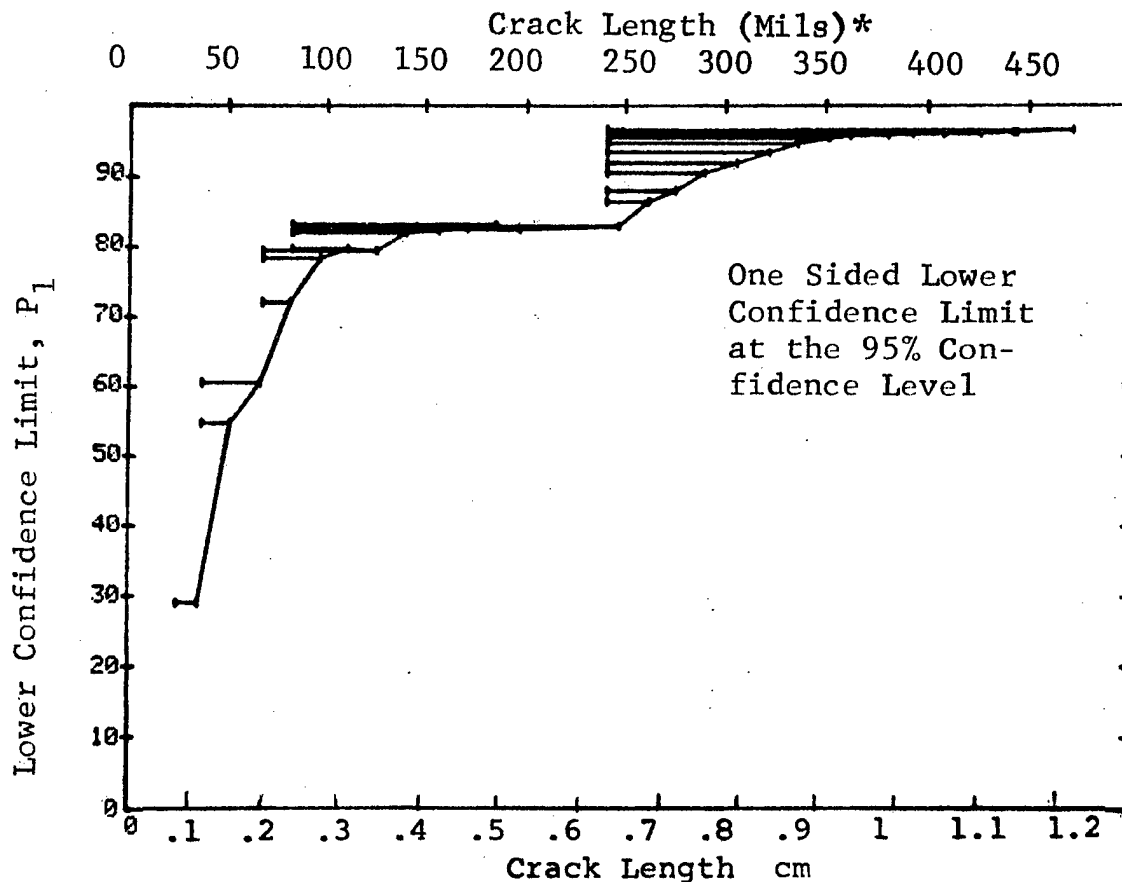


Figure D-15 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 3, (15)		ROCKWELL C		MISS
RANGE	MIN LN	MAX LN	*		DET	50%	95%	0 MIN	
1	0	0	*	0	0	0	0	0	0
2	0	0	*	0	0	0	0	0	0
3	0	0	*	0	0	0	0	0	0
4	0	0	*	0	0	0	0	0	0
5	0	0	*	0	0	0	0	0	0
6	0	0	*	0	0	0	0	0	0
7	0	0	*	0	0	0	0	0	0
8	0	0	*	0	0	0	0	0	0
9	0	0	*	0	0	0	0	0	0
10	0	0	*	0	0	0	0	0	0
11	0	0	*	0	0	0	0	0	0
12	0	0	*	0	0	0	0	0	0
13	0	0	*	0	0	0	0	0	0
14	0	0	*	0	0	0	0	0	0
15	0	0	*	0	0	0	0	0	0
16	0	0	*	0	0	0	0	0	0
17	0	0	*	0	0	0	0	0	0
18	0	0	*	0	0	0	0	0	0
19	0	0	*	0	0	0	0	0	0
20	0	0	*	0	0	0	0	0	0
21	7	49	*	52	25	47	36	0	0
22	31	63	*	60	42	69	58	0	0
23	51	70	*	60	43	70	60	0	0
24	64	79	*	60	46	75	65	0	0
25	70	87	*	60	50	82	73	0	0
26	79	105	*	60	53	87	79	69	0
27	88	131	*	60	54	88	81	56	0
28	105	162	*	60	53	87	79	69	0
29	132	275	*	60	56	92	85	29	43
30	171	330	*	60	59	97	92	0	1
31	279	442	*	60	58	98	95	0	0
32	331	500	*	60	59	97	92	0	1

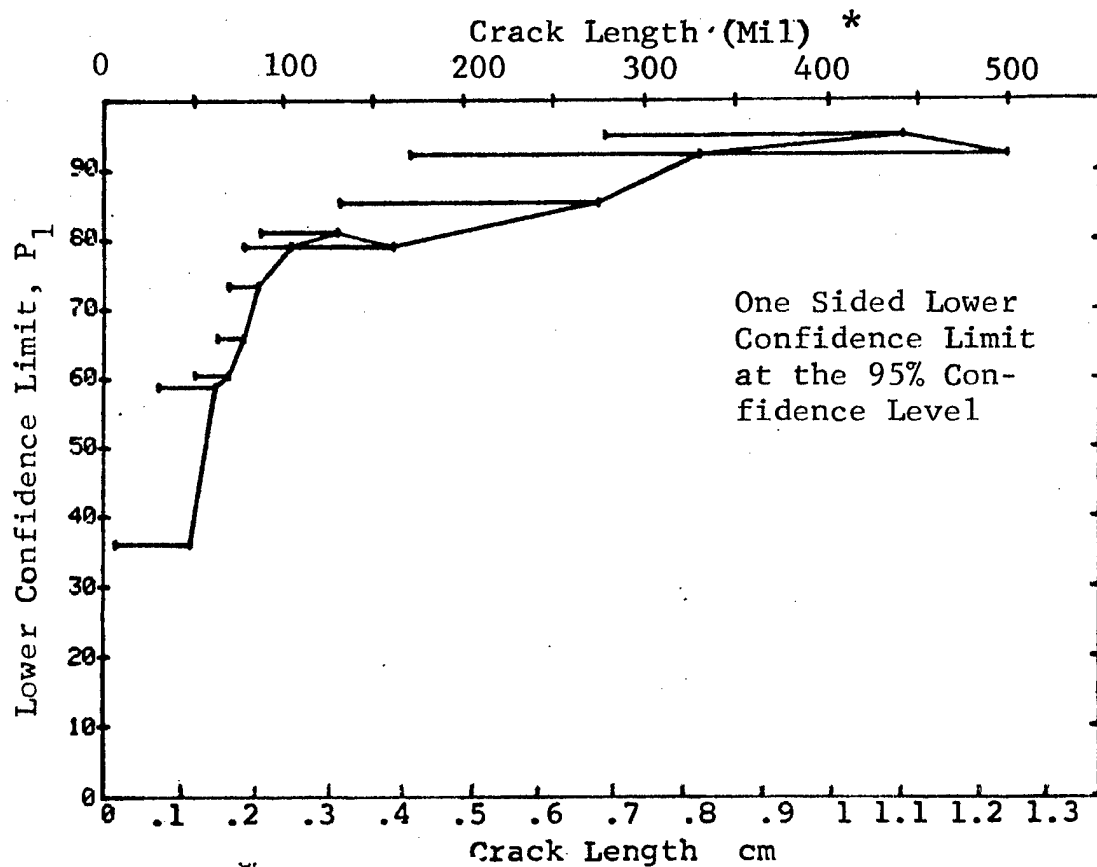


Figure D-15 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75	PENETRANT			TEST 1, (16)			ROCKWELL C		
RANGE	MIN	LN	*MAX LN *	DET	50%	95%	HITS	MISS	
1	7	22		3	20	6	0	0	
2	25	36		6	30	15	0	0	
3	38	52		9	37	22	0	0	
4	54	67		29	61	48	0	0	
5	68	82		36	66	55	0	0	
6	83	97		30	75	63	0	0	
7	98	111		16	90	75	29	44	
8	115	126		15	84	67	0	0	
9	129	141		17	86	70	0	0	
10	143	157		13	82	63	0	0	
11	158	171		3	79	36	0	0	
12	182	185		3	79	36	0	0	
13	190	197		1	29	2	0	0	
14	0	0		0	0	0	0	0	
15	0	0		0	0	0	0	0	
16	241	247		4	84	47	0	0	
17	248	262		17	96	83	12	29	
18	268	275		3	79	36	0	0	
19	279	290		7	90	65	0	0	
20	295	306		6	89	60	0	0	
21	310	322		9	83	60	0	0	
22	323	336		12	94	77	17	34	
23	338	352		10	85	63	0	0	
24	356	362		4	84	47	0	0	
25	370	381		5	87	54	0	0	
26	384	393		2	70	22	0	0	
27	408	408		1	50	5	0	0	
28	426	426		1	50	5	0	0	
29	442	442		1	50	5	0	0	
30	444	444		1	50	5	0	0	
31	458	472		3	91	68	0	0	
32	474	979		59	97	92	0	1	

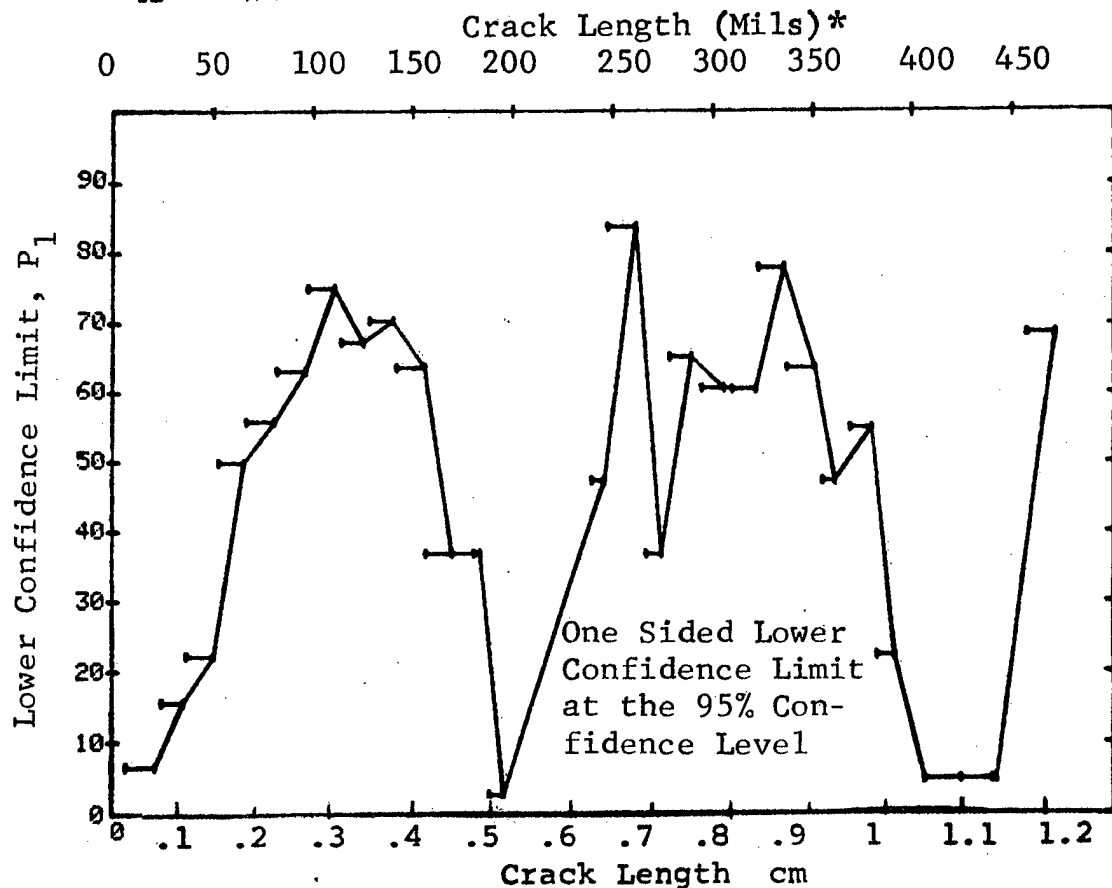


Figure D-16 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates Measured by Operator J D-48 Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75	PENETRANT		N	TEST 2, (16)		ROCKWELL SC		J
RANGE	MIN LN	* MAX LN		DET	50%	95%	0 MIL	
1	7	22*	13	3	0	6	0	0
2	7	16	31	9	0	16	0	0
3	25	52	41	15	0	24	0	0
4	54	67	46	29	0	49	0	0
5	54	82	99	65	0	57	0	0
6	83	97	39	30	0	63	0	0
7	98	111	17	16	0	75	0	0
8	98	126	34	31	0	78	0	0
9	98	141	53	48	0	81	50	0
10	98	157	68	61	0	81	61	0
11	98	171	71	64	0	82	58	0
12	98	185	74	67	0	82	55	0
13	98	197	76	68	0	81	66	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	98	247	80	72	0	82	62	0
17	241	262	21	21	0	86	3	0
18	241	275	24	24	0	88	5	0
19	241	290	31	31	0	90	0	0
20	241	306	37	37	0	92	0	0
21	241	322	47	46	0	90	0	14
22	241	336	59	58	0	92	0	2
23	241	352	70	68	0	91	0	6
24	241	362	74	72	0	91	0	2
25	241	381	79	77	0	92	0	0
26	241	393	81	79	0	92	0	0
27	241	408	82	80	0	92	0	0
28	241	426	83	81	0	92	0	0
29	241	442	84	82	0	92	0	0
30	241	444	85	83	0	92	0	0
31	241	472	93	91	0	93	0	0
32	241	979	153	150	0	95	0	0

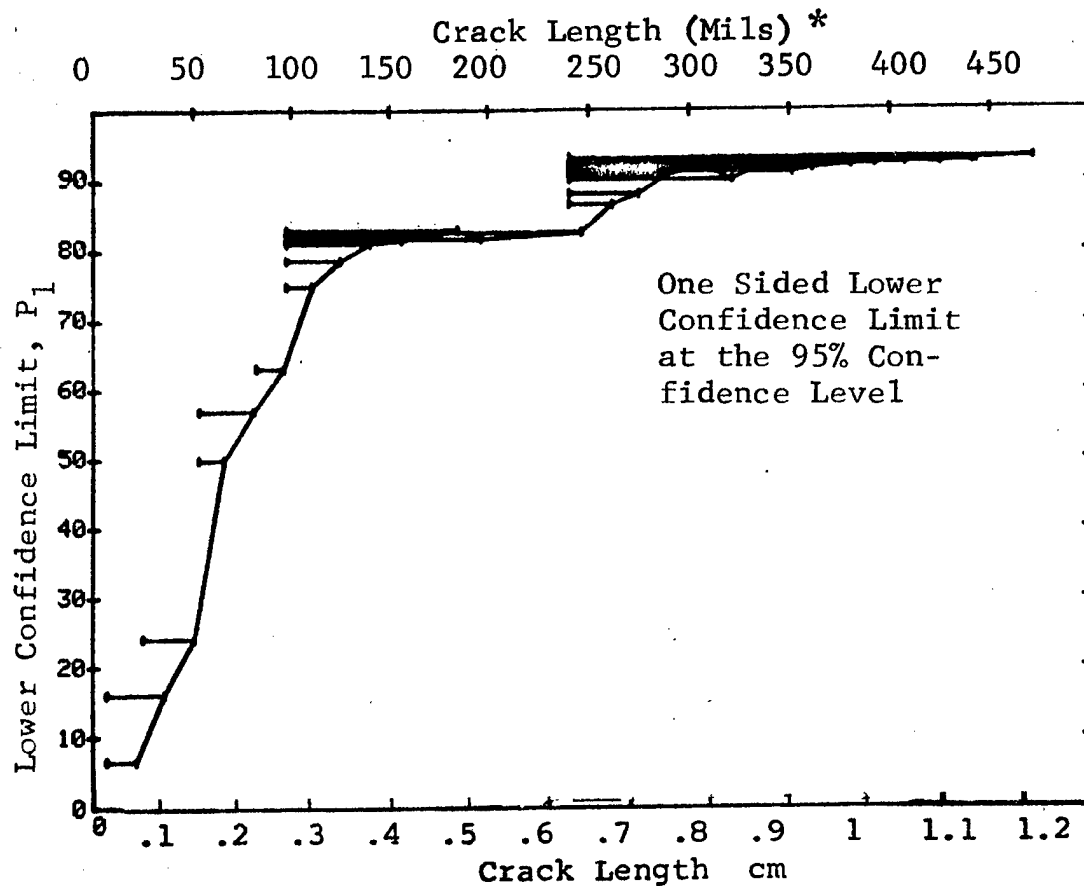


Figure D-16 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 3, (16)		ROCKWELL 50 J	
RANGE	MIN LN	* MAX LN	*		DET	50%	95%	0 MISS
1	0	0	*	0	0	0	0	0
2	0	0	*	10	0	0	0	0
3	0	0	*	0	0	0	0	0
4	0	0	*	0	0	0	0	0
5	0	0	*	0	0	0	0	0
6	0	0	*	0	0	0	0	0
7	0	0	*	0	0	0	0	0
8	0	0	*	0	0	0	0	0
9	0	0	*	0	0	0	0	0
10	0	0	*	0	0	0	0	0
11	0	0	*	0	0	0	0	0
12	0	0	*	0	0	0	0	0
13	0	0	*	0	0	0	0	0
14	0	0	*	0	0	0	0	0
15	0	0	*	0	0	0	0	0
16	0	0	*	0	0	0	0	0
17	0	0	*	0	0	0	0	0
18	0	0	*	0	0	0	0	0
19	0	0	*	0	0	0	0	0
20	0	0	*	0	0	0	0	0
21	7	49	*	52	16	29	20	0
22	31	63	*	60	29	47	37	0
23	51	70	*	60	37	60	50	0
24	64	79	*	60	42	69	58	0
25	70	87	*	60	40	65	55	0
26	79	105	*	60	45	74	64	0
27	88	131	*	60	57	93	87	16
28	105	162	*	60	54	88	81	36
29	132	275	*	60	55	90	83	43
30	171	330	*	60	58	95	89	1
31	279	442	*	60	58	95	89	1
32	331	500	*	60	58	95	89	1

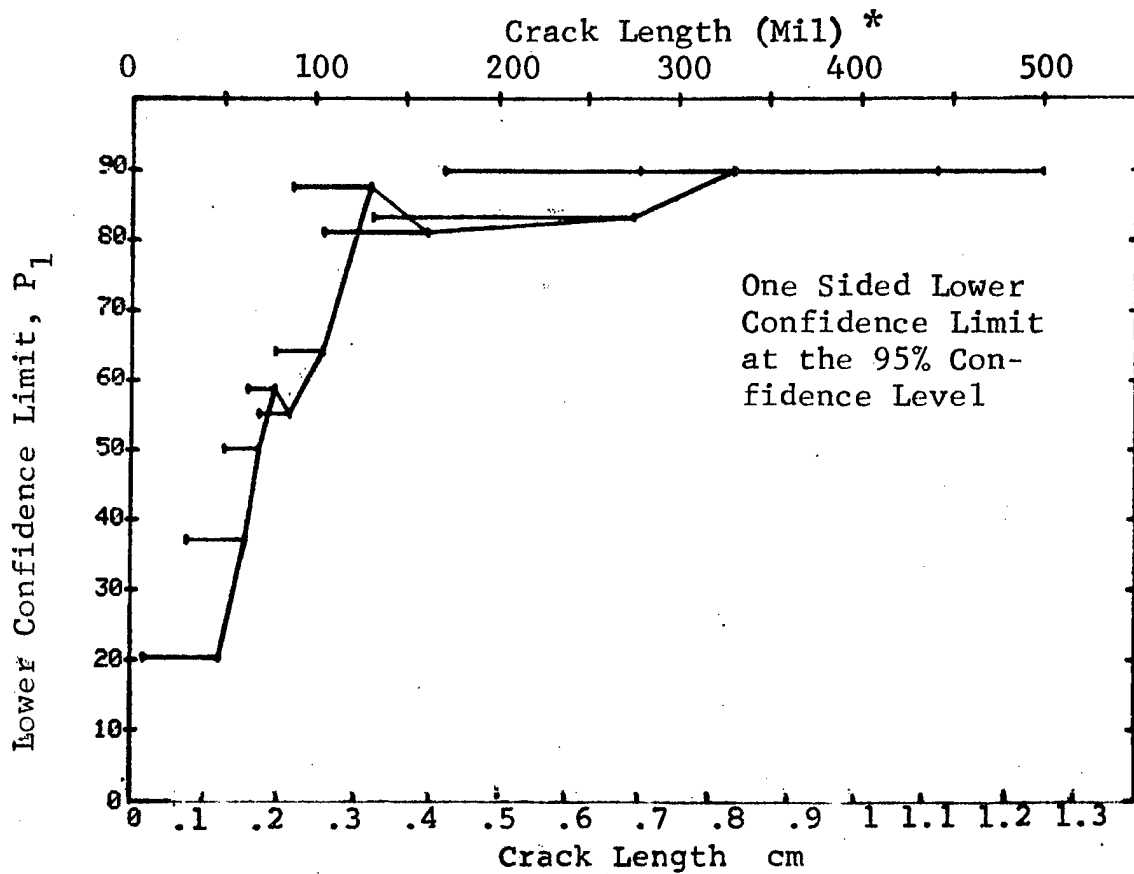


Figure D-16 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 1, (17)		ROCKWELL SC		K
RANGE	MIN LN	MAX LN	*		DET	50%	95%	0 HITS	
1	7	22	*	13	3	20	6	0	0
2	25	36		18	9	47	29	0	0
3	38	52		23	16	67	50	0	0
4	54	67		46	37	79	68	0	0
5	68	82		54	46	84	74	0	0
6	83	97		39	37	93	84	22	37
7	98	111		17	17	96	83	12	29
8	115	126		17	16	90	75	29	44
9	129	141		19	19	96	85	10	27
10	143	157		15	15	95	81	14	31
11	158	171		3	3	79	36	0	0
12	182	185		3	3	79	36	0	0
13	190	197		2	2	70	22	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	241	247		4	4	84	47	0	0
17	248	262		17	17	96	83	12	29
18	268	275		3	3	79	36	0	0
19	279	290		7	7	90	65	0	0
20	295	306		6	6	89	60	0	0
21	310	322		10	10	93	74	0	0
22	323	336		12	12	94	77	17	34
23	338	352		11	11	93	76	18	35
24	356	362		4	4	84	47	0	0
25	370	381		5	5	87	54	0	0
26	384	393		2	2	70	22	0	0
27	408	408		1	1	50	5	0	0
28	426	426		1	1	50	5	0	0
29	442	442		1	1	50	5	0	0
30	444	444		1	1	50	5	0	0
31	458	472		8	8	91	68	0	0
32	474	979		59	59	98	95	0	0

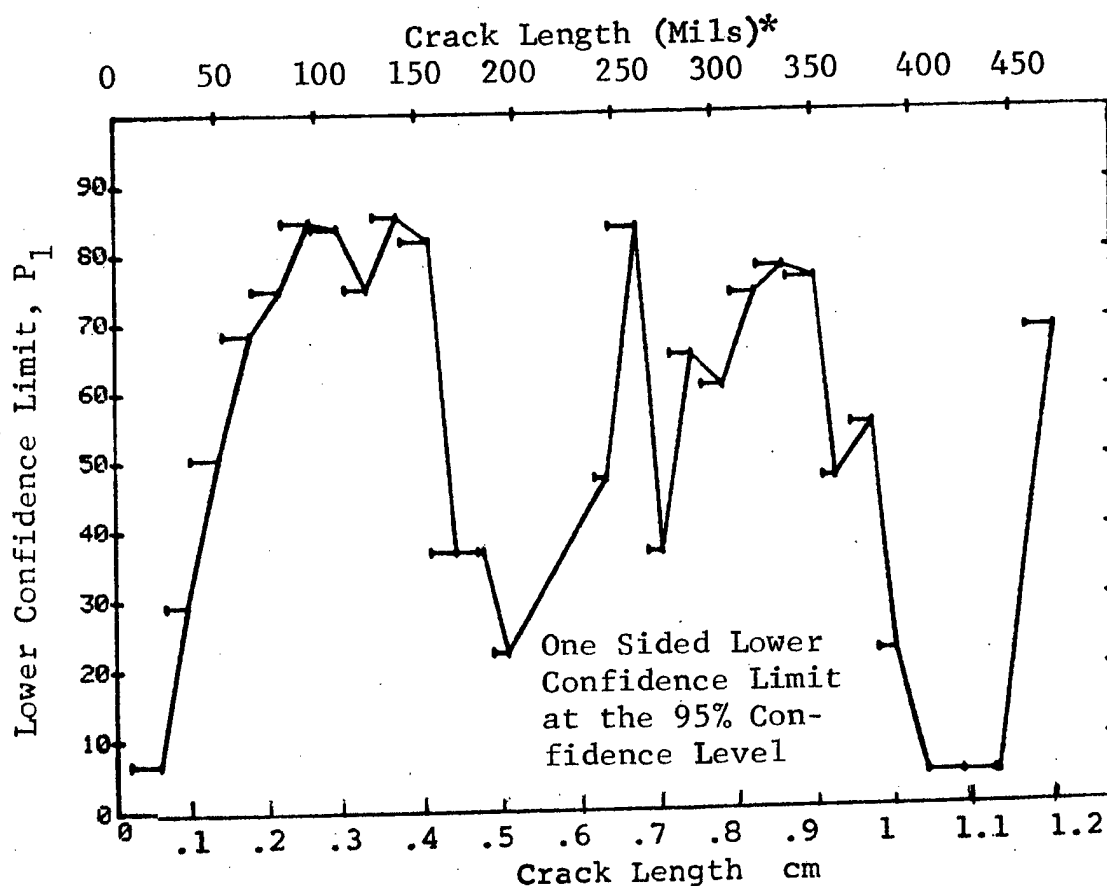


Figure D-17 Probability of Detection for 2219-T8/ Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates Measured by Operator K Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 2, (17)		ROCKWELL 90 K		
RANGE	MIN	LN	MAX LN		DET	50%	95%	0 MILS	1 MILS
1		7 *	22 *	13	3	0	6	0	0
2		25	35	18	9	0	29	0	0
3		38	52	23	16	0	50	0	0
4		54	67	46	37	0	68	0	0
5		54	82	100	83	0	75	0	0
6		83	97	39	37	0	84	22	37
7		83	111	56	54	0	89	5	20
8		83	126	73	70	0	89	3	16
9		83	141	92	89	0	91	0	0
10		98	157	68	67	0	93	0	0
11		98	171	71	70	0	93	0	0
12		98	185	74	73	0	93	0	0
13		98	197	76	75	0	93	0	0
14		0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		98	247	80	79	0	94	0	0
17		129	262	63	63	0	95	0	0
18		129	275	66	66	0	95	0	0
19		129	290	73	73	0	95	0	0
20		129	306	79	79	0	96	0	0
21		129	322	89	89	0	96	0	0
22		129	336	101	101	0	97	0	0
23		129	352	112	112	0	97	0	0
24		129	362	116	116	0	97	0	0
25		129	381	121	121	0	97	0	0
26		129	393	123	123	0	97	0	0
27		129	408	124	124	0	97	0	0
28		129	426	125	125	0	97	0	0
29		129	442	126	126	0	97	0	0
30		129	444	127	127	0	97	0	0
31		129	472	135	135	0	97	0	0
32		129	979	194	194	0	98	0	0

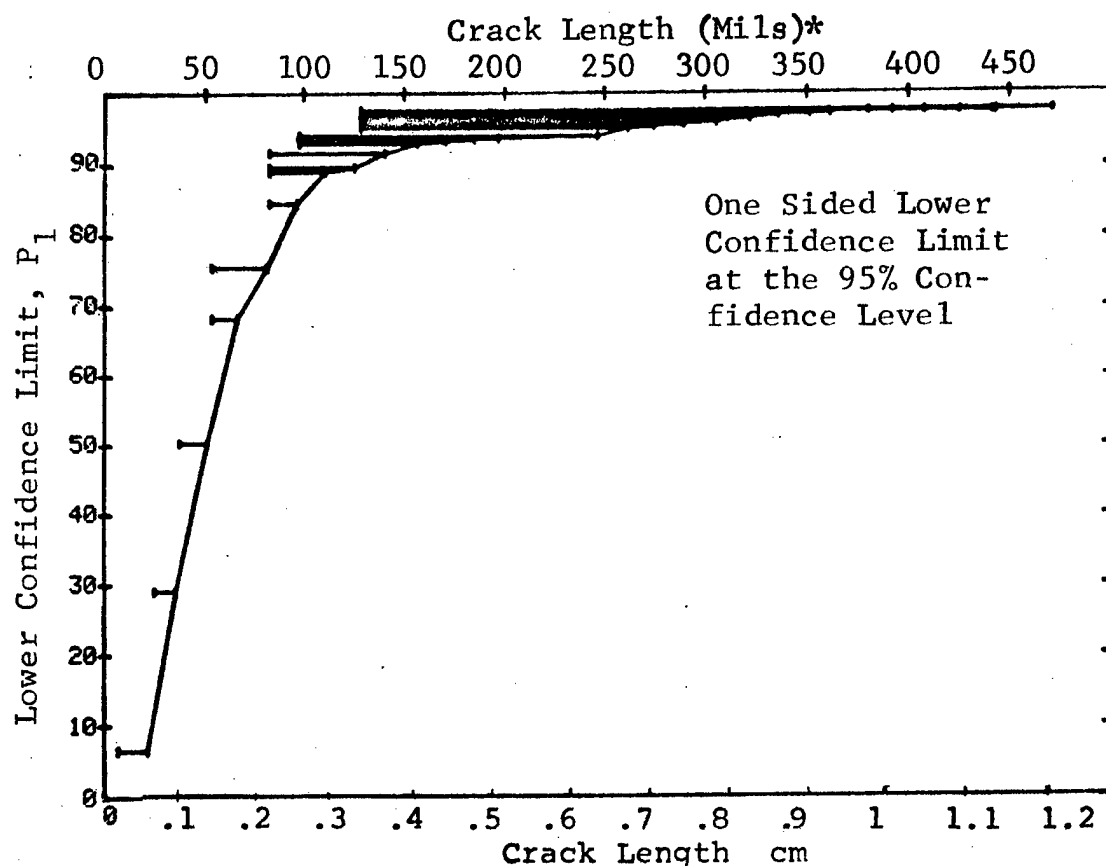


Figure D-17 (Continued)

for Opera

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 3, (17)		ROCKWELL SC		K
RANGE	MIN LN	0 *	MAX LN		OET	50%	95%	0 MISS	
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	7	51	53	27	50	38	0	0	0
22	32	64	60	45	74	64	0	0	0
23	52	70	60	47	77	67	0	0	0
24	64	79	60	51	83	75	94	100	0
25	70	87	60	54	88	81	56	69	0
26	79	105	60	56	92	85	29	43	0
27	88	131	60	59	97	92	0	1	0
28	105	162	60	59	97	92	0	1	0
29	132	275	60	60	98	95	0	0	0
30	171	330	60	60	98	95	0	0	0
31	279	442	60	60	98	95	0	0	0
32	331	500	60	60	98	95	0	0	0

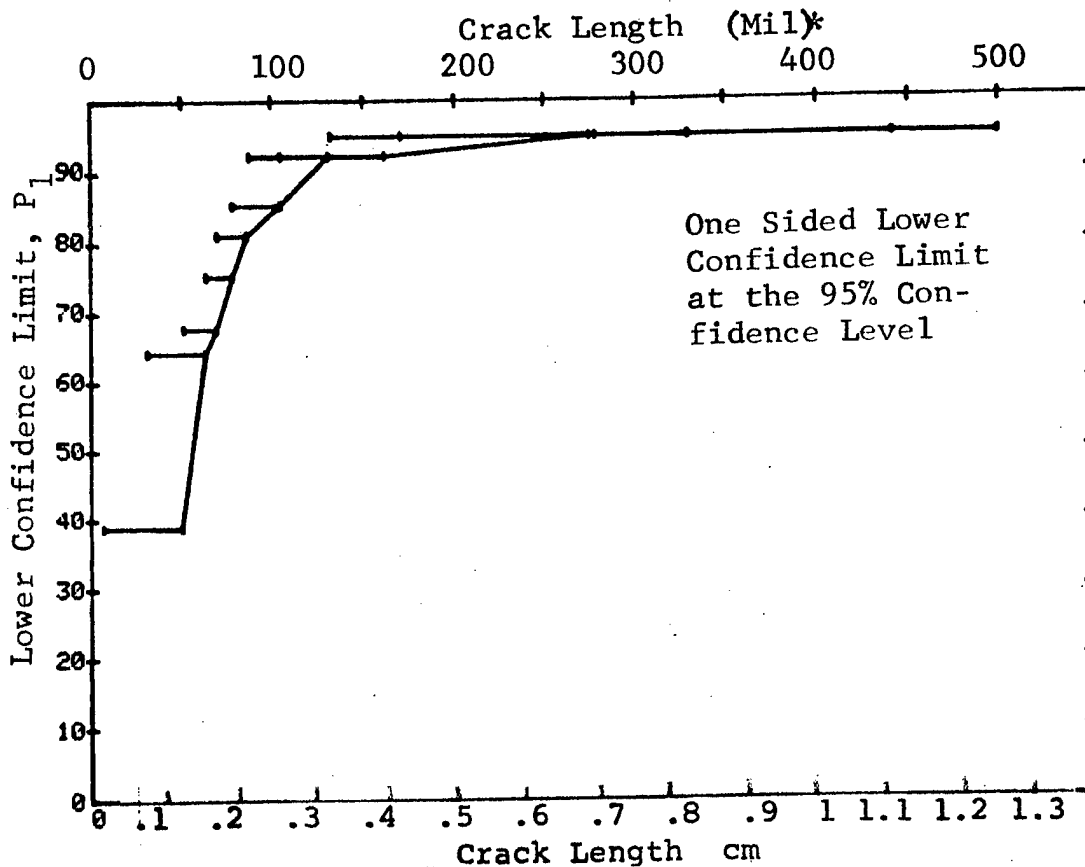


Figure D-17 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 1, (18)		ROCKWELL 50		L
RANGE	MIN LN	* MAX LN	*		DET	50%	95%	0 MISS	
1	7	22	*	13	3	20	6	0	0
2	25	36		18	13	69	50	0	0
3	38	52		23	15	62	45	0	0
4	54	67		46	34	72	61	0	0
5	68	82		53	46	85	76	76	89
6	83	97		39	34	85	74	0	0
7	98	111		17	15	84	67	0	0
8	115	126		17	15	84	67	0	0
9	129	141		19	15	75	58	0	0
10	143	157		15	11	69	48	0	0
11	158	171		3	3	79	36	0	0
12	182	185		3	3	79	36	0	0
13	190	197		2	1	29	2	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	241	247		4	4	84	47	0	0
17	248	262		17	17	96	83	12	29
18	268	275		3	3	79	36	0	0
19	279	290		7	7	90	65	0	0
20	295	306		6	5	73	41	0	0
21	310	322		10	10	93	74	0	0
22	323	336		12	11	86	66	0	0
23	338	352		11	7	58	34	0	0
24	356	362		4	4	84	47	0	0
25	370	381		5	2	31	7	0	0
26	384	393		2	1	29	2	0	0
27	408	408		1	1	50	5	0	0
28	426	426		1	1	50	5	0	0
29	442	442		1	0	0	0	0	0
30	444	444		1	1	50	5	0	0
31	458	472		8	6	67	40	0	0
32	474	979		59	54	90	83	44	57

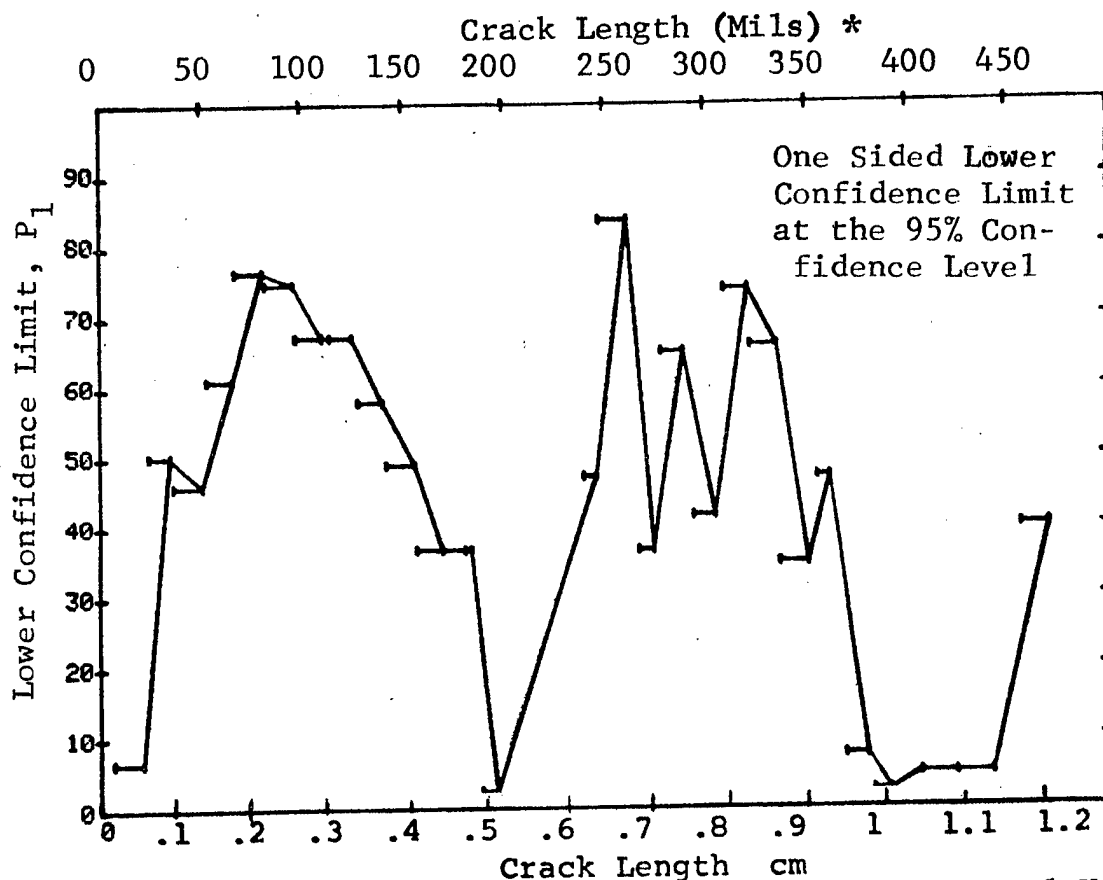


Figure D-18 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates Measured by Operator L. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75	PENETRANT		TEST 2, (18)		ROCKWELL		L
RANGE	MIN LN	MAX LN	DET	50%	95%	0 MISS	1 MISS
1	7	* 22 *	13	0	6	0	0
2	25	36	13	0	50	0	0
3	25	52	28	0	54	0	0
4	25	67	62	0	62	0	0
5	68	82	46	0	76	0	0
6	68	97	80	0	79	0	0
7	68	111	95	0	80	0	0
8	68	126	110	0	81	0	0
9	68	141	125	0	80	0	0
10	68	157	136	0	79	0	0
11	68	171	139	0	79	0	0
12	68	185	142	0	80	0	0
13	68	197	143	0	79	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	68	247	147	0	80	0	0
17	241	262	21	0	86	0	25
18	241	275	24	0	88	0	22
19	241	290	31	0	90	0	15
20	241	306	36	0	87	0	24
21	241	322	46	0	90	0	14
22	241	336	57	0	89	2	17
23	241	352	64	0	83	46	50
24	241	362	68	0	84	42	55
25	68	381	213	0	82	0	0
26	68	393	214	0	81	0	0
27	68	408	215	0	81	0	0
28	68	426	216	0	81	0	0
29	68	442	216	0	81	0	0
30	68	444	217	0	81	0	0
31	68	472	223	0	81	0	0
32	150	979	141	0	83	0	0

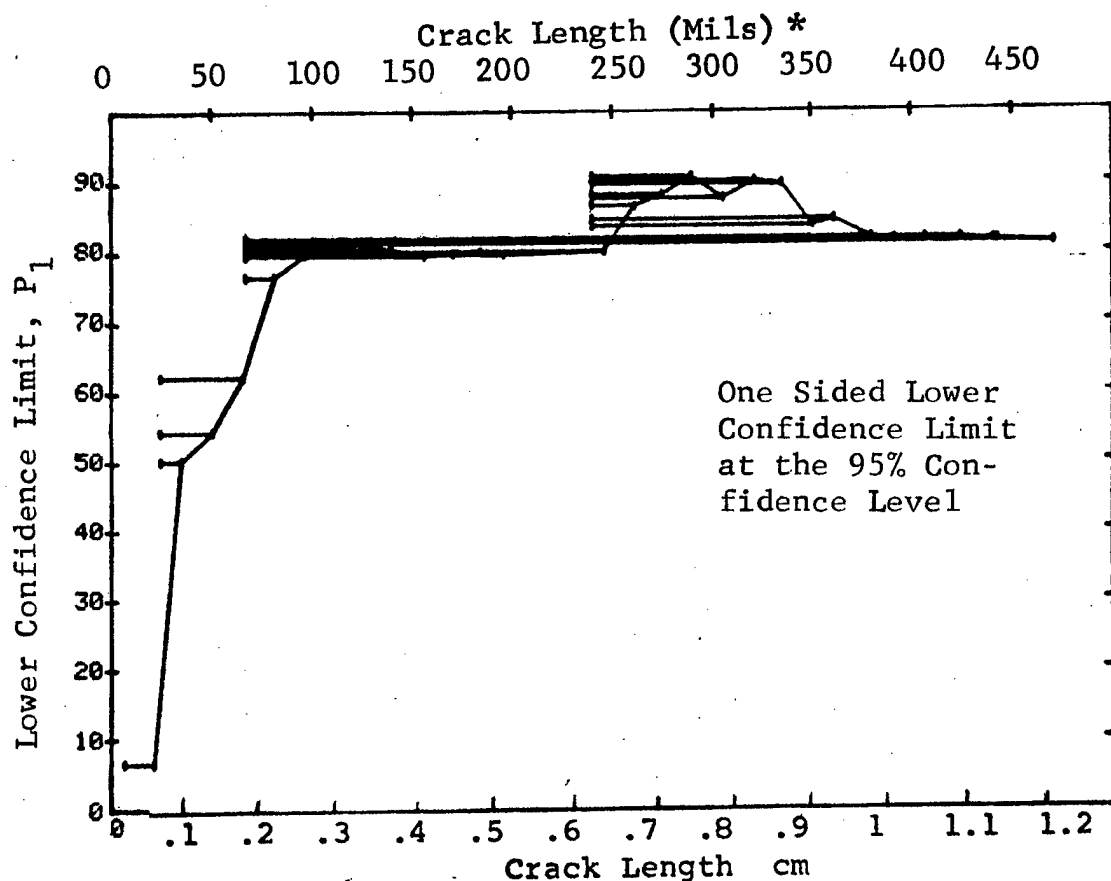


Fig Pe D-18 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75		PENETRANT		N	TEST 3, (18)		ROCKWELL SC L		
RANGE	MIN LN	MAX LN	*		DET	50%	95%	0 MISS	1 MISS
1	0*	0 *		0	0	0	0	0	0
2	0	0		0	0	0	0	0	0
3	0	0		0	0	0	0	0	0
4	0	0		0	0	0	0	0	0
5	0	0		0	0	0	0	0	0
6	0	0		0	0	0	0	0	0
7	0	0		0	0	0	0	0	0
8	0	0		0	0	0	0	0	0
9	0	0		0	0	0	0	0	0
10	0	0		0	0	0	0	0	0
11	0	0		0	0	0	0	0	0
12	0	0		0	0	0	0	0	0
13	0	0		0	0	0	0	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	0	0		0	0	0	0	0	0
17	0	0		0	0	0	0	0	0
18	0	0		0	0	0	0	0	0
19	0	0		0	0	0	0	0	0
20	0	0		0	0	0	0	0	0
21	7	49		52	30	56	45	0	0
22	31	63		60	44	72	62	0	0
23	51	70		60	43	70	60	0	0
24	64	79		60	47	77	67	0	0
25	70	87		60	55	90	83	43	56
26	79	105		60	53	87	79	69	82
27	88	131		60	52	85	77	82	94
28	105	162		60	49	80	71	0	0
29	132	275		60	52	85	77	82	94
30	171	330		60	58	95	89	1	16
31	279	442		60	49	80	71	0	0
32	331	500		60	46	75	65	0	0

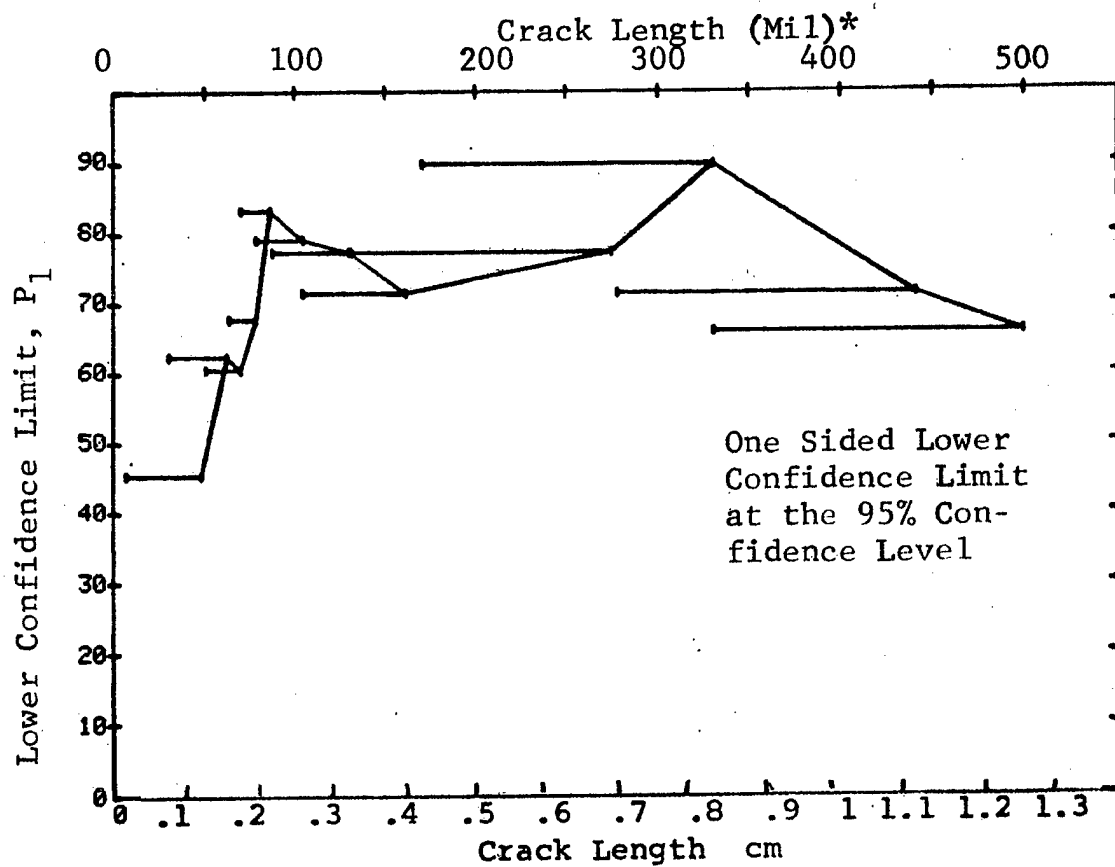


Figure D-18 (Concluded)

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(a) Range Interval Method of Data Cumulation

18-SEP-75	PENETRANT		P-1. (19)		50%	95%	0 MIL	1 MIL
RANGE	MIN LN	* MAX LN *	N	DET				
1	10	41	36	17	45	32	0	0
2	42	72	80	25	30	73	0	0
3	73	103	82	78	94	89	0	0
4	104	134	36	34	92	83	25	4
5	135	162	26	21	78	63	0	0
6	171	190	4	4	84	47	0	0
7	197	197	1	1	50	5	0	0
8	241	258	16	16	95	82	13	30
9	259	288	13	13	94	79	16	37
10	290	318	16	16	95	82	13	37
11	321	347	23	22	92	80	23	38
12	352	381	11	10	85	63	0	0
13	384	408	3	3	79	36	0	0
14	426	444	3	3	79	36	0	0
15	458	475	11	11	93	76	18	35
16	478	506	22	22	96	87	7	24
17	508	535	25	25	97	88	4	21
18	538	568	6	6	89	60	0	0
19	0	0	0	0	0	0	0	0
20	610	610	1	1	50	5	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	710	710	1	1	50	5	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	979	979	1	1	50	5	0	0

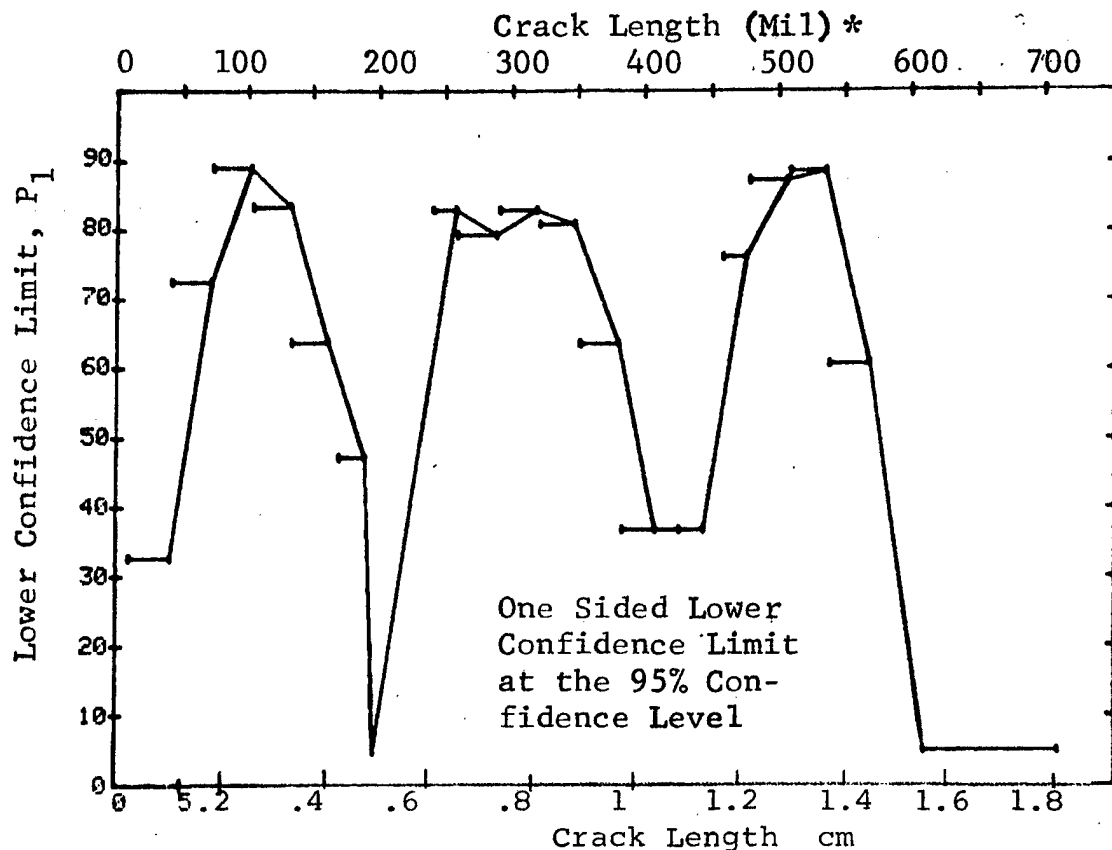


Figure D-19 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates Measured by Operator M. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

18-SEP-75	PENETRANT			P-2, (19)	M	0 MIN	1 MIN
RANGE	MIN	LN	MAX LN	DET	50%	95%	
1	10	*	41	17	0	32	0
2	42		72	65	0	72	0
3	73		103	78	0	89	0
4	73		134	112	0	90	0
5	73		162	133	0	87	0
6	73		190	137	0	87	0
7	73		197	138	0	88	0
8	73		258	154	0	89	0
9	171		288	34	0	91	12
10	171		318	50	0	94	0
11	171		347	72	0	93	0
12	171		381	82	0	92	0
13	171		408	85	0	92	0
14	171		444	88	0	93	0
15	171		475	99	0	93	0
16	171		506	121	0	94	0
17	171		535	146	0	95	0
18	171		568	152	0	95	0
19	0		0	0	0	0	0
20	171		610	153	0	95	0
21	0		0	0	0	0	0
22	0		0	0	0	0	0
23	171		710	154	0	96	0
24	0		0	0	0	0	0
25	0		0	0	0	0	0
26	0		0	0	0	0	0
27	0		0	0	0	0	0
28	0		0	0	0	0	0
29	0		0	0	0	0	0
30	0		0	0	0	0	0
31	0		0	0	0	0	0
32	171		979	155	0	96	0

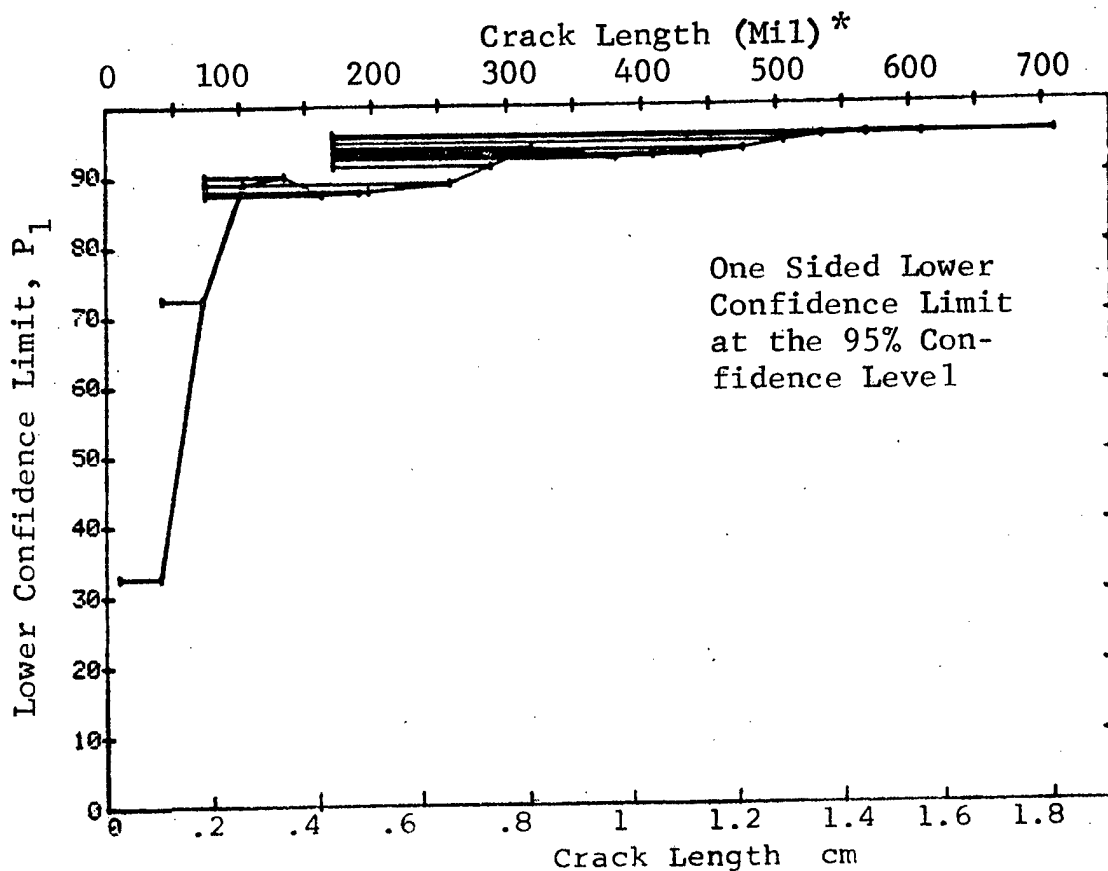


Figure D-19 (Continued) for Δ^1

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(c) Overlapping Sixty Point Method of Data Cumulation

18-SEP-75	PENETRANT		N	P-3		M	0 MI	
RANGE	MIN	LN		DET	(19)			
1	0*	0*	0	0	0	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	
20	10	52	52	30	56	45	0	
21	32	64	60	46	75	65	0	
22	54	70	60	49	80	71	0	
23	64	80	60	52	85	77	0	
24	71	89	60	55	90	83	43	
25	80	106	60	58	95	89	1	
26	89	134	60	58	95	89	1	
27	106	182	60	53	87	79	69	
28	134	283	60	55	90	83	43	
29	183	333	60	60	93	85	0	
30	287	450	60	58	95	89	1	
31	334	506	60	58	95	89	1	
32	459	550	60	60	98	95	0	

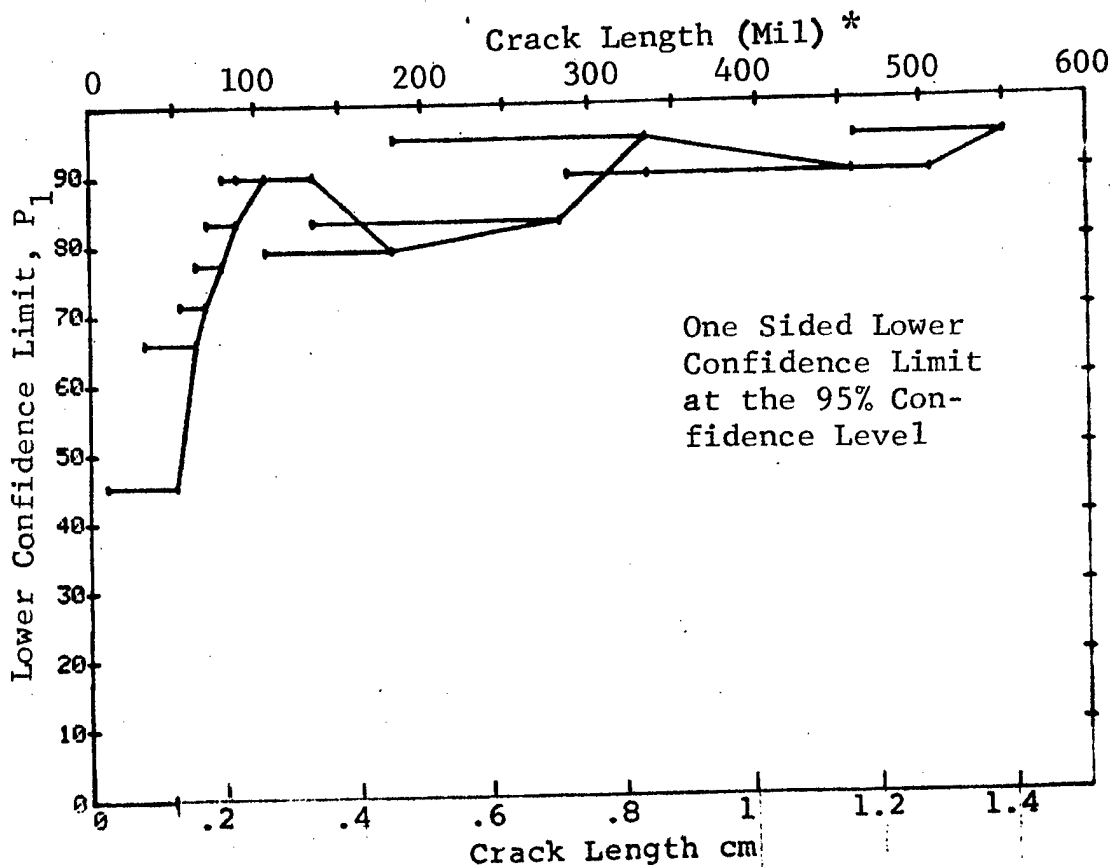


Figure D-19 (Concluded)

(a) Range Interval Method of Data Cumulation

18-SEP-75	PENETRANT			F-1, (20) N			0 NIBB		
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 NIBB	1 NIBB	2 NIBB
1	10	41	37	12	31	19	0	0	0
2	42	2	30	60	74	65	0	0	0
3	73	103	82	72	87	80	25	27	0
4	104	134	36	32	87	76	53	0	0
5	135	162	26	20	74	59	0	0	0
6	171	190	5	5	87	54	0	0	0
7	197	197	1	1	50	5	0	0	0
8	241	258	16	15	89	73	0	0	0
9	259	288	13	13	94	79	16	33	0
10	290	318	16	15	89	73	0	0	0
11	321	347	23	20	84	69	0	0	0
12	352	381	11	10	85	63	0	0	0
13	384	408	3	3	79	36	0	0	0
14	426	444	3	3	79	36	0	0	0
15	458	475	11	11	93	76	18	35	0
16	478	506	22	21	92	80	24	33	0
17	508	535	25	25	97	88	4	21	0
18	538	568	6	6	89	60	0	0	0
19	0	0	0	0	0	0	0	0	0
20	610	610	1	1	50	5	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	710	710	1	1	50	5	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	979	979	1	1	50	5	0	0	0

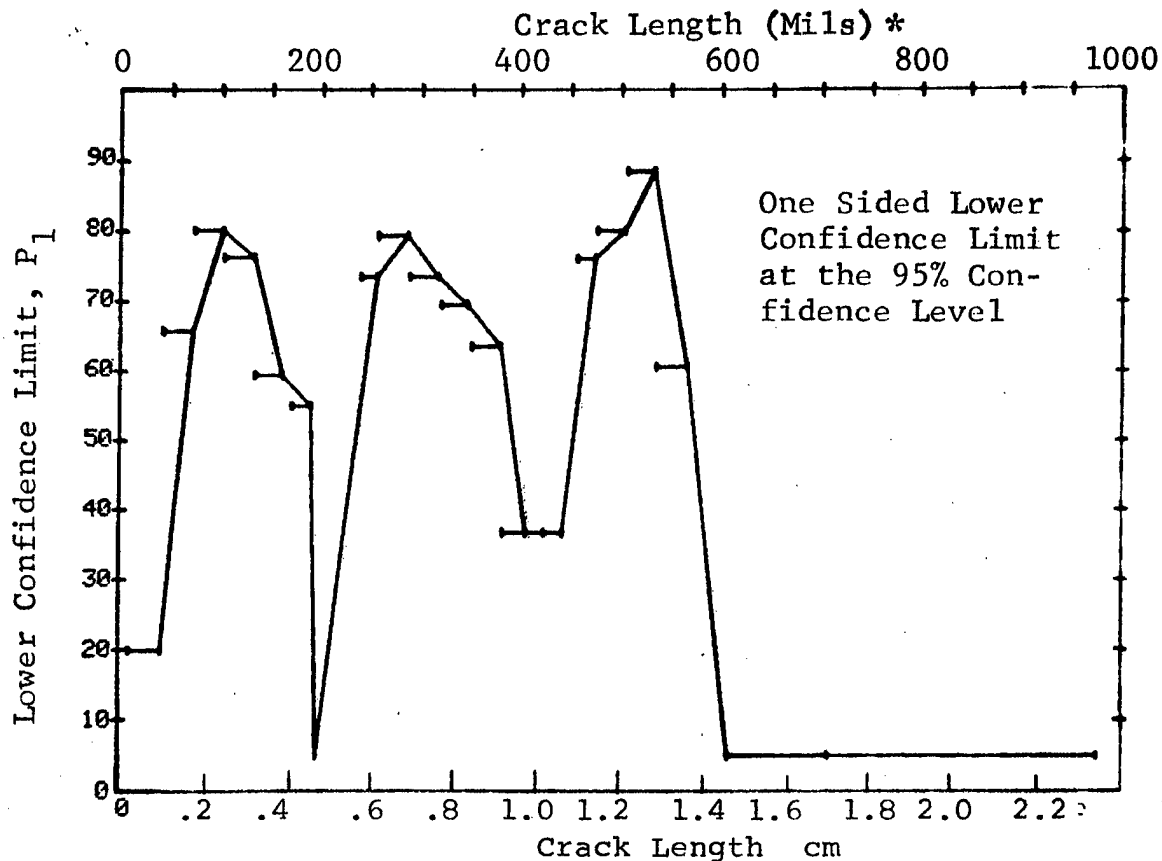


Figure D-20 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Flat Plates Measured by Operator N. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

18-SEP-75	PENETRANT		P-2, (20) N		50%	95%	0 MISS	1 MISS
RANGE	MIN	LN	MAX LN	H	DET			
1	10	*	41	*	37	12	0	19
2	42	72	80	80	60	0	0	65
3	73	103	82	82	72	0	85	80
4	73	134	118	104	0	82	0	0
5	73	162	144	124	0	80	0	0
6	73	190	149	129	0	81	0	0
7	73	197	150	130	0	81	0	0
8	73	258	166	145	0	82	0	0
9	171	288	35	34	0	87	11	12
10	171	318	51	49	0	88	10	10
11	171	347	74	69	0	86	23	40
12	171	381	85	79	0	86	31	44
13	171	408	88	82	0	86	28	41
14	171	444	91	85	0	87	25	38
15	171	475	102	96	0	88	0	0
16	171	506	124	117	0	89	0	0
17	384	535	64	63	0	92	0	0
18	384	568	70	69	0	93	0	0
19	0	0	0	0	0	0	0	0
20	384	610	71	70	0	93	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	384	710	72	71	0	93	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	384	979	73	72	0	93	0	0

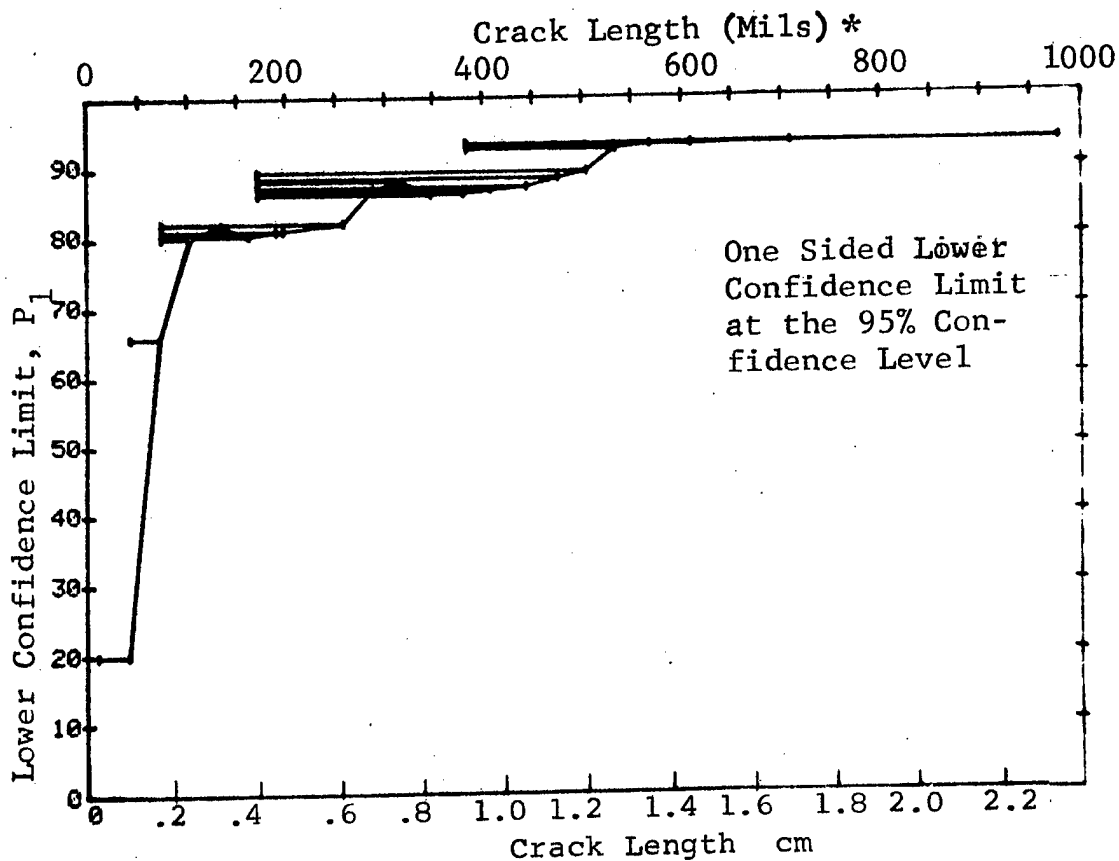


Figure D-20 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

18-SEP-75	PENETRANT			N	P-3, DET	(20) 50%	95%	0 MIN	1 MIN
RANGE	MIN	LN	* MAX LN *						
1		0	0	0	0	0	0	0	0
2		0	0	0	0	0	0	0	0
3		0	0	0	0	0	0	0	0
4		0	0	0	0	0	0	0	0
5		0	0	0	0	0	0	0	0
6		0	0	0	0	0	0	0	0
7		0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0
20	10		54	54	26	47	36	0	0
21	33		64	60	44	72	62	0	0
22	55		71	60	45	74	64	0	0
23	64		80	60	45	74	64	0	0
24	71		89	60	50	82	73	0	0
25	80		106	60	55	90	83	43	0
26	90		134	60	54	88	81	56	0
27	108		183	60	50	82	73	69	0
28	134		283	60	53	87	79	11	0
29	185		333	60	57	93	87	11	0
30	287		458	60	55	90	83	43	0
31	334		506	60	56	92	85	26	0
32	459		550	60	59	97	92	11	0

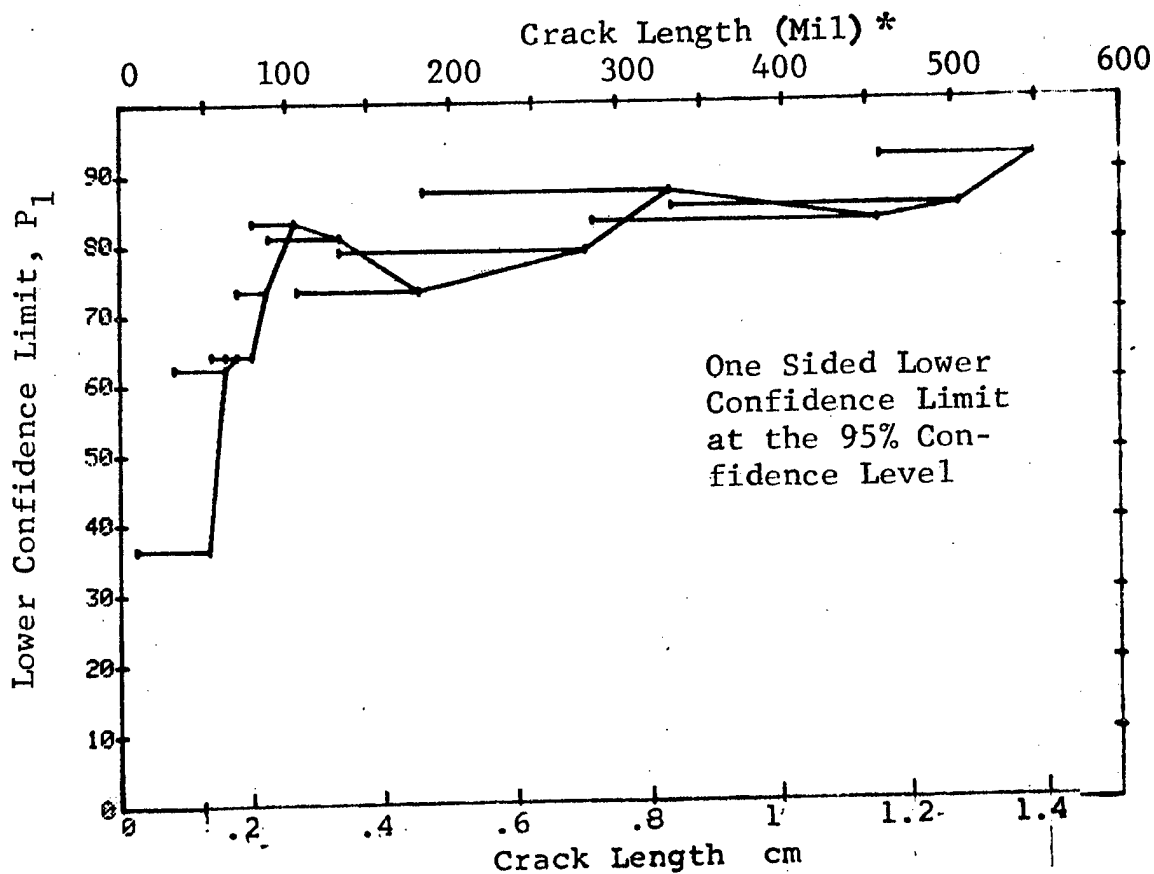


Figure D-20 (Concluded)

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(a) Range Interval Method of Data Cumulation

24-JUL-75			EDDY CURRENT		TEST 1, (21)		T			
RANGE	MIN	LN	* MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		7	* 22 *		13	1	5	0	0	0
2		25		36	18	2	9	0	0	0
3		38		51	23	3	11	3	0	0
4		54		67	46	30	64	52	0	0
5		68		82	53	36	66	55	0	0
6		83		97	38	36	93	84	23	38
7		98			18	16	85	68	0	0
8	115			126	17	16	90	75	29	44
9	129			141	19	17	86	70	0	0
10	143			157	15	15	95	81	14	31
11	158			171	3	3	79	36	0	0
12	182			185	3	3	79	36	0	0
13	190			197	2	2	70	22	0	0
14	0			0	0	0	0	0	0	0
15	232			232	1	1	50	5	0	0
16	241			247	3	3	79	36	0	0
17	248			262	17	17	96	83	12	29
18	268			275	3	3	79	36	0	0
19	279			290	7	7	90	65	0	0
20	295			304	6	6	89	60	0	0
21	310			322	10	10	93	74	0	0
22	323			336	12	12	94	77	17	34
23	338			352	11	11	93	76	18	35
24	356			362	4	4	84	47	0	0
25	370			381	5	5	87	54	0	0
26	384			393	2	2	70	22	0	0
27	408			408	1	1	50	5	0	0
28	426			426	1	1	50	5	0	0
29	442			442	1	1	50	5	0	0
30	444			444	1	1	50	5	0	0
31	458			472	8	8	91	68	0	0
32	474			979	59	59	98	95	0	0

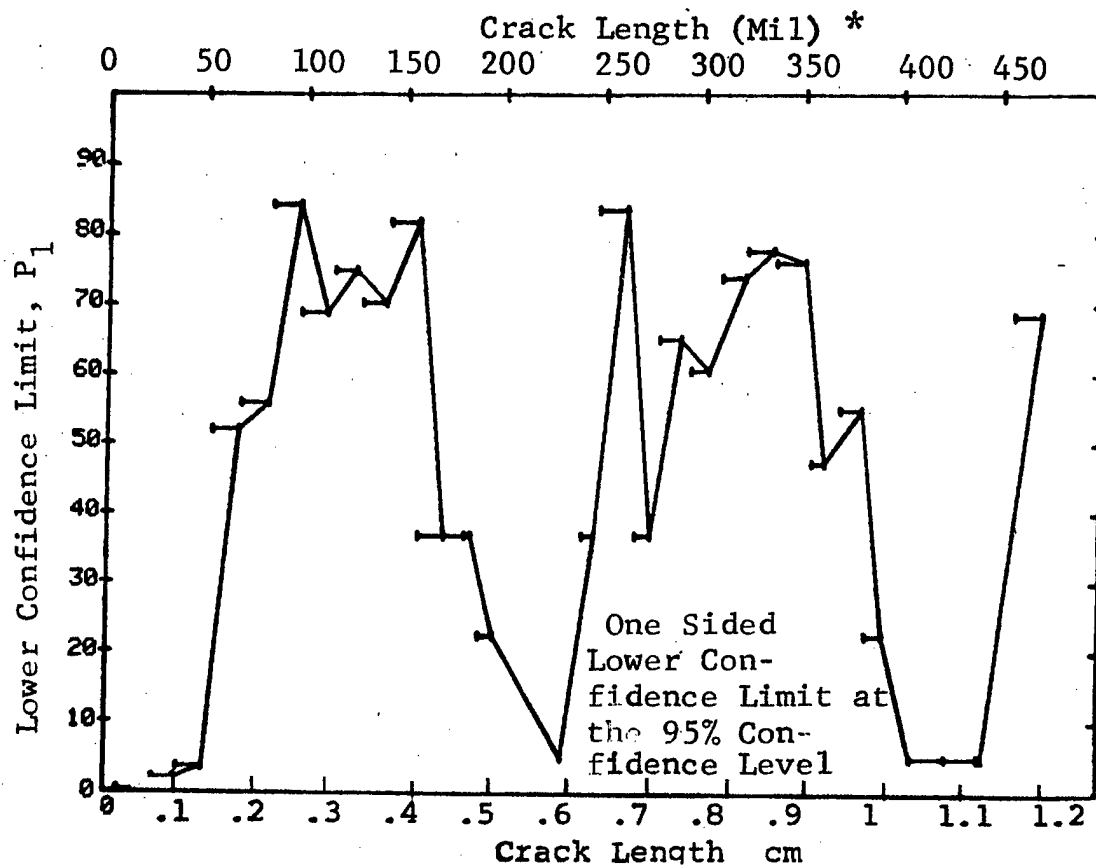


Figure D-21 Probability of Detection for 2219-T87 Al Using Eddy Current. Etched Fatigue Cracks in Flat Plates Measured by Operator T. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75 EDDY CURRENT				TEST 2, (21)		ROCKWELL SC T	
RANGE	MIN LN	* MAX LN	N	DET	50%	95%	0 MISS 1 MISS
1	7	22	13	1	0	0	0 0
2	7	36	31	3	0	2	0 0
3	7	51	54	6	0	4	0 0
4	54	67	46	30	0	52	0 0
5	54	82	99	66	0	58	0 0
6	83	97	38	36	0	84	23 38
7	83	111	56	52	0	84	33 47
8	83	126	73	68	0	86	30 43
9	83	141	92	85	0	86	37 50
10	83	157	107	100	0	88	0 0
11	83	171	110	103	0	88	0 0
12	83	185	113	106	0	88	0 0
13	83	197	115	108	0	88	0 0
14	0	0	0	0	0	0	0 0
15	83	232	116	109	0	88	0 0
16	143	247	27	27	0	89	2 19
17	143	262	44	44	0	93	0 2
18	143	275	47	47	0	93	0 0
19	143	290	54	54	0	94	0 0
20	143	304	60	60	0	95	0 0
21	143	322	70	70	0	95	0 0
22	143	336	82	82	0	96	0 0
23	143	352	93	93	0	96	0 0
24	143	362	97	97	0	96	0 0
25	143	381	102	102	0	97	0 0
26	143	393	104	104	0	97	0 0
27	143	408	105	105	0	97	0 0
28	143	426	106	106	0	97	0 0
29	143	442	107	107	0	97	0 0
30	143	444	108	108	0	97	0 0
31	143	472	116	116	0	97	0 0
32	143	479	175	175	0	98	0 0

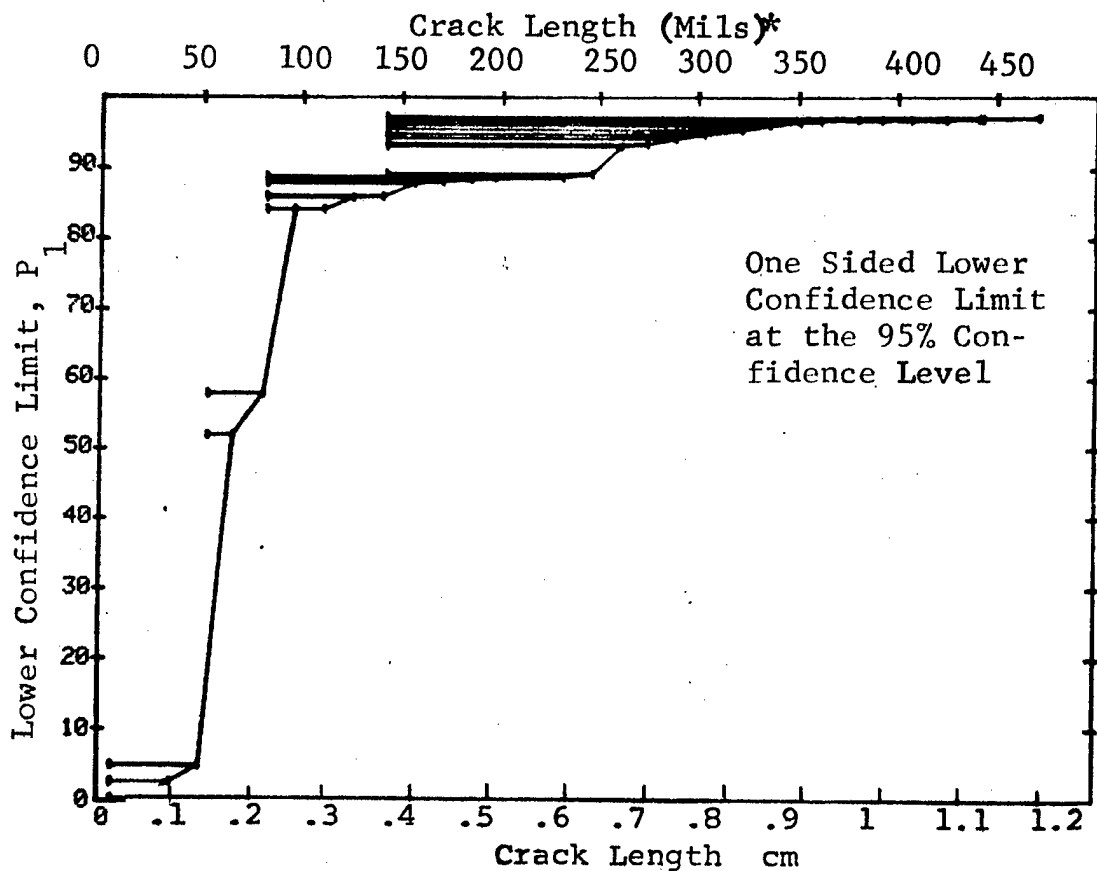


Figure D-21 (Continued)

for

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75		EDDY CURRENT			N	TEST 3		(21)		ROCKWELL SC		T
RANGE	MIN	LN	MAX	LN		DET	50%	95%	0 MISS	1 MISS		
1	0	0	*	0	*	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	7	49			52	5	8	3	0	0	0	0
22	31	63			60	23	37	27	0	0	0	0
23	49	70			60	36	59	48	0	0	0	0
24	64	79			60	37	60	50	0	0	0	0
25	70	87			60	50	82	73	0	0	0	0
26	79	105			60	55	90	83	43	56	0	0
27	88	131			60	53	87	79	69	82	0	0
28	105	162			60	57	93	87	16	29	0	0
29	132	275			60	60	98	95	0	0	0	0
30	171	330			60	60	98	95	0	0	0	0
31	279	442			60	60	98	95	0	0	0	0
32	331	500			60	60	98	95	0	0	0	0

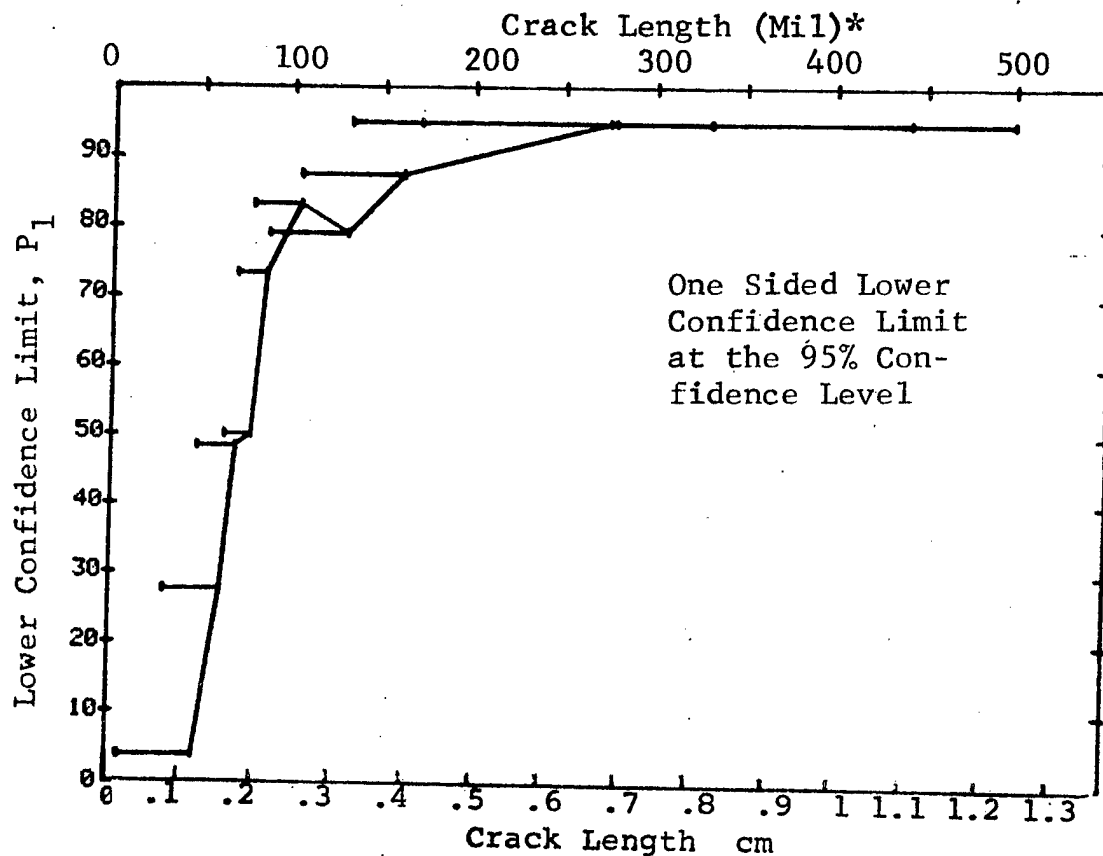


Figure D-21 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75	EDDY CURRENT			TEST 1 . ROCKWELL 50 . 'U'					(22)
RANGE	MIN LN	* MAX LN *	N	DET	50%	95%	0 MISS	1 MISS	
1	7	22	13	3	20	6	0	0	0
2	25	26	18	6	30	15	0	0	0
3	38	52	25	13	50	34	0	0	0
4	54	67	48	42	86	76	68	81	0
5	68	82	50	50	98	94	0	0	0
6	83	97	39	35	88	78	50	64	0
7	98	111	17	16	90	75	29	44	0
8	115	126	18	18	96	84	11	28	0
9	129	141	18	18	96	84	11	28	0
10	143	157	15	15	95	81	14	31	0
11	158	171	3	3	79	36	0	0	0
12	182	185	3	3	79	36	0	0	0
13	190	197	2	2	70	23	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	241	247	4	4	84	47	0	0	0
17	248	262	16	16	95	82	13	30	0
18	268	275	3	3	79	36	0	0	0
19	279	290	7	7	90	65	0	0	0
20	295	306	6	6	89	60	0	0	0
21	310	322	10	10	93	74	0	0	0
22	323	336	12	12	94	77	17	34	0
23	338	352	11	11	93	76	18	35	0
24	356	362	4	4	84	47	0	0	0
25	370	381	5	5	87	54	0	0	0
26	384	393	2	2	70	22	0	0	0
27	408	408	1	1	50	5	0	0	0
28	426	426	1	1	50	5	0	0	0
29	442	442	1	1	50	5	0	0	0
30	444	444	1	1	50	5	0	0	0
31	458	472	8	8	91	68	0	0	0
32	474	979	59	59	98	95	0	0	0

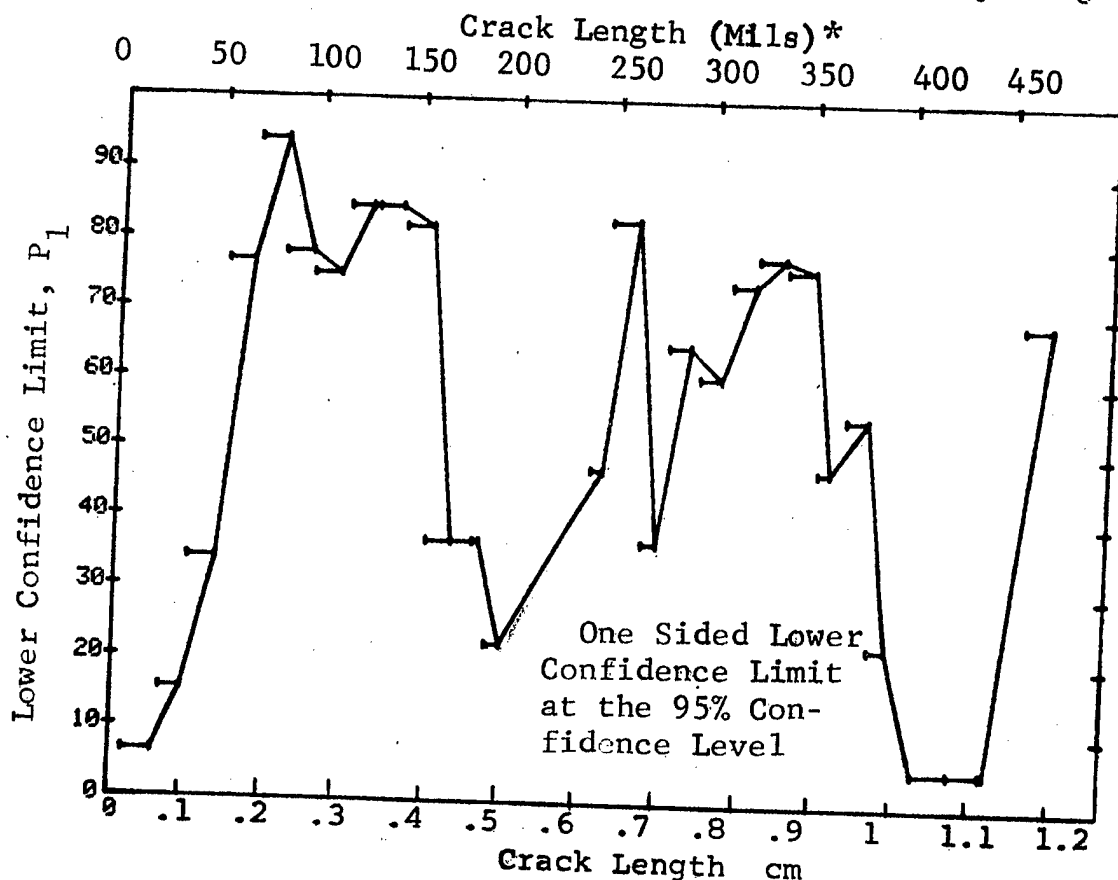


Figure D-22 Probability of Detection for 2219-T87 Al Using Eddy Current. Etched Fatigue Cracks in Flat Plates Measured by Operator U. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75		EDDY CURRENT			TEST 2, ROCKWELL SC, 'U'					(22)
RANGE	MIN LN	MAX LN	*	N	DET	50%	95%	0 MISS	1 MISS	
1	7	22	*	13	3	0	6	0	0	
2	7	36	*	31	9	0	16	0	0	
3	38	52	*	25	13	0	34	0	0	
4	54	67	*	48	42	0	76	0	0	
5	68	82	*	50	50	0	94	0	0	
6	68	97	*	89	85	0	90	0	14	
7	68	111	*	106	101	0	90	0	0	
8	68	126	*	124	119	0	91	0	0	
9	68	141	*	142	137	0	92	0	0	
10	115	157	*	51	51	0	94	0	0	
11	115	171	*	54	54	0	94	0	0	
12	115	185	*	57	57	0	94	0	0	
13	115	197	*	59	59	0	95	0	0	
14	0	0	*	0	0	0	0	0	0	
15	0	0	*	0	0	0	0	0	0	
16	115	247	*	63	63	0	95	0	0	
17	115	262	*	79	79	0	96	0	0	
18	115	275	*	82	82	0	96	0	0	
19	115	290	*	89	89	0	96	0	0	
20	115	306	*	95	95	0	96	0	0	
21	115	322	*	105	105	0	97	0	0	
22	115	336	*	117	117	0	97	0	0	
23	115	352	*	128	128	0	97	0	0	
24	115	362	*	132	132	0	97	0	0	
25	115	381	*	137	137	0	97	0	0	
26	115	393	*	139	139	0	97	0	0	
27	115	408	*	140	140	0	97	0	0	
28	115	426	*	141	141	0	97	0	0	
29	115	442	*	142	142	0	97	0	0	
30	115	444	*	143	143	0	97	0	0	
31	115	472	*	151	151	0	98	0	0	
32	115	979	*	210	210	0	98	0	0	

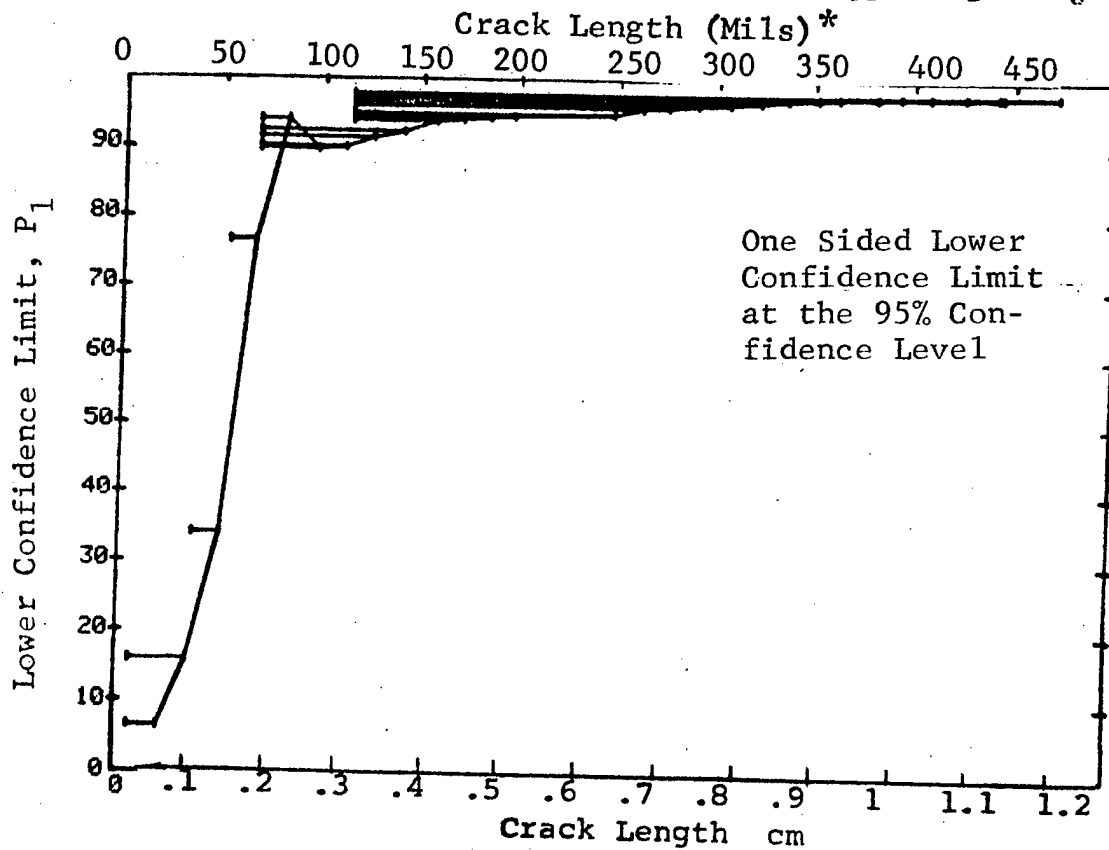


Figure D-22 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75 EDDY CURRENT				TEST 3 ROCKWELL SC, 'U' (22)					
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0*	0*	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	7	49	52	20	37	27	0	0	
22	31	63	60	38	62	51	0	0	
23	49	69	60	52	85	77	82	94	
24	63	79	60	59	97	92	0	1	
25	69	87	60	59	97	92	0	1	
26	79	104	60	55	90	83	43	55	
27	87	131	60	56	92	85	29	43	
28	105	158	60	60	98	95	0	0	
29	132	275	60	60	98	95	0	0	
30	162	330	60	60	98	95	0	0	
31	279	442	60	60	98	95	0	0	
32	331	500	60	60	98	95	0	0	

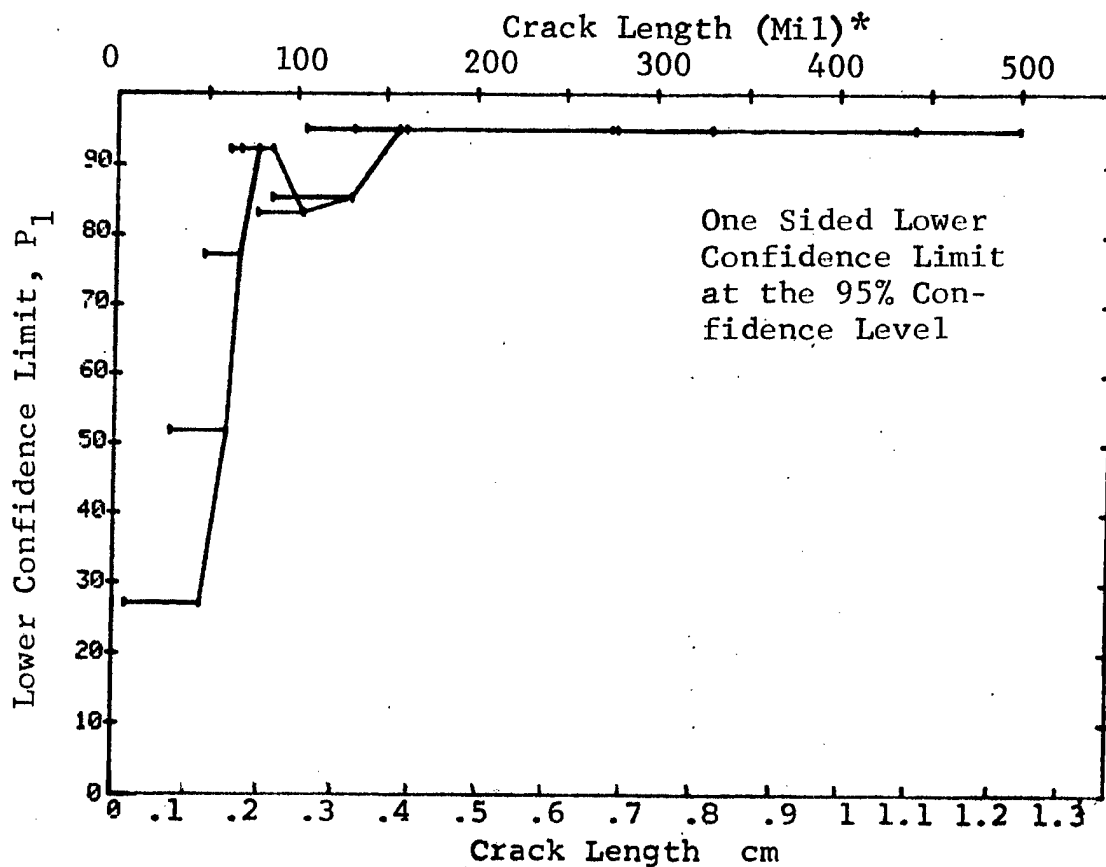


Figure D-22 (Continued)

(a) Range Interval Method of Data Cumulation

03-JUL-75 EDDY CURRENT				TEST 1, ROCKWELL SC. 'U' (23)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7	22	13	1	5	0	0	0
2	25	36	18	2	9	2	0	0
3	38	52	23	10	41	25	0	0
4	54	67	47	26	54	42	0	0
5	68	82	53	44	81	72	0	0
6	83	97	38	34	97	77	51	65
7	98	111	17	16	90	75	29	44
8	115	126	17	16	90	75	29	44
9	129	141	19	16	81	64	0	0
10	143	157	15	12	76	56	0	0
11	158	171	3	3	79	36	0	0
12	182	185	3	1	20	1	0	0
13	190	197	2	2	70	22	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	241	247	4	3	61	24	0	0
17	248	262	16	16	95	83	13	30
18	268	275	3	3	79	36	0	0
19	279	290	6	6	89	60	0	0
20	295	306	7	5	63	34	0	0
21	310	322	10	9	83	60	0	0
22	323	336	12	12	94	77	17	34
23	338	352	11	9	76	52	0	0
24	356	362	4	4	84	47	0	0
25	370	381	5	4	68	34	0	0
26	384	393	2	2	70	22	0	0
27	408	408	1	1	50	5	0	0
28	426	426	1	1	50	5	0	0
29	435	442	3	2	50	15	0	0
30	444	444	1	1	50	5	0	0
31	458	472	8	8	91	68	0	0
32	474	979	57	52	90	82	40	53

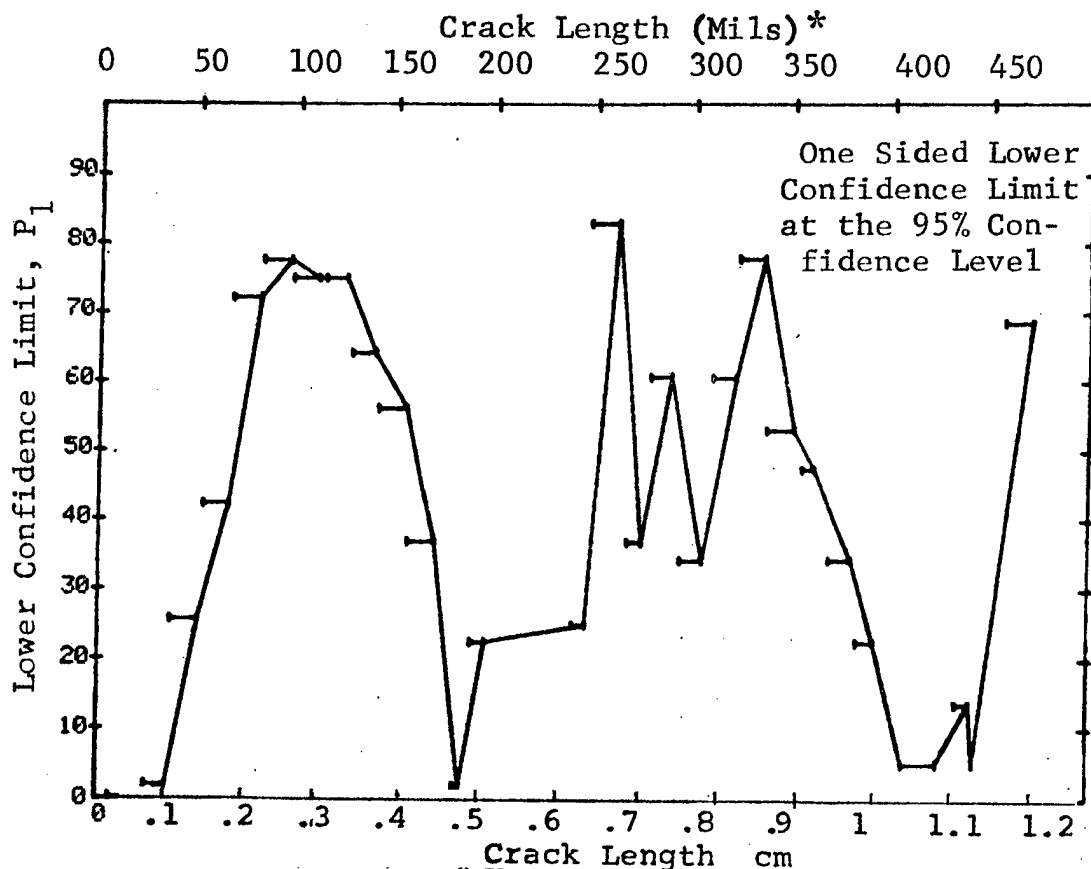


Figure D-23 Probability of Detection for 2219-T87 Al Using Eddy Current. Etched Fatigue Cracks in Flat Plates Measured by Operator V. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75 EDDY CURRENT				TEST 2, ROCKWELL SC. 'U' (23)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7 *	22 *	13	1	0	0	0	0
2	7	26	31	3	0	0	0	0
3	38	52	23	10	0	25	0	0
4	54	67	47	26	0	42	0	0
5	68	82	53	44	0	72	0	0
6	68	97	91	78	0	78	0	0
7	83	111	55	50	0	81	48	61
8	83	126	72	66	0	84	44	57
9	83	141	91	82	0	83	63	76
10	83	157	106	94	0	82	0	0
11	83	171	109	97	0	82	0	0
12	83	185	112	98	0	81	0	0
13	83	197	114	100	0	81	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	83	247	118	103	0	81	0	0
17	83	262	134	119	0	83	0	0
18	248	275	19	19	0	85	10	27
19	248	290	25	25	0	88	4	21
20	83	306	150	133	0	83	0	0
21	83	322	160	142	0	83	0	0
22	248	336	54	51	0	86	22	35
23	248	352	65	60	0	84	38	51
24	248	362	69	64	0	85	34	47
25	83	381	192	171	0	84	0	0
26	248	393	76	70	0	85	40	53
27	248	408	77	71	0	85	39	52
28	248	426	78	72	0	85	38	51
29	248	442	81	74	0	84	40	61
30	83	444	200	178	0	84	0	0
31	248	472	90	83	0	85	39	52
32	248	979	147	135	0	87	0	0

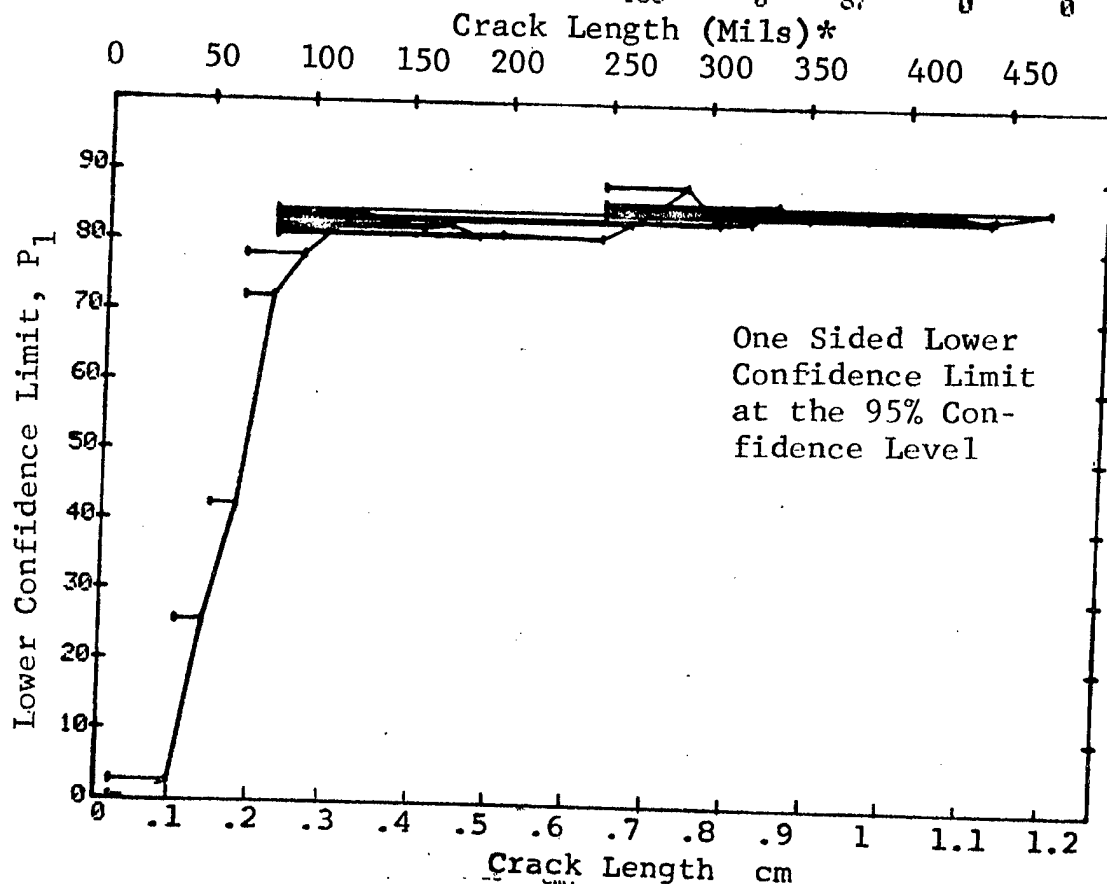


Figure D-23 (Continued)

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(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75		EDDY CURRENT		N	TEST 3, ROCKWELL SC. 'U' (23)				
RANGE	MIN LN	0 *	MAX LN		DET	50%	95%	0 MISS	1 MISS
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	7	51	53	12	21	13	0	0	0
22	32	63	60	26	42	32	0	0	0
23	52	70	60	36	59	48	0	0	0
24	64	79	60	43	70	60	0	0	0
25	70	87	60	52	85	77	82	94	0
26	79	105	60	56	92	85	29	43	0
27	88	132	60	54	88	81	56	69	0
28	106	171	60	52	85	77	82	94	0
29	134	279	60	53	87	79	69	82	0
30	182	331	60	54	88	81	56	69	0
31	283	442	60	53	87	79	69	82	0
32	333	500	60	54	88	81	56	69	0

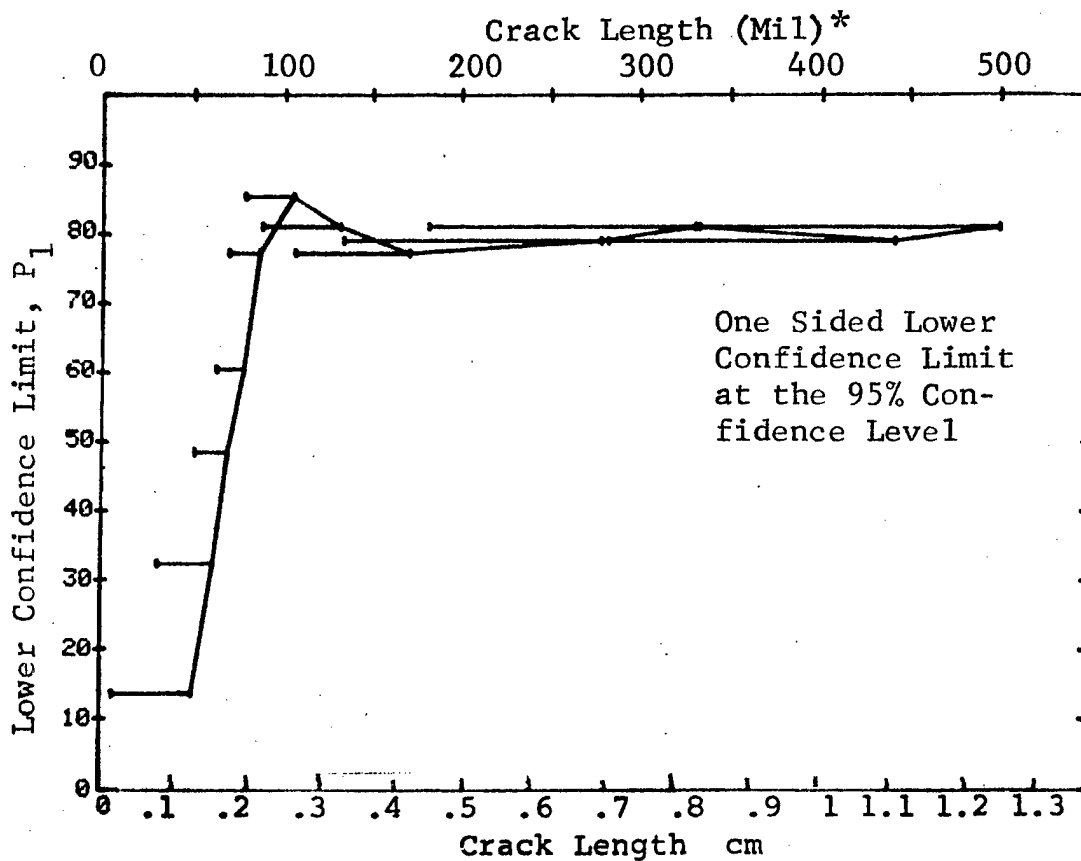


Figure D-23 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75 EDDY CURRENT				TEST 1, ROCKWELL SC, 'W' (24)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7	22	13	2	12	2	0	0
2	25	55	18	6	30	15	0	0
3	38	52	22	8	34	19	0	0
4	54	67	46	10	20	12	0	0
5	68	82	53	47	87	78	63	76
6	83	97	39	37	93	84	22	37
7	98	111	17	17	96	83	12	28
8	115	126	17	16	90	75	29	44
9	129	141	19	17	86	70	0	0
10	143	157	15	12	76	56	0	0
11	158	171	3	3	79	36	0	0
12	182	185	3	3	79	36	0	0
13	190	197	2	2	70	22	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	241	247	4	4	84	47	0	0
17	248	262	17	17	96	83	12	29
18	268	275	3	3	79	36	0	0
19	279	290	7	6	77	47	0	0
20	295	306	6	6	89	60	0	0
21	310	322	10	10	93	74	0	0
22	323	336	12	11	86	66	0	0
23	338	352	11	9	76	52	0	0
24	356	362	4	4	84	47	0	0
25	370	381	5	4	68	34	0	0
26	384	393	2	2	70	22	0	0
27	408	408	1	1	50	5	0	0
28	426	426	1	1	50	5	0	0
29	442	442	1	0	0	0	0	0
30	444	444	1	1	50	5	0	0
31	458	472	8	7	79	52	0	0
32	474	979	58	53	90	82	45	58

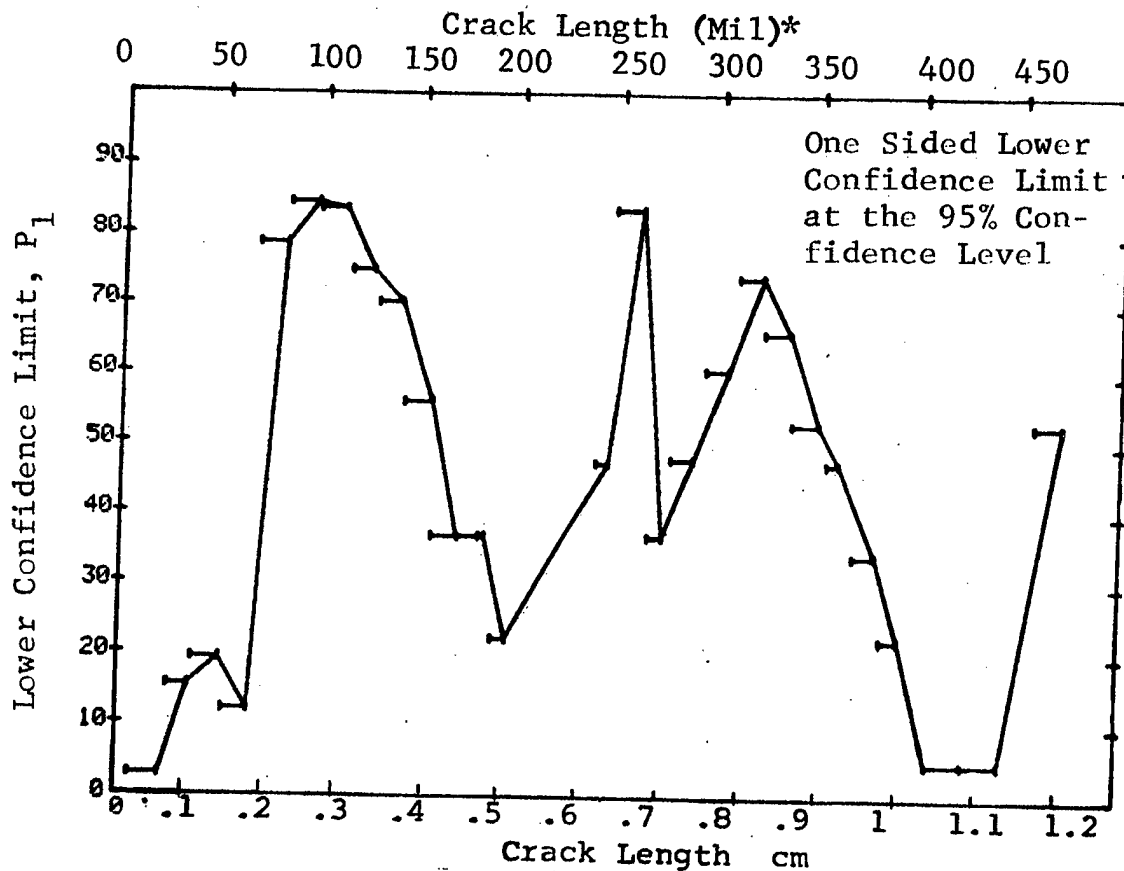


Figure D-24 Probability of Detection for 2219-T87 Al Using Eddy Current. Etched Fatigue Cracks in Flat Plates Measured by Operator W. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75 EDDY CURRENT				TEST 2, ROCKWELL SC. 'H' (24)				
RANGE	MIN LN	7* MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1		23 *	13	2	0	2	0	0
2	25	35	18	6	0	15	0	0
3	25	52	40	14	0	22	0	0
4	25	67	86	24	0	28	0	0
5	68	82	53	47	0	78	0	0
6	68	97	92	84	0	84	50	62
7	83	111	56	54	0	89	5	20
8	83	126	73	70	0	89	3	16
9	83	141	92	87	0	89	11	24
10	83	157	107	99	0	86	0	0
11	83	171	110	102	0	87	0	0
12	83	185	113	105	0	87	0	0
13	83	197	115	107	0	87	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	83	247	119	111	0	88	0	0
17	158	262	29	29	0	90	0	17
18	158	275	32	32	0	91	0	14
19	83	290	146	137	0	89	0	0
20	158	306	45	44	0	89	1	15
21	158	322	55	54	0	91	0	6
22	158	336	67	65	0	90	0	2
23	83	352	185	173	0	89	0	0
24	83	362	189	177	0	89	0	0
25	83	381	194	181	0	89	0	0
26	83	393	196	183	0	89	0	0
27	83	408	197	184	0	89	0	0
28	83	426	198	185	0	89	0	0
29	68	442	252	232	0	88	0	0
30	83	444	200	186	0	89	0	0
31	83	472	208	193	0	89	0	0
32	83	979	266	246	0	89	0	0

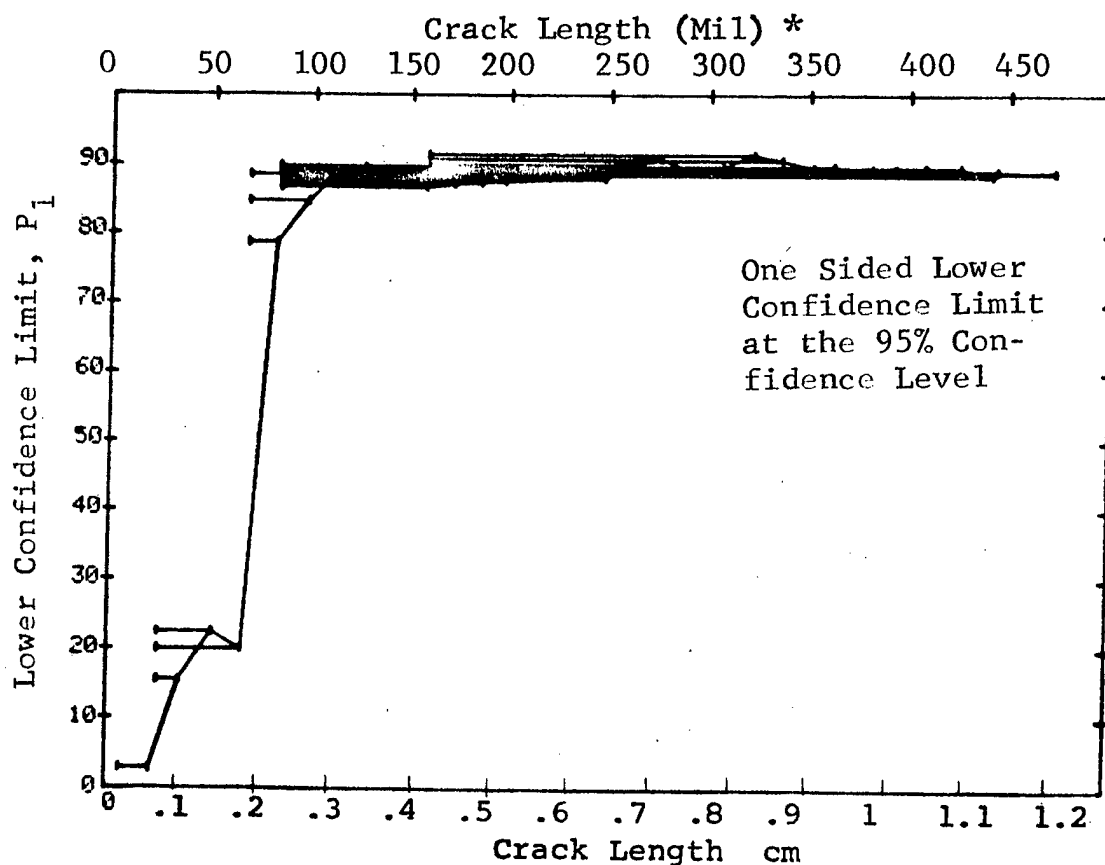


Figure D-24 (Continued)

for

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75 EDDY CURRENT				TEST 3, ROCKWELL SC, 'W' (24)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	7	49	51	16	30	20	0	0
22	30	63	60	16	25	17	0	0
23	51	70	60	19	30	21	0	0
24	64	79	60	43	70	60	0	0
25	70	87	60	55	90	83	43	56
26	79	105	60	57	93	87	16	29
27	87	131	60	59	97	92	0	1
28	106	162	60	54	88	81	56	69
29	132	275	60	55	90	83	40	56
30	171	330	60	59	97	92	0	1
31	279	442	60	54	88	81	56	69
32	331	500	60	52	85	77	82	94

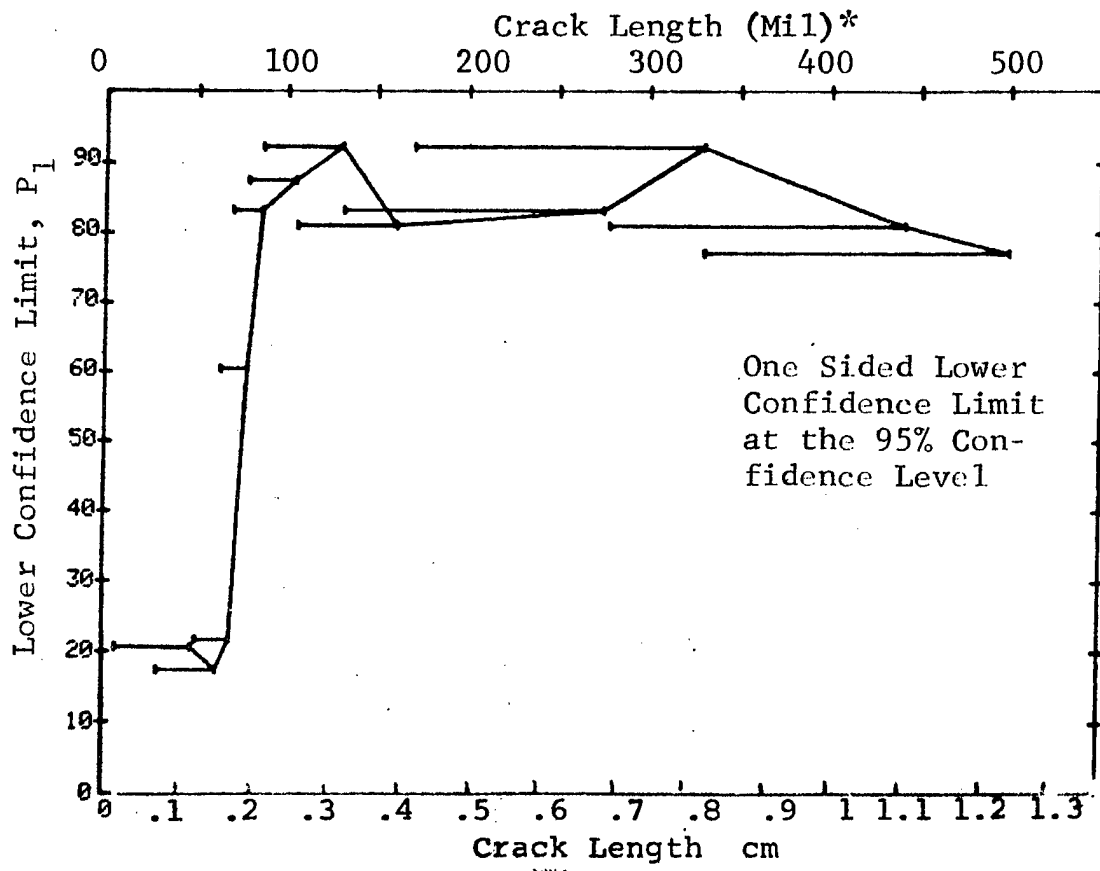


Figure D-24 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75 EDDY CURRENT				TEST 1, ROCKWELL SC, 'M' (25)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7 *	22 *	13	1	5	0	0	0
2	25	36	18	3	14	4	0	0
3	38	52	23	8	32	18	0	0
4	54	67	47	31	64	52	0	0
5	68	82	53	31	38	28	0	0
6	83	97	39	36	90	81	37	50
7	98	111	17	17	96	83	12	29
8	115	126	17	17	96	83	12	29
9	129	141	19	19	96	85	10	27
10	143	157	14	13	88	70	0	0
11	158	171	3	3	79	36	0	0
12	182	185	3	3	79	36	0	0
13	190	197	2	2	70	22	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	241	247	4	4	84	47	0	0
17	248	261	16	16	95	82	13	30
18	268	275	3	3	79	36	0	0
19	279	290	7	7	90	65	0	0
20	295	306	6	6	89	60	0	0
21	310	322	10	10	93	74	0	0
22	323	336	12	12	94	77	17	34
23	338	352	11	10	85	63	0	0
24	356	362	5	4	68	34	0	0
25	370	381	4	4	84	47	0	0
26	384	393	2	2	70	22	0	0
27	408	408	1	1	50	5	0	0
28	426	426	1	1	50	5	0	0
29	442	442	1	1	50	5	0	0
30	444	444	1	1	50	5	0	0
31	458	472	8	8	91	68	0	0
32	474	979	59	58	97	92	0	2

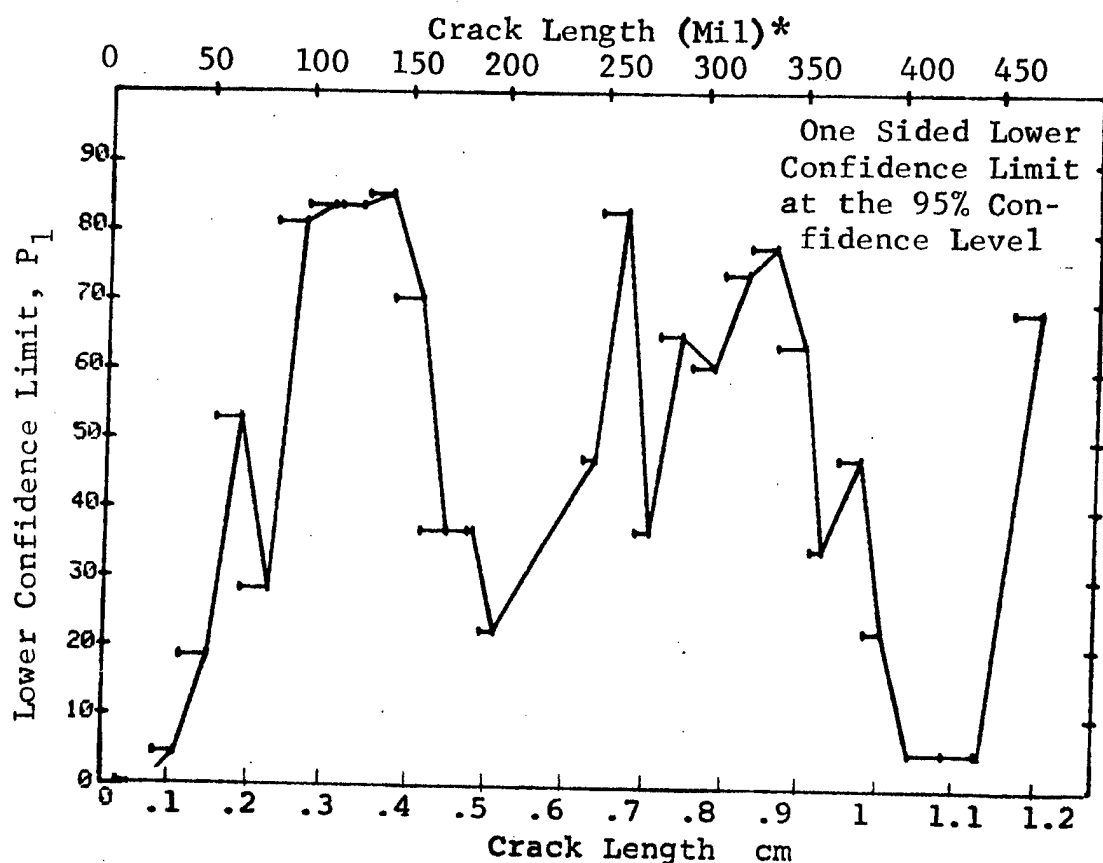


Figure D-25 Probability of Detection for 2219-T87 Al Using Eddy Current. Etched Fatigue Cracks in Flat Plates Measured by Operator X. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75		EDDY CURRENT		N	TEST 2, ROCKWELL SC, 'X' (25)				
RANGE	MIN LN	* MAX LN			DET	50%	95%	0 MISS	1 MISS
1	7	* 22 *	13	1	0	0	0	0	0
2	25	36	18	3	0	4	0	0	0
3	38	52	23	8	0	18	0	0	0
4	54	67	47	31	0	52	0	0	0
5	54	82	100	52	0	43	0	0	0
6	83	97	39	36	0	81	37	50	0
7	83	111	56	53	0	86	20	33	0
8	98	126	34	34	0	91	0	13	0
9	98	141	53	53	0	94	0	0	0
10	98	157	67	66	0	93	0	0	0
11	98	171	70	69	0	93	0	0	0
12	98	185	73	72	0	93	0	0	0
13	98	197	75	74	0	93	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	98	247	79	78	0	94	0	0	0
17	98	261	95	94	0	95	0	0	0
18	98	275	98	97	0	95	0	0	0
19	98	290	105	104	0	95	0	0	0
20	98	306	111	110	0	95	0	0	0
21	98	322	121	120	0	96	0	0	0
22	98	336	133	132	0	96	0	0	0
23	98	352	144	142	0	95	0	0	0
24	98	362	149	146	0	94	0	0	0
25	98	381	153	150	0	95	0	0	0
26	98	393	155	152	0	95	0	0	0
27	98	408	156	153	0	95	0	0	0
28	98	426	157	154	0	95	0	0	0
29	98	442	158	155	0	95	0	0	0
30	98	444	159	156	0	95	0	0	0
31	98	472	167	164	0	95	0	0	0
32	98	979	226	222	0	95	0	0	0

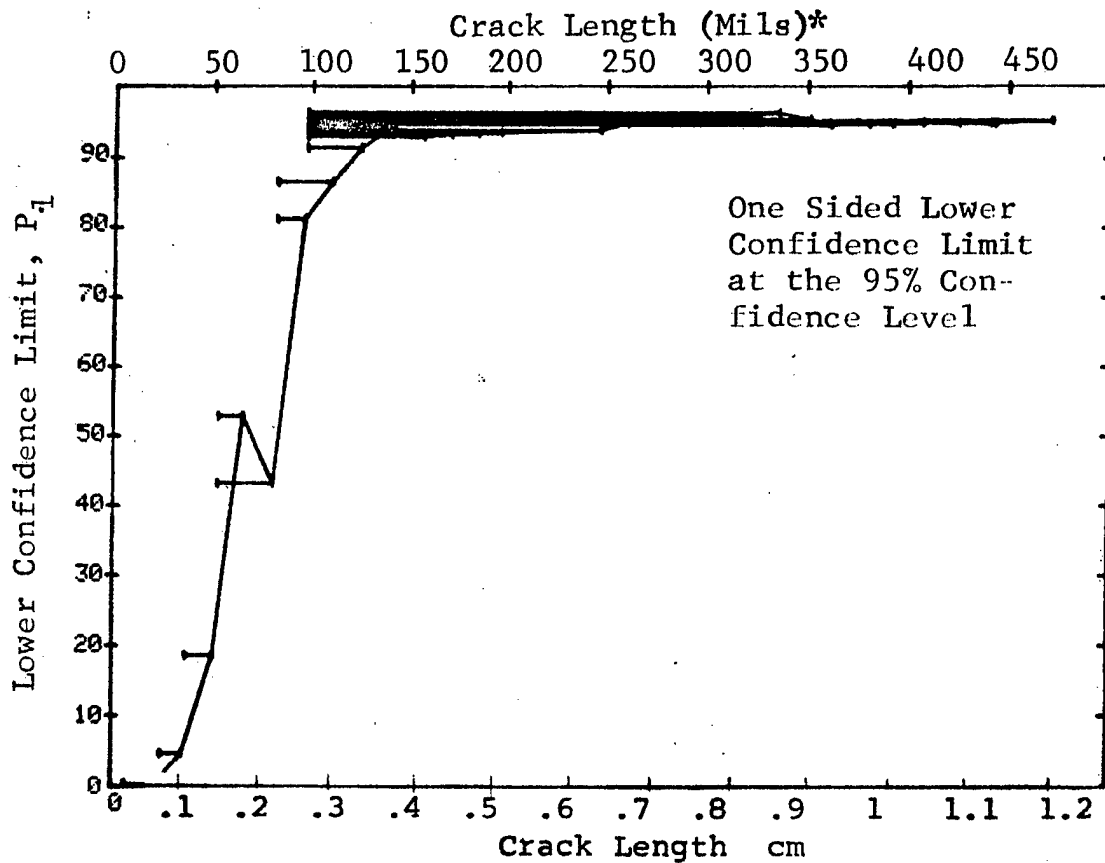


Figure D-25 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75		EDDY CURRENT		N	TEST 3. ROCKWELL SC. 'X' (25)				
RANGE	MIN LN	* MAX LN	* MAX LN		DET	50%	95%	0 MISS	1 MISS
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	7	49	51	10	18	11	0	0	0
22	30	63	60	25	40	30	0	0	0
23	49	69	60	35	57	46	0	0	0
24	63	79	60	29	47	37	0	0	0
25	69	86	60	33	54	43	0	0	0
26	79	103	60	51	83	75	94	100	0
27	87	129	60	60	98	95	0	0	0
28	104	158	60	59	97	92	0	1	0
29	131	275	60	59	97	92	0	1	0
30	162	330	60	60	98	95	0	0	0
31	279	442	60	58	95	89	1	16	0
32	331	500	60	57	93	87	16	29	0

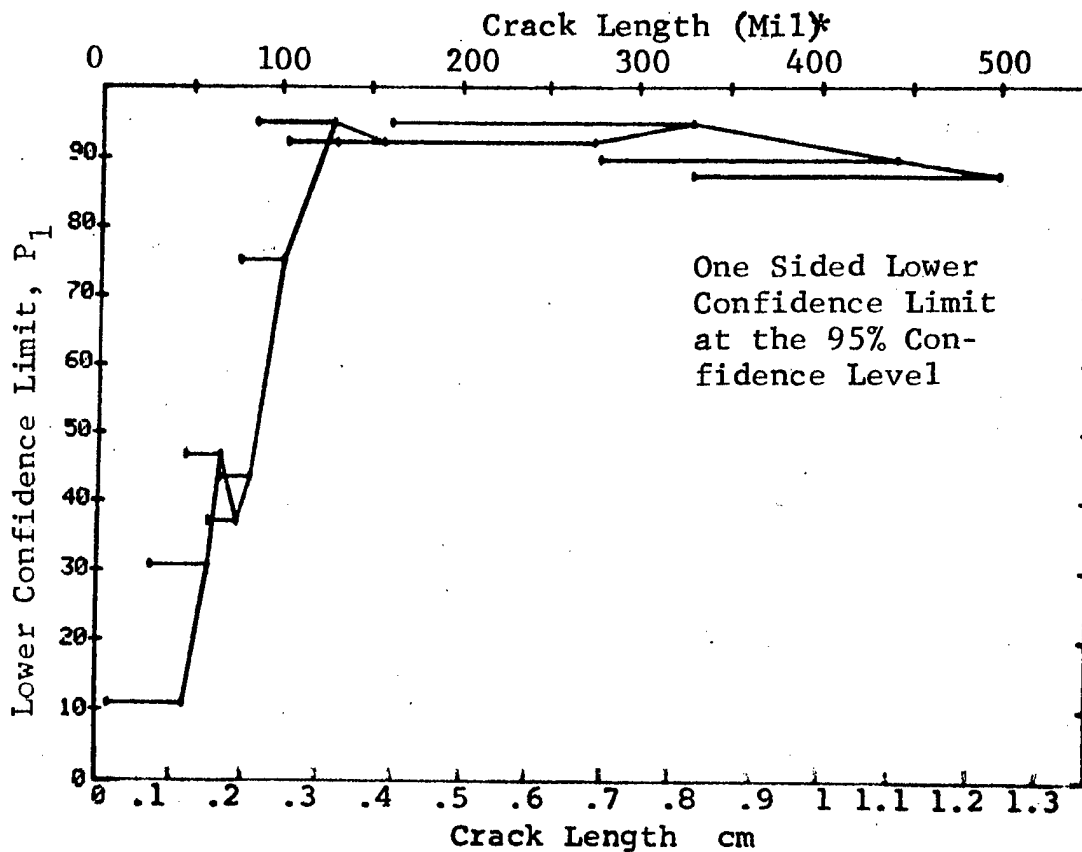


Figure D-25 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75 RADIOGRAPHY				TEST 1, ROCKWELL SCALING (26)					
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	7	22	13	0	0	0	0	0	
2	25	36	18	2	9	0	0	0	
3	38	52	23	3	11	3	0	0	
4	54	67	46	7	14	7	0	0	
5	68	82	53	12	21	13	0	0	
6	83	97	39	12	29	18	0	0	
7	98	111	17	6	32	16	0	0	
8	115	126	17	1	3	0	0	0	
9	129	141	19	1	3	0	0	0	
10	143	157	15	1	4	0	0	0	
11	158	171	3	0	0	0	0	0	
12	182	185	3	1	20	1	0	0	
13	190	197	2	1	29	2	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	241	247	4	0	0	0	0	0	
17	248	262	17	4	84	47	0	0	
18	268	275	3	16	90	75	29	44	
19	279	290	7	3	79	36	0	0	
20	295	306	6	5	63	34	0	0	
21	310	322	10	2	26	6	0	0	
22	323	336	12	5	45	22	0	0	
23	338	352	11	4	29	12	0	0	
24	356	362	4	11	93	76	18	0	
25	370	381	5	3	61	24	0	0	
26	384	393	2	5	87	54	0	0	
27	408	408	1	2	70	22	0	0	
28	426	426	1	0	0	0	0	0	
29	442	442	1	0	0	0	0	0	
30	444	444	1	1	50	5	0	0	
31	458	472	8	1	50	5	0	0	
32	474	979	59	8	91	68	0	0	
				54	90	83	44	0	

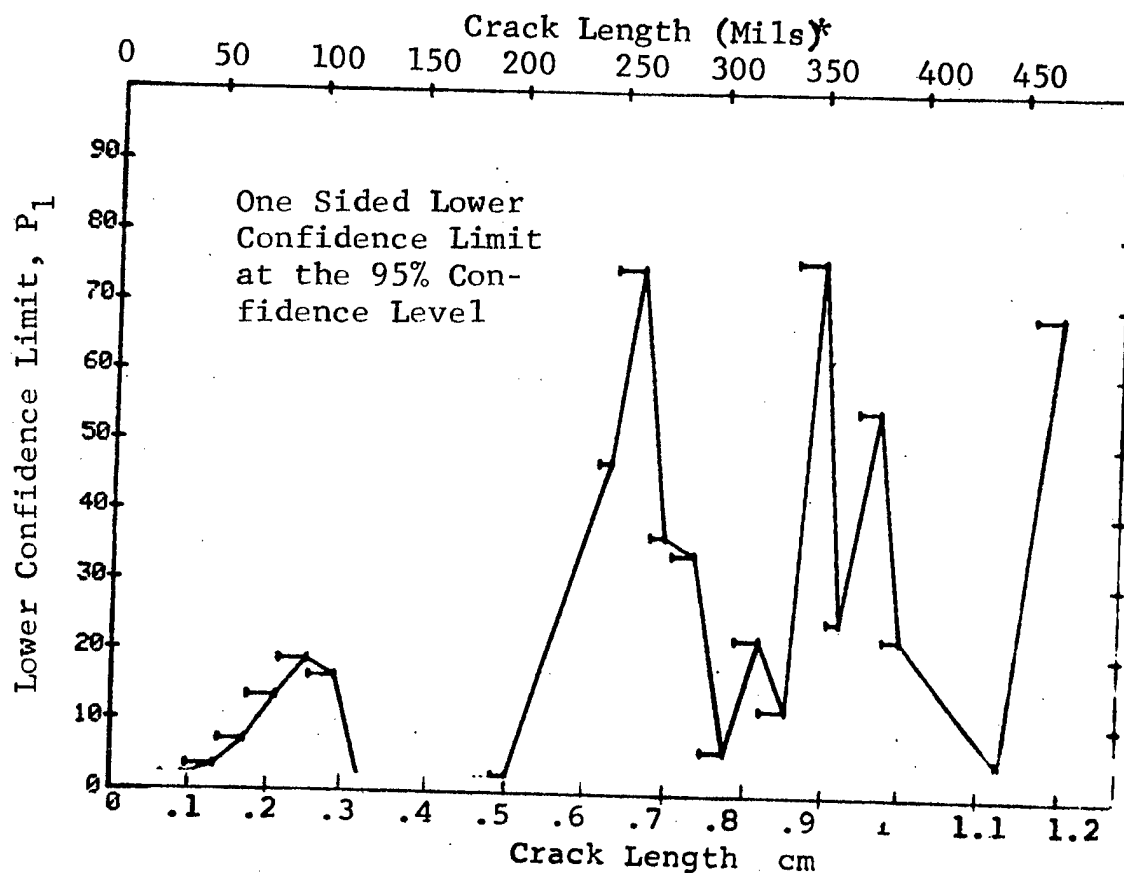


Figure D-26 Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates Measured by Operator A. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75		RADIOGRAPHY		N	TEST 2, ROCKWELL SC.		(26)	
RANGE	MIN LN	* MAX LN *			DET	50%	95%	0 MISS 1 MISS
1	7	22	13	0	0	0	0	0
2	25	36	18	2	0	2	0	0
3	25	52	41	5	0	4	0	0
4	25	67	87	12	0	8	0	0
5	68	82	53	12	0	13	0	0
6	83	97	39	12	0	18	0	0
7	83	111	56	18	0	21	0	0
8	68	126	126	31	0	16	0	0
9	68	141	145	32	0	16	0	0
10	68	157	160	33	0	15	0	0
11	68	171	163	33	0	15	0	0
12	68	185	166	34	0	15	0	0
13	68	197	168	35	0	15	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	241	247	4	4	0	47	0	0
17	241	262	21	20	0	79	0	0
18	241	275	24	23	0	81	22	27
19	241	290	31	28	0	76	0	0
20	241	306	37	30	0	67	0	0
21	241	322	47	35	0	61	0	0
22	241	336	59	39	0	54	0	0
23	338	352	11	11	0	76	0	0
24	338	362	15	14	0	72	0	0
25	338	381	20	19	0	78	0	0
26	338	393	22	21	0	80	24	0
27	338	408	23	21	0	75	0	0
28	338	426	24	21	0	70	0	0
29	338	442	25	22	0	71	0	0
30	338	444	26	23	0	72	0	0
31	338	472	34	31	0	78	0	0
32	442	979	69	64	0	85	31	0

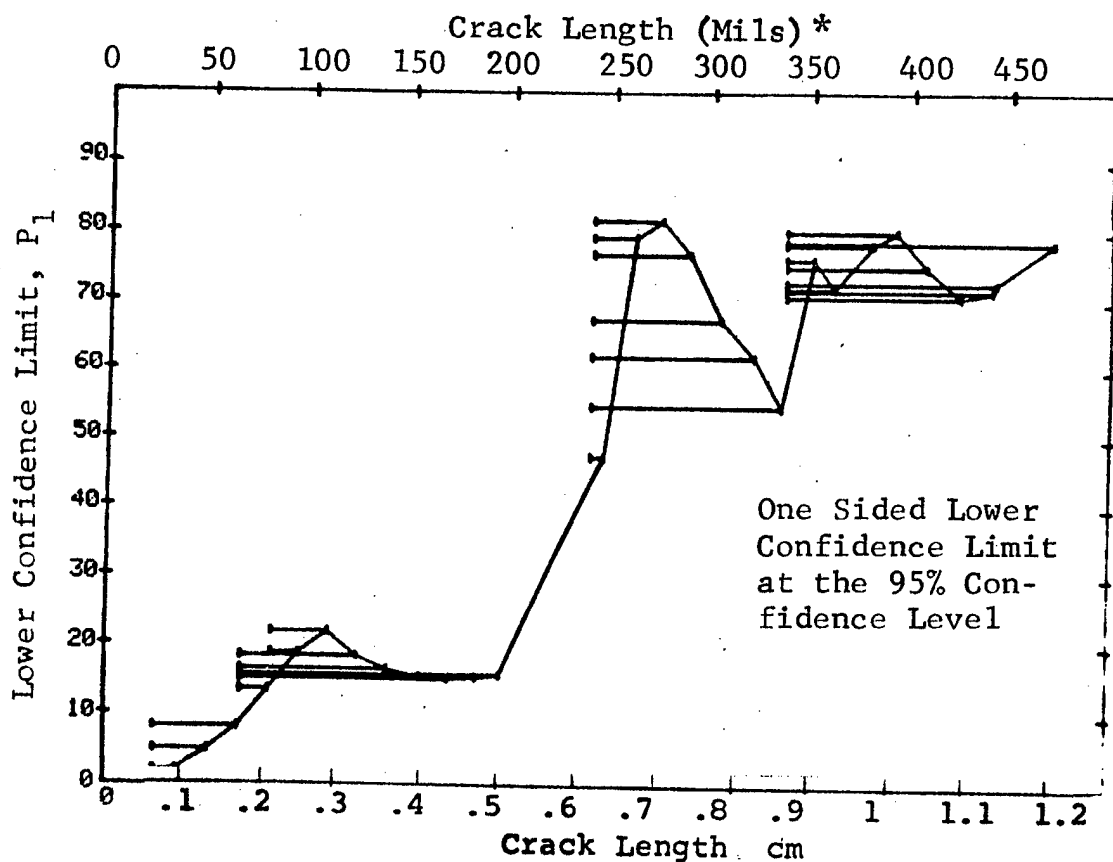


Figure D-26 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

03-JUL-75		RADIOGRAPHY			N	TEST 3, ROCKWELL SC, 'H					(26)
RANGE	MIN LN	0*	MAX LN	*		DET	50%	95%	SC	MISS	MISS
1		0	0		0	0	0	0	0	0	0
2		0	0		0	0	0	0	0	0	0
3		0	0		0	0	0	0	0	0	0
4		0	0		0	0	0	0	0	0	0
5		0	0		0	0	0	0	0	0	0
6		0	0		0	0	0	0	0	0	0
7		0	0		0	0	0	0	0	0	0
8		0	0		0	0	0	0	0	0	0
9		0	0		0	0	0	0	0	0	0
10		0	0		0	0	0	0	0	0	0
11		0	0		0	0	0	0	0	0	0
12		0	0		0	0	0	0	0	0	0
13		0	0		0	0	0	0	0	0	0
14		0	0		0	0	0	0	0	0	0
15		0	0		0	0	0	0	0	0	0
16		0	0		0	0	0	0	0	0	0
17		0	0		0	0	0	0	0	0	0
18		0	0		0	0	0	0	0	0	0
19		0	0		0	0	0	0	0	0	0
20		0	0		0	0	0	0	0	0	0
21		0	0		0	0	0	0	0	0	0
22	7		49		52	4	7	2	0	0	0
23	31		63		60	8	12	6	0	0	0
24	51		70		60	10	16	9	0	0	0
25	64		79		60	12	19	11	0	0	0
26	70		87		60	17	27	18	0	0	0
27	79		105		60	18	29	20	0	0	0
28	88		131		60	13	20	13	0	0	0
29	105		162		60	5	7	3	0	0	0
30	132		275		60	26	42	21	0	0	0
31	171		330		60	40	65	55	0	0	0
32	279		442		60	38	62	51	0	0	0
	331		500		60	50	82	73	0	0	0

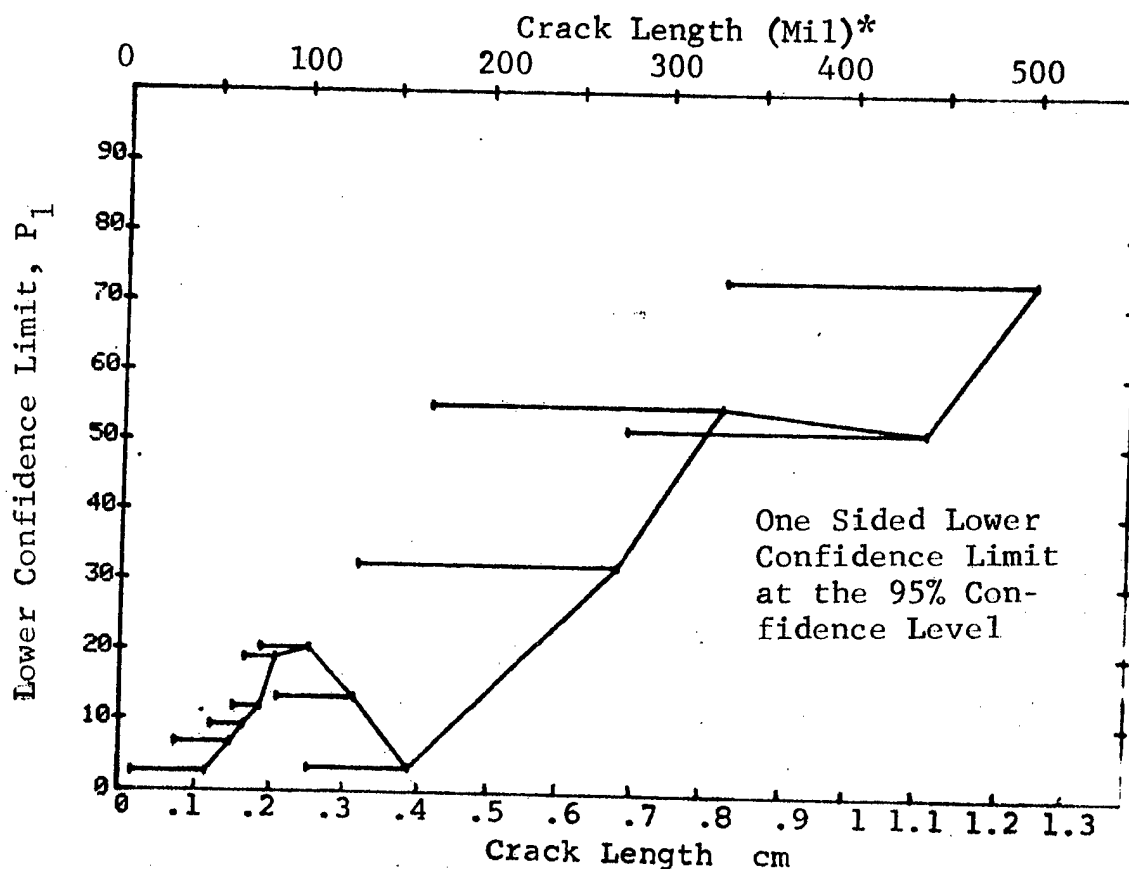


Figure D-26 (Concluded)

(a) Range Interval Method of Data Cumulation

03-JUL-75 RADIOGRAPHY			TEST 1, ROCKWELL SC. 1E (27)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS 1 MISS
1	7	32	13	1	5	0	0
2	25	36	18	1	3	0	0
3	38	52	23	1	2	0	0
4	54	67	46	5	10	4	0
5	68	82	53	9	16	9	0
6	93	97	37	8	20	11	0
7	98	111	17	2	9	2	0
8	115	126	17	0	0	0	0
9	129	141	19	0	0	0	0
10	143	157	15	1	4	0	0
11	158	171	3	0	0	0	0
12	182	185	3	0	0	0	0
13	190	197	2	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	241	247	4	4	84	47	0
17	248	262	17	16	90	75	29
18	268	275	3	3	79	36	0
19	279	290	7	6	77	47	0
20	295	306	6	2	26	6	0
21	310	322	10	4	35	15	0
22	323	336	12	3	21	7	0
23	338	352	11	10	85	63	0
24	356	362	4	3	61	24	0
25	370	381	5	5	87	54	0
26	384	393	2	1	29	2	0
27	408	408	1	1	50	5	0
28	426	426	1	0	0	0	0
29	442	442	1	1	50	5	0
30	444	444	1	1	50	5	0
31	458	472	8	8	91	68	0
32	474	979	59	54	90	83	44

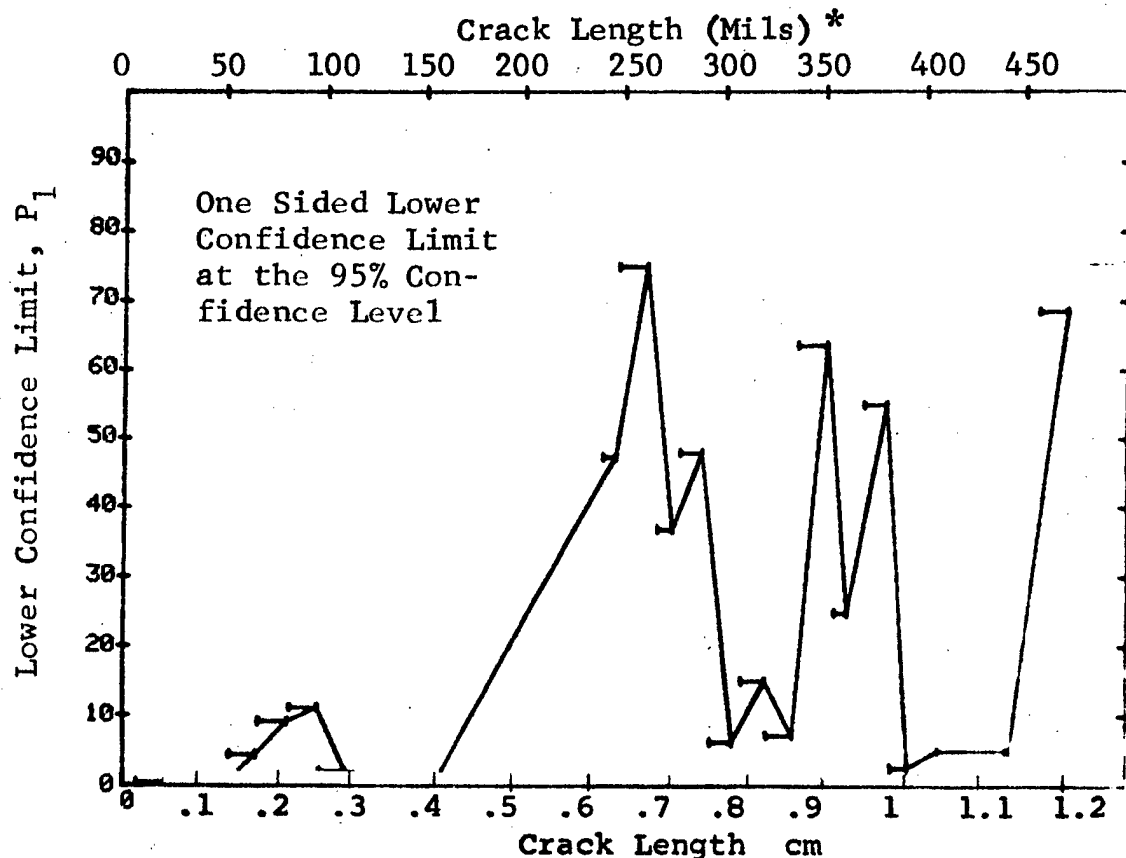


Figure D-27. Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates Measured by Operator B. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

03-JUL-75 RADIOGRAPHY				TEST 2, ROCKWELL SC. '0' (27)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7	22 *	13	1	0	0	0	0
2	7	36	31	2	0	0	0	0
3	7	52	54	3	0	1	0	0
4	54	67	46	5	0	1	0	0
5	68	82	53	5	0	4	0	0
6	68	97	90	9	0	9	0	0
7	68	111	107	17	0	12	0	0
8	68	126	124	19	0	11	0	0
9	54	141	189	19	0	10	0	0
10	54	157	204	24	0	8	0	0
11	68	171	161	25	0	8	0	0
12	54	185	210	26	0	8	0	0
13	54	197	212	25	0	8	0	0
14	0	0	0	25	0	8	0	0
15	0	0	0	0	0	0	0	0
16	241	247	4	0	0	0	0	0
17	241	262	21	4	0	47	0	0
18	241	275	24	20	0	79	0	0
19	241	290	31	23	0	81	22	37
20	241	306	37	29	0	81	30	45
21	241	322	47	31	0	70	0	0
22	241	336	59	35	0	61	0	0
23	338	352	11	38	0	52	0	0
24	338	362	15	10	0	62	0	0
25	338	381	20	13	0	63	0	0
26	338	393	22	18	0	71	0	0
27	338	408	23	19	0	68	0	0
28	338	426	24	20	0	69	0	0
29	338	442	25	20	0	65	0	0
30	338	444	26	21	0	66	0	0
31	338	472	34	22	0	68	0	0
32	442	979	69	30	0	75	0	0
				64	0	85	34	47

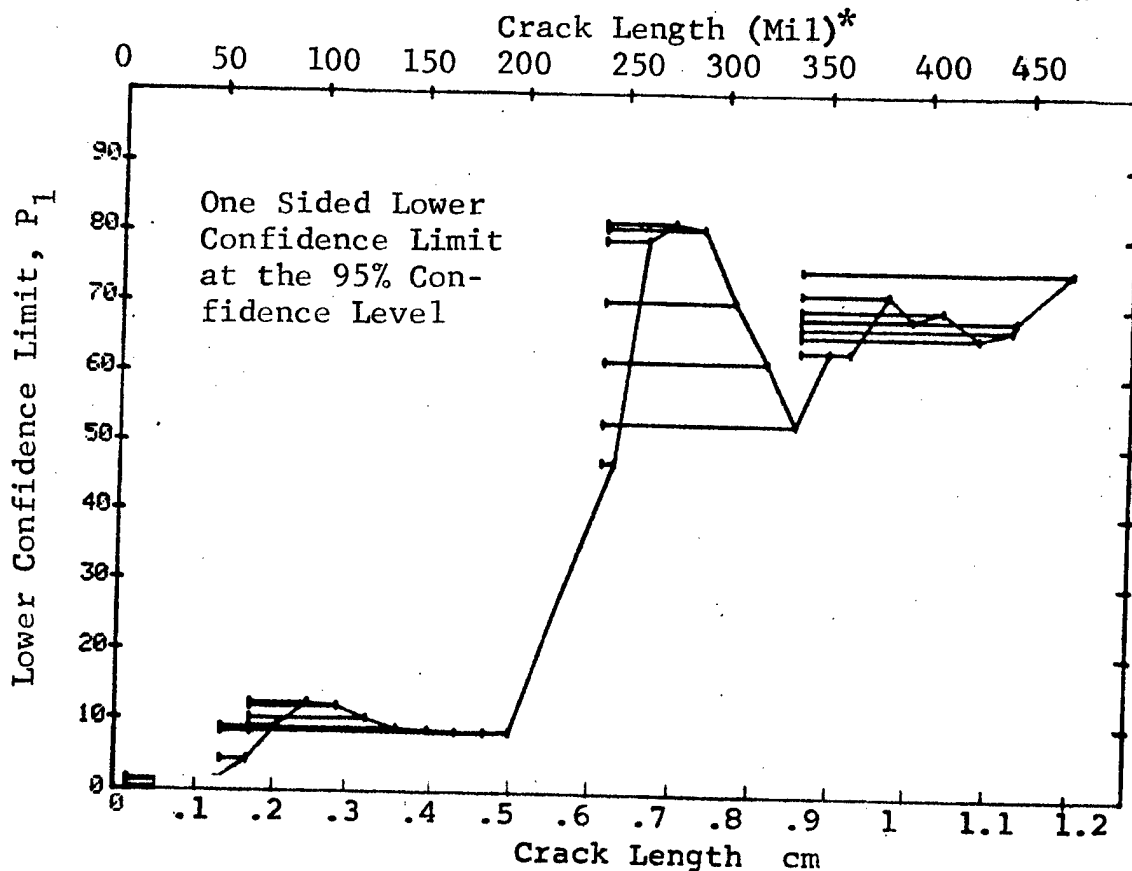


Figure D-27 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

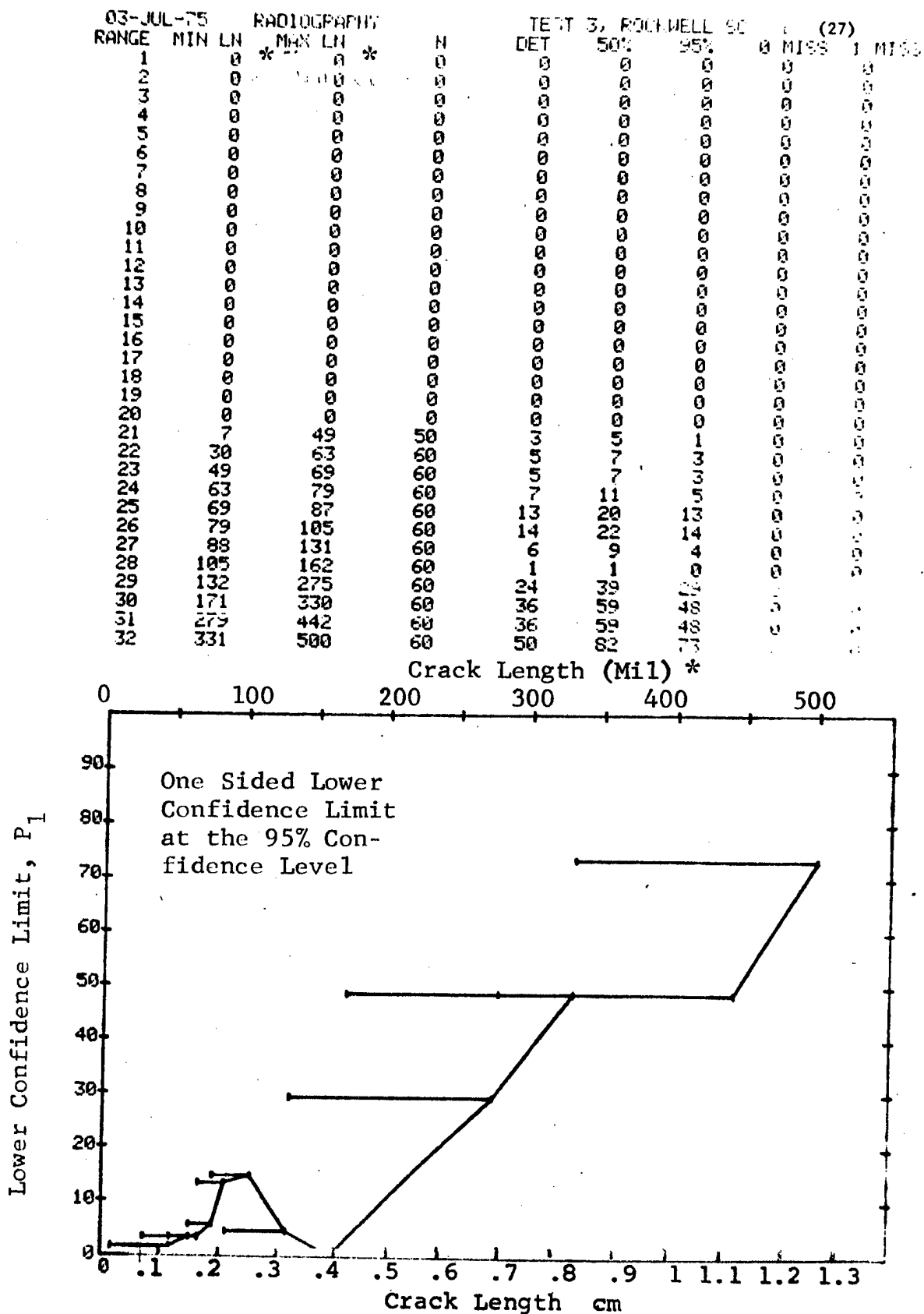


Figure D-27 (Concluded)

(a) Range Interval Method of Data Cumulation

23-JUL-75		RADIOGRAPHY		N	TEST 1, DEN=20, ROCKWELL CO. C (28)				
RANGE	MIN LN	* MAX LN	*		DET	50%	95%	0 MICS	1 MICS
1	7	22	*	13	0	0	0	0	0
2	25	36		18	0	0	0	0	0
3	38	52		23	1	2	0	0	0
4	54	67		46	1	1	0	0	0
5	68	82		53	3	5	1	0	0
6	83	97		39	6	14	6	0	0
7	98	111		17	3	15	4	0	0
8	115	126		17	0	0	0	0	0
9	129	141		19	1	3	0	0	0
10	143	157		15	1	4	0	0	0
11	158	171		3	0	0	0	0	0
12	182	185		3	0	0	0	0	0
13	190	197		2	0	0	0	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	241	247		4	3	61	24	0	0
17	248	262		17	15	84	67	0	0
18	268	275		3	2	50	13	0	0
19	279	290		7	4	50	22	0	0
20	295	306		6	1	10	0	0	0
21	310	322		10	1	6	0	0	0
22	323	336		12	2	13	3	0	0
23	338	352		11	9	76	52	0	0
24	356	362		4	3	61	24	0	0
25	370	381		5	4	68	24	0	0
26	384	393		2	2	70	22	0	0
27	408	408		1	0	0	0	0	0
28	426	426		1	0	0	0	0	0
29	442	442		1	1	50	0	0	0
30	444	444		1	1	50	0	0	0
31	458	472		8	7	79	52	0	0
32	474	979		59	48	80	71	0	0

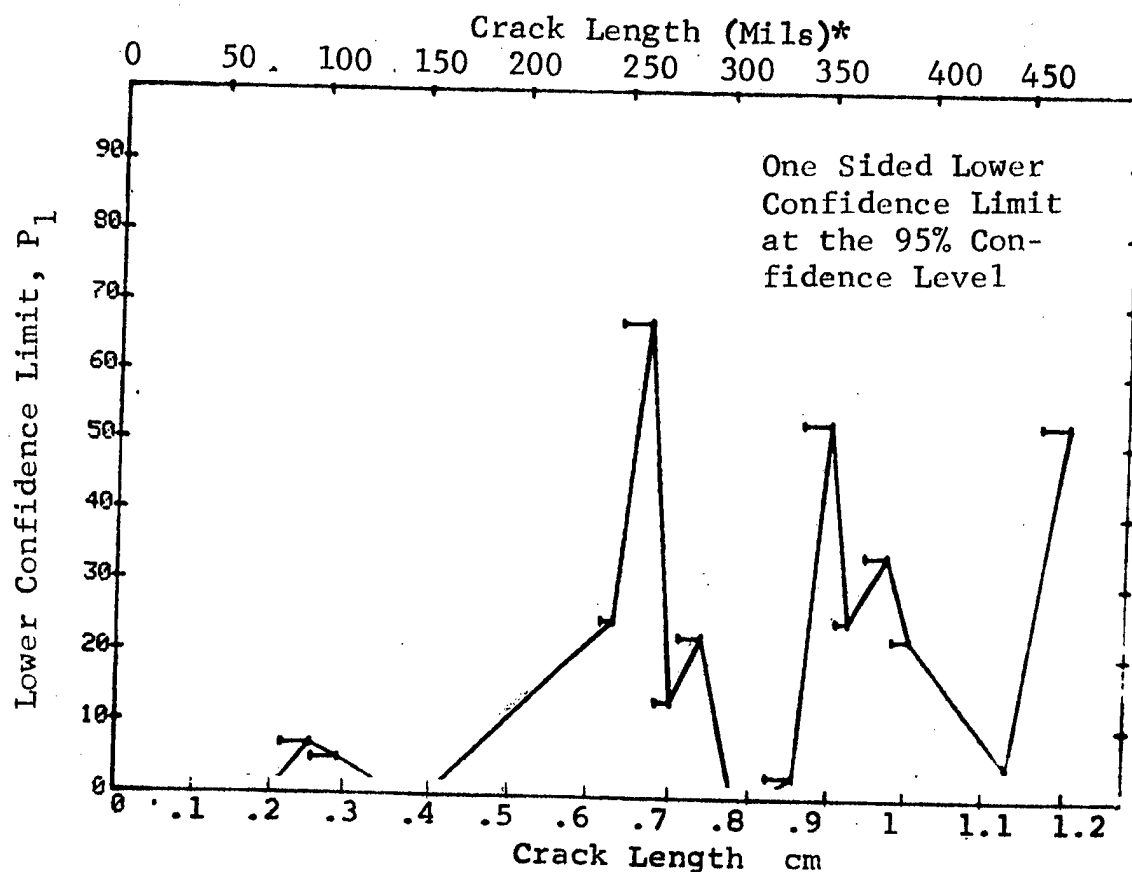


Figure D-28 Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates Measured by Operator C. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

23-JUL-75 PADINGPHAY				TEST 2, DSH=20, ROCKWELL SC. c (28)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7 *	22 *	13	0	0	0	0	0
2	25	36	13	0	0	0	0	0
3	38	52	23	1	0	0	0	0
4	38	67	69	2	0	0	0	0
5	38	82	122	5	0	1	0	0
6	83	97	39	6	0	6	0	0
7	83	111	56	9	0	8	0	0
8	83	126	73	9	0	6	0	0
9	83	141	92	10	0	6	0	0
10	83	157	107	11	0	5	0	0
11	83	171	110	11	0	5	0	0
12	83	185	113	11	0	5	0	0
13	83	197	115	11	0	5	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	241	247	4	3	0	24	0	0
17	248	262	17	15	0	67	0	0
18	241	275	24	20	0	65	0	0
19	241	290	31	24	0	61	0	0
20	241	306	37	25	0	52	0	0
21	241	322	47	26	0	42	0	0
22	241	336	59	28	0	36	0	0
23	338	352	11	9	0	52	0	0
24	338	362	15	12	0	56	0	0
25	338	381	20	16	0	50	0	0
26	338	393	22	18	0	63	0	0
27	338	408	23	18	0	59	0	0
28	338	426	24	18	0	56	0	0
29	338	442	25	19	0	50	0	0
30	338	444	26	20	0	50	0	0
31	338	472	34	27	0	34	0	0
32	442	979	69	57	0	13	0	0

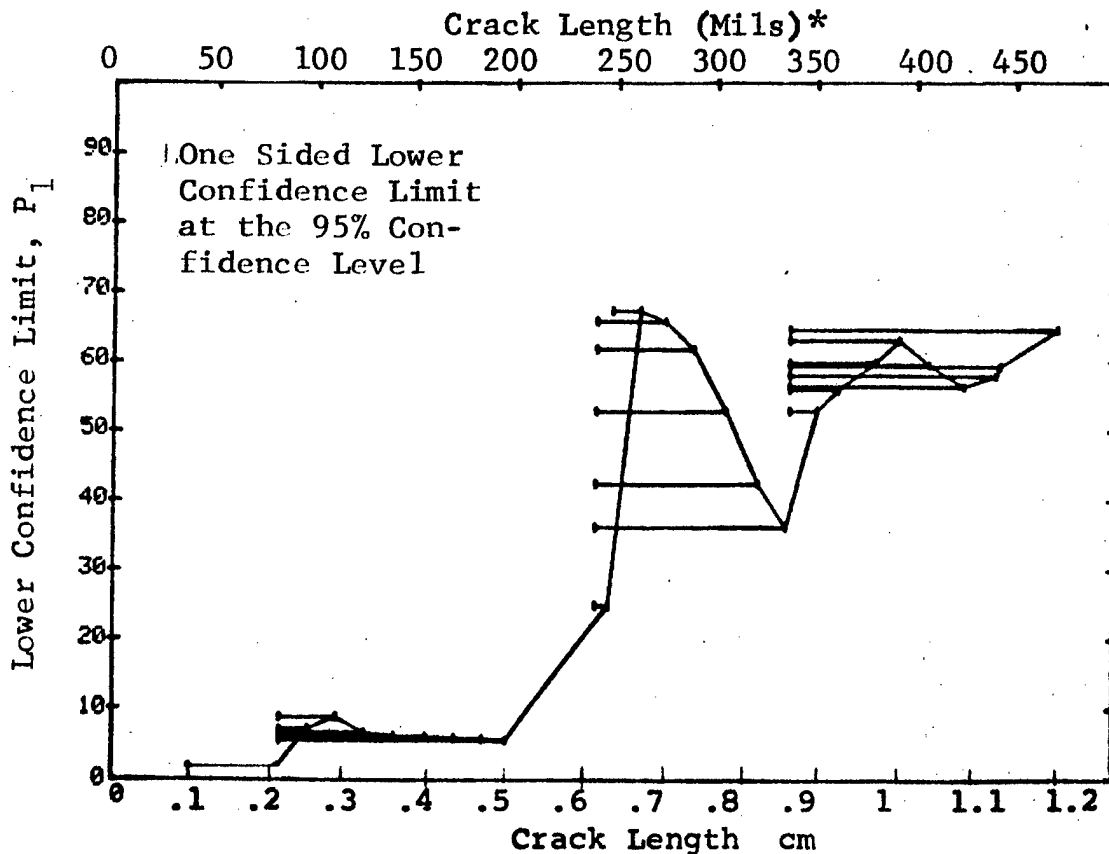


Figure D-28 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

23-JUL-75			RADIOGRAPHY		N	TEST 3, DSN=20, ROCKWELL SC. (28) C				
RANGE	MIN	LN	MAX	LN		DET	50%	95%	0 MISS	1 MISS
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	7		49		52	1	1	0	0	0
22	31		63		60	2	2	0	0	0
23	51		70		60	1	1	0	0	0
24	64		79		60	1	1	0	0	0
25	70		87		60	9	14	0	0	0
26	79		105		60	10	16	0	0	0
27	88		131		60	4	6	2	0	0
28	105		162		60	3	4	1	0	0
29	132		275		60	21	34	34	0	0
30	171		330		60	27	44	33	0	0
31	279		442		60	27	44	33	0	0
32	331		500		60	43	70	60	0	0

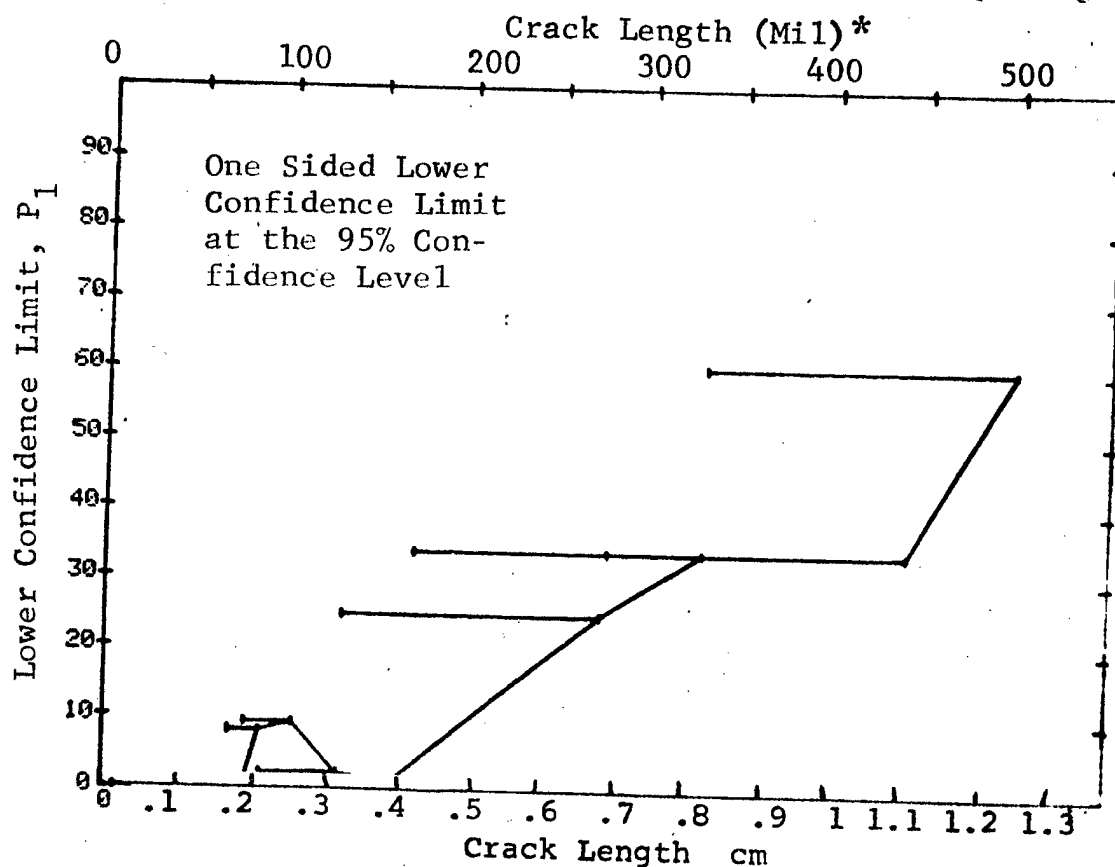


Figure D-28 (Concluded)

(a) Range Interval Method of Data Cumulation

23-JUL-75		RADIOGRAPHY		TEST 1, DSN=21, ROCKWELL SC. D (29)	
RANGE	MIN LN	* MAX LN	*	DET	50% 95% 0 MISS 1 MISS
1	7	32	13	1	5 0 0 0
2	25	36	18	2	9 2 0 0
3	38	52	23	2	7 1 0 0
4	54	67	46	7	14 7 0 0
5	68	82	53	9	16 9 0 0
6	83	97	39	16	39 27 0 0
7	98	111	17	6	32 16 0 0
8	115	126	17	1	3 0 0 0
9	129	141	19	3	13 4 0 0
10	143	157	15	2	10 2 0 0
11	158	171	3	0	0 0 0 0
12	182	185	3	0	0 0 0 0
13	190	197	2	1	29 2 0 0
14	0	0	0	0	0 0 0 0
15	0	0	0	0	0 0 0 0
16	241	247	4	3	61 24 0 0
17	248	262	17	16	90 75 29 44
18	268	275	3	3	79 36 0 0
19	279	290	7	3	36 12 0 0
20	295	306	6	1	10 0 0 0
21	310	322	10	3	25 0 0 0
22	323	336	12	4	29 12 0 0
23	338	352	11	8	67 43 0 0
24	356	362	4	3	61 24 0 0
25	370	381	5	5	87 54 0 0
26	384	393	2	2	70 22 0 0
27	408	408	1	0	0 0 0 0
28	426	426	1	0	0 0 0 0
29	442	442	1	1	50 5 0 0
30	444	444	1	1	50 5 0 0
31	458	472	8	8	91 68 11 11
32	474	979	59	58	97 92 0 0

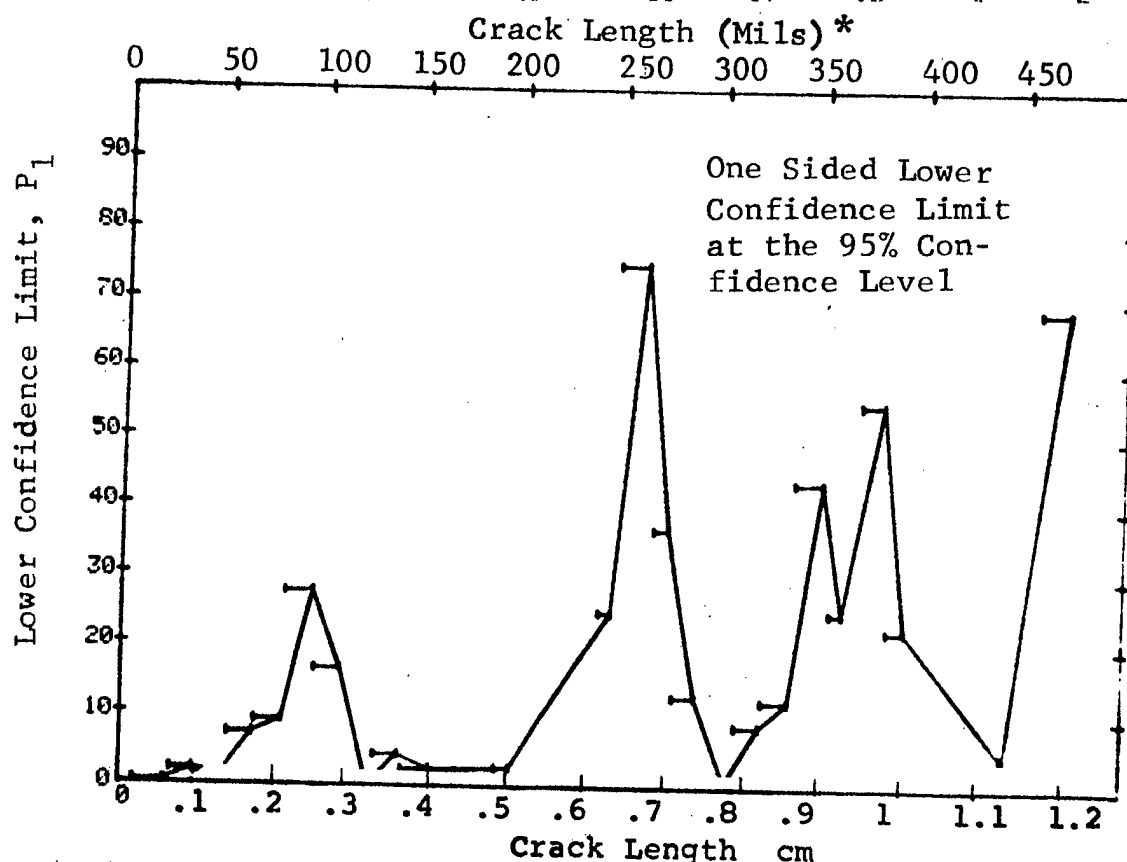


Figure D-29 Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates Measured by Operator D. Lab. Env. D-87

(b) Optimum Probability Method of Data Cumulation

23-JUL-75 RADIOGRAPHY				TEST 2, DSN=21, ROCKWELL C, D' (29)				
RANGE	MIN LN	MAX LN	N	DFT	50%	95%	0 MISS	1 MISS
1	7	22	13	1	0	0	0	0
2	7	36	21	3	0	2	0	0
3	7	52	54	5	0	3	0	0
4	54	67	46	7	0	7	0	0
5	54	82	99	16	0	10	0	0
6	83	97	39	16	0	27	0	0
7	83	111	56	22	0	28	0	0
8	83	126	73	23	0	22	0	0
9	83	141	92	26	0	20	0	0
10	83	157	107	28	0	19	0	0
11	83	171	110	28	0	18	0	0
12	83	185	113	28	0	18	0	0
13	83	197	115	29	0	18	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	190	247	6	4	0	27	0	0
17	248	262	17	16	0	75	0	0
18	248	275	20	19	0	78	0	0
19	241	290	31	25	0	65	0	0
20	241	306	37	26	0	55	0	0
21	241	322	47	29	0	46	0	0
22	241	336	59	33	0	44	0	0
23	241	352	70	41	0	46	0	0
24	241	362	74	44	0	49	0	0
25	338	381	20	16	0	55	0	0
26	370	393	7	7	0	85	0	0
27	338	408	23	18	0	59	0	0
28	338	426	24	18	0	56	0	0
29	338	442	25	19	0	56	0	0
30	338	444	26	20	0	56	0	0
31	442	472	10	10	0	74	0	0
32	442	979	69	68	0	93	0	0

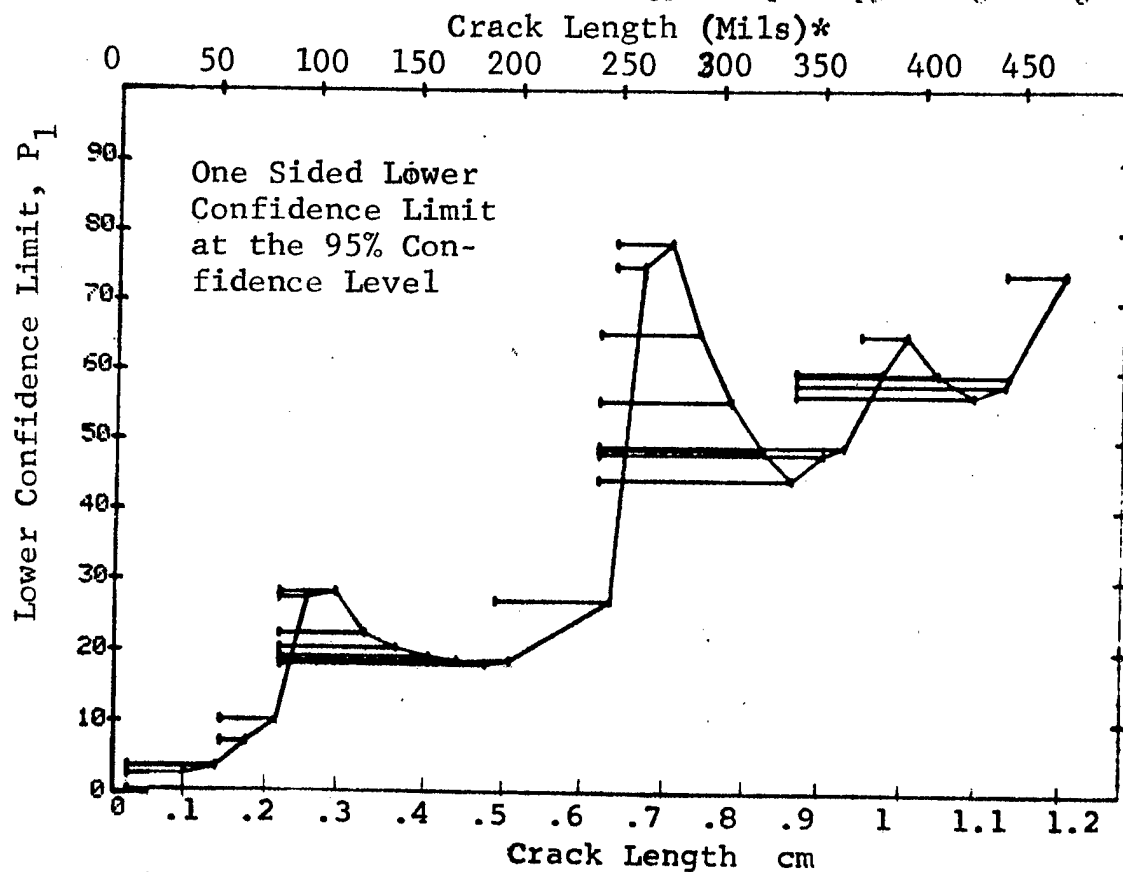


Figure D-29 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

23-JUL-75		RADIOGRAPHY			TEST	3. DSN=31, ROCKWELL SC		D (29)		
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		0	*	0	*	0	0	0	0	0
2		0		0		0	0	0	0	0
3		0		0		0	0	0	0	0
4		0		0		0	0	0	0	0
5		0		0		0	0	0	0	0
6		0		0		0	0	0	0	0
7		0		0		0	0	0	0	0
8		0		0		0	0	0	0	0
9		0		0		0	0	0	0	0
10		0		0		0	0	0	0	0
11		0		0		0	0	0	0	0
12		0		0		0	0	0	0	0
13		0		0		0	0	0	0	0
14		0		0		0	0	0	0	0
15		0		0		0	0	0	0	0
16		0		0		0	0	0	0	0
17		0		0		0	0	0	0	0
18		0		0		0	0	0	0	0
19		0		0		0	0	0	0	0
20		0		0		0	0	0	0	0
21		7		49		4	7	2	0	0
22		31		63		10	16	9	0	0
23		51		70		9	14	8	0	0
24		64		79		7	11	5	0	0
25		70		87		16	25	17	0	0
26		79		105		24	39	29	0	0
27		88		131		15	24	16	0	0
28		105		162		7	11	5	0	0
29		132		275		28	45	35	0	0
30		171		330		32	52	41	0	0
31		279		442		30	49	38	0	0
32		331		500		51	83	75	94	100

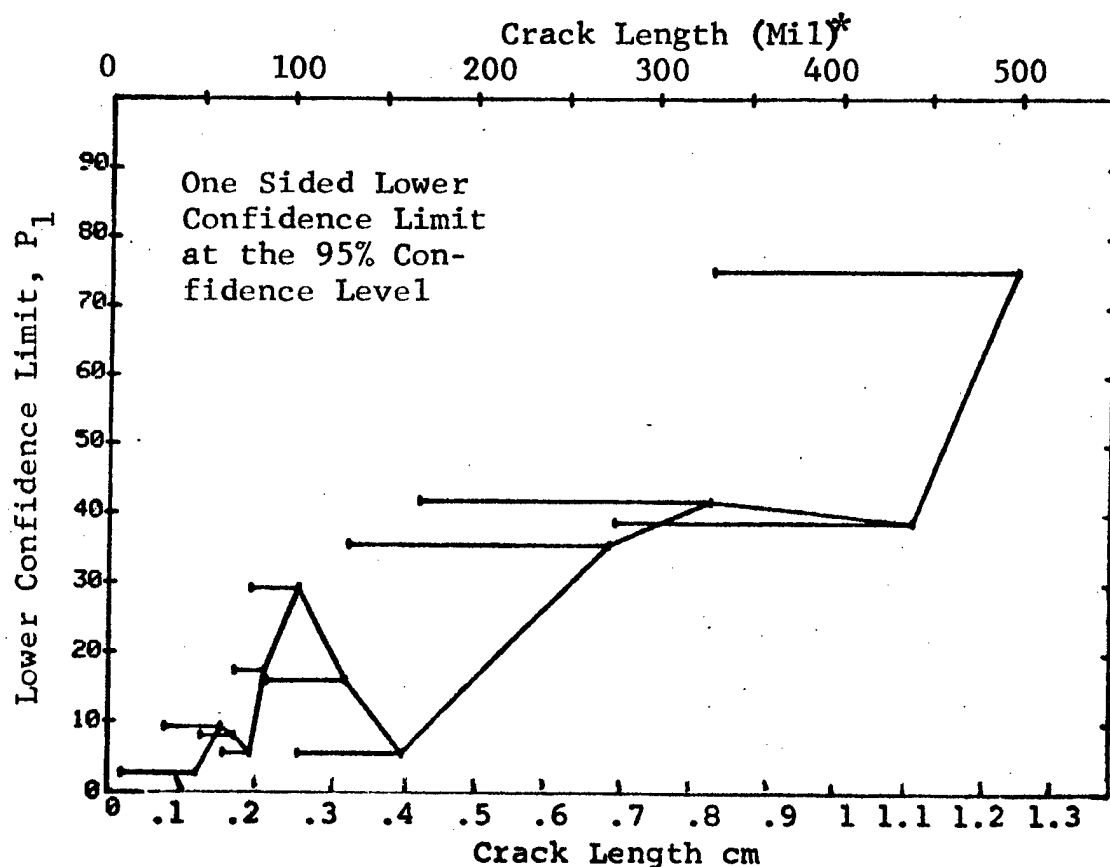


Figure D-29 (Concluded)

(a) Range Interval Method of Data Cumulation

23-JUL-75		RADIOGRAPHY		N	TEST 1,		(30)	E	
RANGE	MIN LN	MAX LN	LN*		DET	50%		0 MISS	1 MISS
1			7*	8	0	0	0	0	0
2	20	28	18*	11	3	23	7	0	0
3	30	40		15	1	4	0	0	0
4	41	51		19	4	18	7	0	0
5	52	62		26	8	29	16	0	0
6	63	73		43	13	29	18	0	0
7	74	84		38	15	38	26	0	0
8	85	95		26	12	44	29	0	0
9	96	106		19	6	29	14	0	0
10	108	117		8	1	8	0	0	0
11	118	126		13	2	12	2	0	0
12	129	138		16	2	10	2	0	0
13	140	150		13	2	12	2	0	0
14	151	158		6	1	10	0	0	0
15	162	171		2	1	29	0	0	0
16	182	183		2	1	29	0	0	0
17	185	190		2	1	29	0	0	0
18	197	197		1	1	29	0	0	0
19	0	0		0	0	50	0	0	0
20	0	0		0	0	0	0	0	0
21	0	0		0	0	0	0	0	0
22	241	249		7	7	0	0	0	0
23	250	260		11	11	90	65	0	0
24	261	269		5	5	93	76	18	35
25	275	279		5	5	87	54	0	0
26	283	290		5	5	79	36	0	0
27	295	304		5	5	87	54	0	0
28	306	313		7	4	68	34	0	0
29	317	326		8	5	63	34	0	0
30	328	336		8	3	32	11	0	0
31	338	347		9	4	44	19	0	0
32	352	362		4	6	60	34	0	0
					3	61	24	0	0

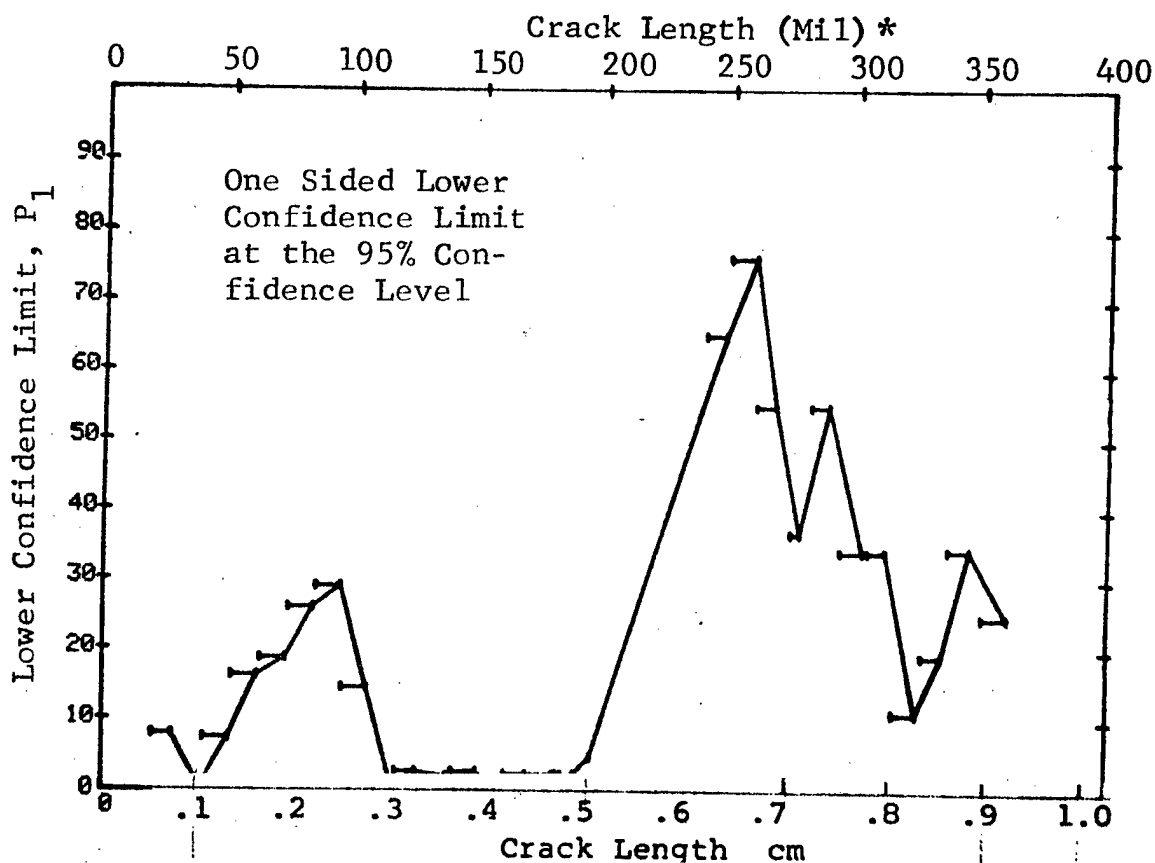


Figure D-30 Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates Measured by Operator E. Lab. Env.

(b) Overlapping Sixty Point Method of Data Cumulation

23-JUL-75		RADIOGRAPHY		N	TEST 2		(30) ROCKWELL SC		E
RANGE	MIN LN	* MAX LN *			DET	50%	95%	0 MISS	
1	7	18	8	0	0	0	0	0	0
2	20	28	11	3	0	7	0	0	0
3	20	40	26	4	0	5	0	0	0
4	20	51	45	8	0	9	0	0	0
5	52	62	26	3	0	16	0	0	0
6	52	73	69	21	0	21	0	0	0
7	74	84	38	15	0	26	0	0	0
8	74	95	64	27	0	31	0	0	0
9	74	106	83	33	0	30	0	0	0
10	74	117	91	34	0	28	0	0	0
11	63	126	147	49	0	26	0	0	0
12	52	138	189	59	0	25	0	0	0
13	52	150	202	61	0	24	0	0	0
14	52	158	208	62	0	24	0	0	0
15	52	171	210	63	0	24	0	0	0
16	52	183	212	64	0	25	0	0	0
17	52	190	214	65	0	25	0	0	0
18	63	197	189	58	0	25	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	197	249	8	8	0	68	0	0	0
23	197	260	19	19	0	85	10	27	0
24	197	269	24	24	0	88	5	22	0
25	197	279	27	27	0	89	2	19	0
26	197	290	32	32	0	91	0	14	0
27	197	304	37	36	0	87	9	24	0
28	197	313	44	41	0	83	32	45	0
29	197	326	52	44	0	73	0	0	0
30	197	336	60	48	0	69	0	0	0
31	197	347	69	54	0	68	0	0	0
32	197	362	73	57	0	68	0	0	0

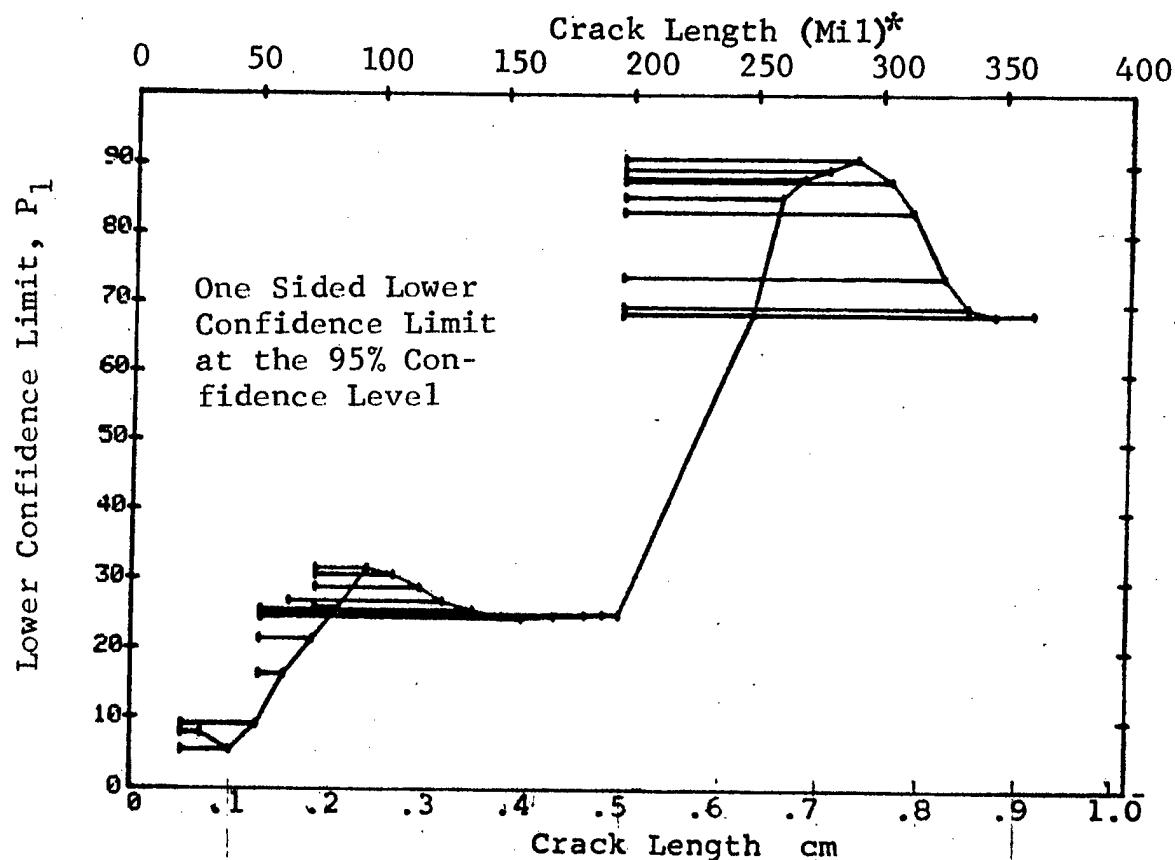


Figure D-30 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

23-JUL-75		RADIOGRAPHY			N	TEST 3. (30)		ROCKWELL SC E		
RANGE	MIN LN	MAX LN	* %	* %		DET	50%	95%	0 MISS	1 MISS
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	7	44	40	5	11	5	0	0	0	0
23	21	60	60	12	19	11	0	0	0	0
24	45	67	60	17	27	18	0	0	0	0
25	61	76	60	19	30	21	0	0	0	0
26	68	84	60	22	35	26	0	0	0	0
27	76	97	60	25	40	30	0	0	0	0
28	85	123	60	28	32	23	0	0	0	0
29	97	144	60	12	19	11	0	0	0	0
30	124	257	60	22	35	26	0	0	0	0
31	145	313	60	45	74	64	0	0	0	0
32	257	362	60	44	72	62	0	0	0	0

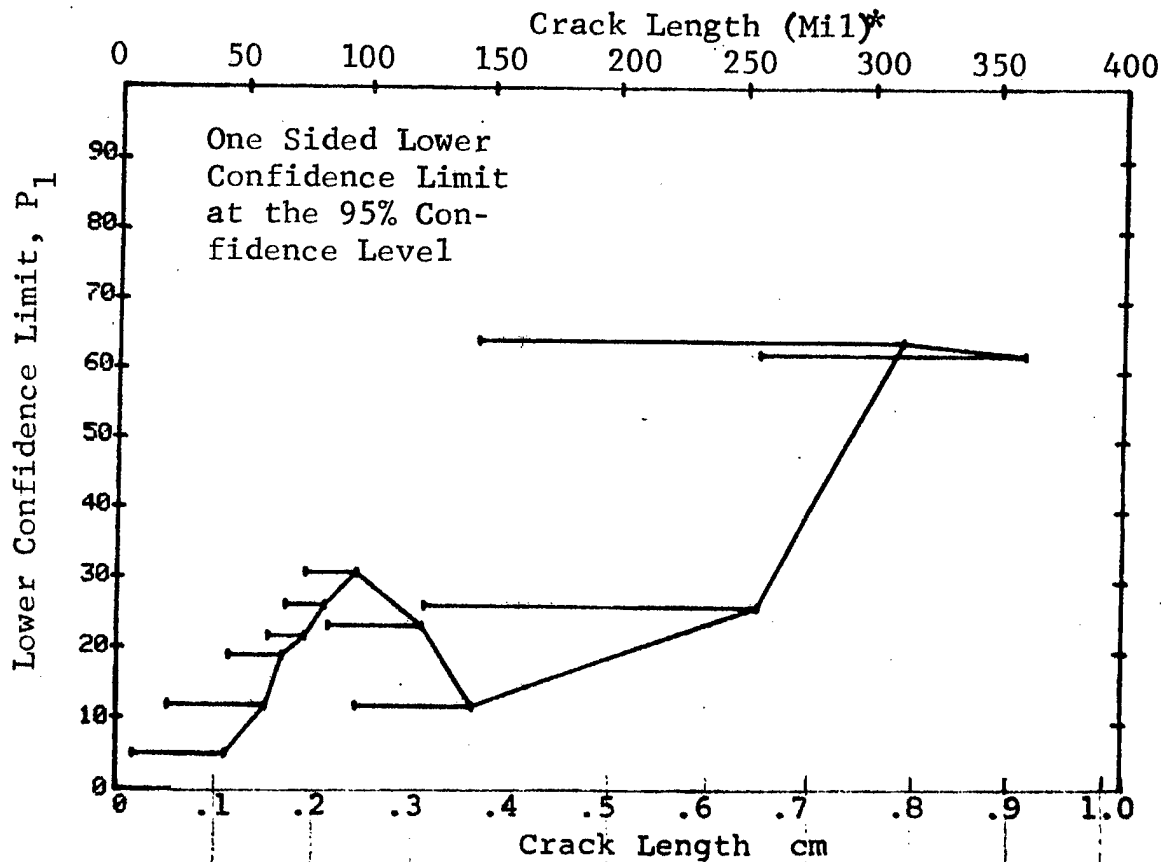


Figure D-30 (Concluded)

(a) Range Interval Method of Data Cumulation

23-JUL-75 RADIOGRAPHY				TEST 1, (31)				P	
RANGE	MIN LN	* MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	7	22	13	2	12	2	0	0	
2	25	36	18	3	14	4	0	0	
3	38	52	23	7	28	15	0	0	
4	54	67	46	13	27	17	0	0	
5	68	82	53	23	42	31	0	0	
6	83	97	39	18	44	32	0	0	
7	98	111	17	5	26	12	0	0	
8	115	126	16	4	22	9	0	0	
9	129	141	20	5	22	10	0	0	
10	143	157	15	8	50	29	0	0	
11	158	171	3	2	50	13	0	0	
12	182	185	3	2	50	13	0	0	
13	190	197	2	1	29	2	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	241	247	4	4	84	47	0	0	
17	248	262	17	16	90	75	29	44	
18	268	275	3	3	79	36	0	0	
19	279	290	7	6	77	47	0	0	
20	295	306	6	5	73	41	0	0	
21	310	322	10	4	35	15	0	0	
22	323	336	12	9	70	47	0	0	
23	338	352	11	9	76	52	0	0	
24	356	362	4	2	38	9	0	0	
25	370	381	5	4	68	34	0	0	
26	384	393	2	2	70	22	0	0	
27	408	408	1	1	50	5	0	0	
28	426	426	1	0	0	0	0	0	
29	442	442	1	1	50	5	0	0	
30	444	444	1	0	0	0	0	0	
31	458	472	8	6	67	40	0	0	
32	474	979	59	51	85	76	83	95	

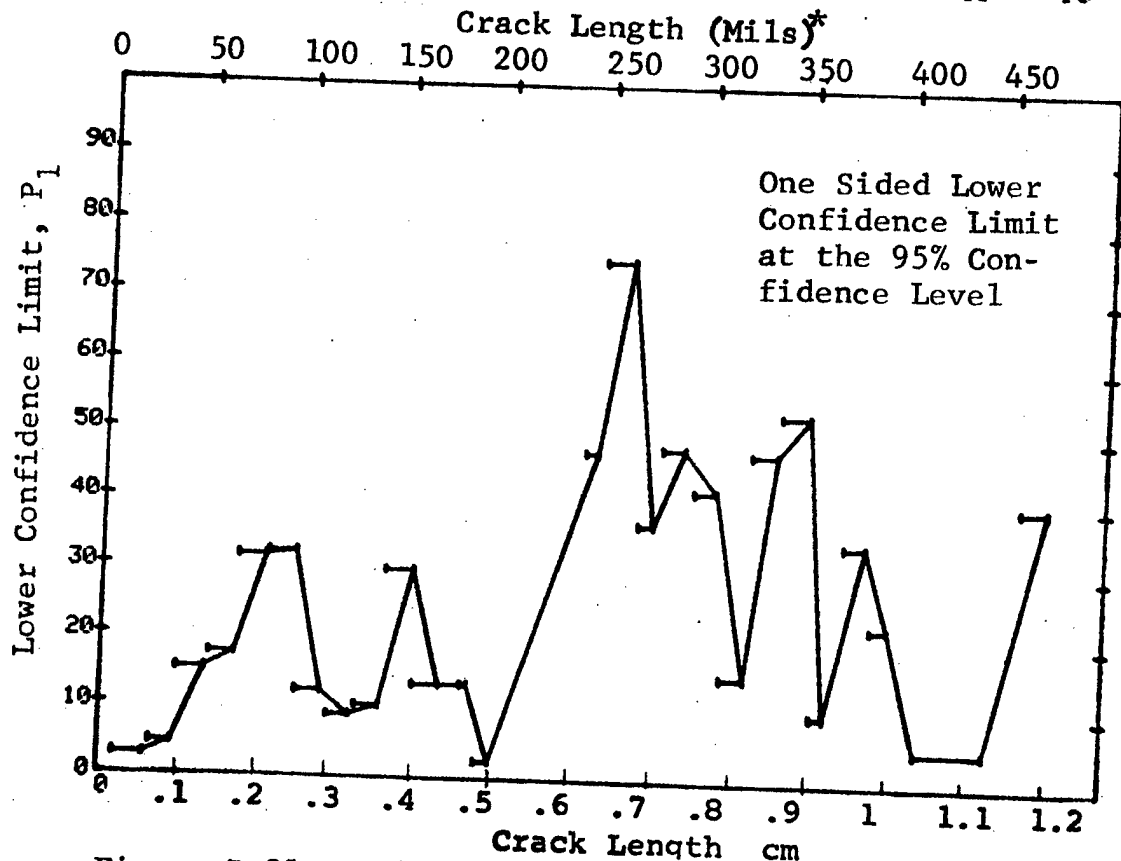


Figure D-31 Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates Measured by Operator F. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

23-JUL-75		RADIOGRAPHY		N	TEST 2, (31)		ROCKWELL SC		P MISS
RANGE	MIN LN	MAX LN			DET	50%	95%	0 MISS	
1	7	22	13	2	0	2	0	0	0
2	7	31	31	5	0	6	0	0	0
3	38	52	23	7	0	15	0	0	0
4	38	67	69	20	0	20	0	0	0
5	68	82	53	23	0	31	0	0	0
6	68	97	92	41	0	35	0	0	0
7	68	111	109	46	0	34	0	0	0
8	68	126	125	50	0	32	0	0	0
9	68	141	145	55	0	31	0	0	0
10	68	157	160	63	0	32	0	0	0
11	143	171	18	10	0	34	0	0	0
12	143	185	21	12	0	37	0	0	0
13	143	197	23	13	0	37	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	241	247	4	4	0	47	0	0	0
17	241	262	21	20	0	79	0	0	0
18	241	275	24	23	0	81	22	37	0
19	241	290	31	29	0	81	30	45	0
20	241	306	37	34	0	80	39	52	0
21	241	322	47	38	0	68	0	0	0
22	241	336	59	47	0	69	0	0	0
23	241	352	70	56	0	70	0	0	0
24	241	362	74	58	0	69	0	0	0
25	241	381	79	62	0	69	0	0	0
26	241	393	81	64	0	70	0	0	0
27	241	408	82	65	0	70	0	0	0
28	241	426	83	65	0	69	0	0	0
29	241	442	84	66	0	69	0	0	0
30	241	444	85	66	0	68	0	0	0
31	241	472	93	72	0	69	0	0	0
32	474	979	59	51	0	76	0	0	0

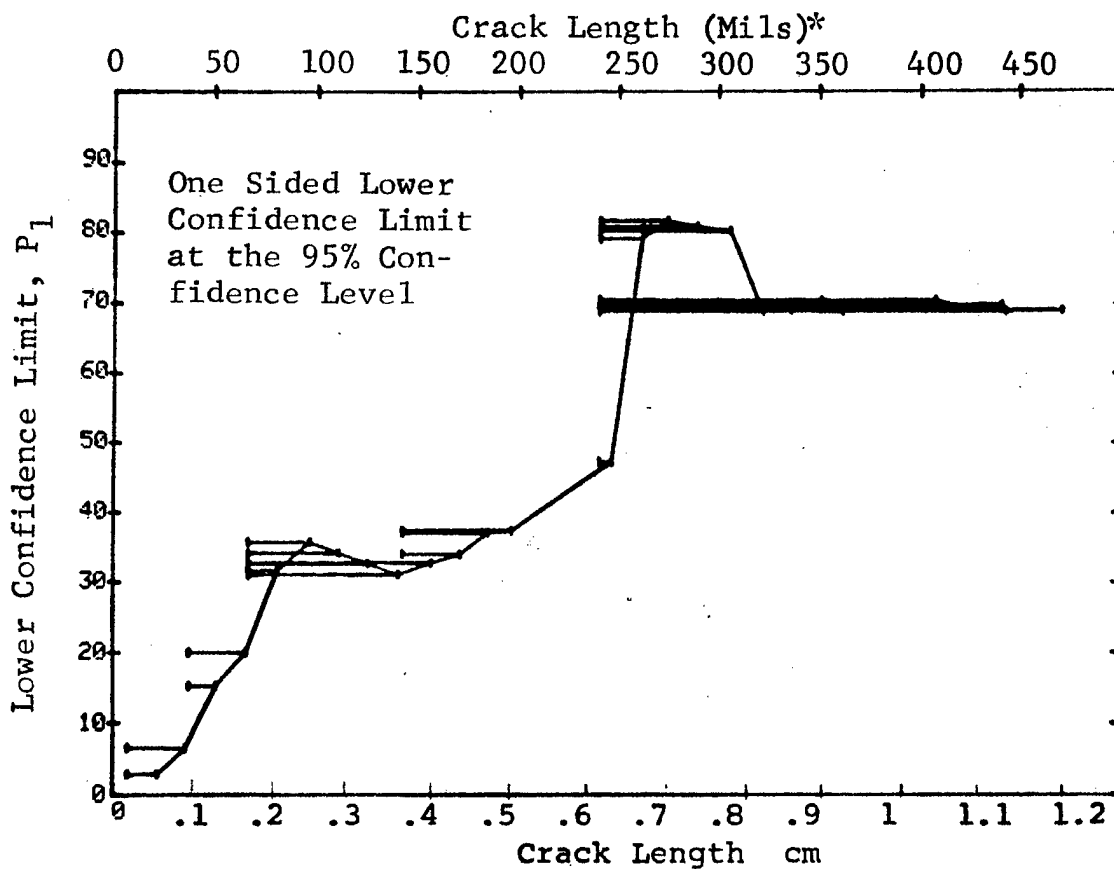


Figure D-31 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

23-JUL-75		RADIOGRAPHY		N	TEST 3, (31)		ROCKWELL SC		F
RANGE	MIN LN	* MAX LN	*		DET	50%	95%	0 MISS	
1	0	0		0	0	0	0	0	0
2	0	0		0	0	0	0	0	0
3	0	0		0	0	0	0	0	0
4	0	0		0	0	0	0	0	0
5	0	0		0	0	0	0	0	0
6	0	0		0	0	0	0	0	0
7	0	0		0	0	0	0	0	0
8	0	0		0	0	0	0	0	0
9	0	0		0	0	0	0	0	0
10	0	0		0	0	0	0	0	0
11	0	0		0	0	0	0	0	0
12	0	0		0	0	0	0	0	0
13	0	0		0	0	0	0	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	0	0		0	0	0	0	0	0
17	0	0		0	0	0	0	0	0
18	0	0		0	0	0	0	0	0
19	0	0		0	0	0	0	0	0
20	0	0		0	0	0	0	0	0
21	7	49		52	11	0	0	0	0
22	31	63		60	16	0	0	0	0
23	51	70		60	19	0	0	0	0
24	64	79		60	21	0	0	0	0
25	70	87		60	29	0	0	0	0
26	79	105		60	26	0	0	0	0
27	88	131		60	19	0	0	0	0
28	105	162		60	21	0	0	0	0
29	132	275		60	38	0	0	0	0
30	171	330		60	47	0	0	0	0
31	279	442		60	43	0	0	0	0
32	331	500		60	47	0	0	0	0

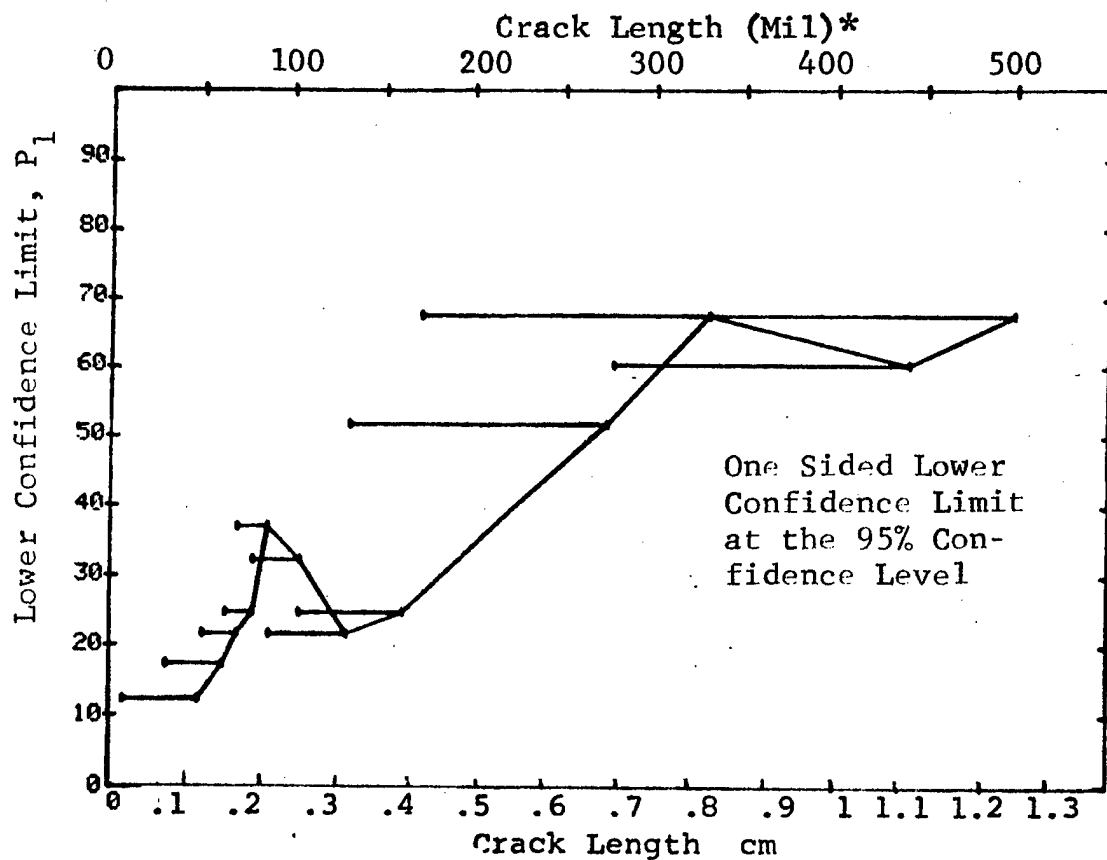


Figure D-31 (Concluded)

(a) Range Interval Method of Data Cumulation

18-SEP-75		RADIOGRAPHY		N	P-1, (32)		G	0 MISS	1 MISS
RANGE	MIN LN	MAX LN		DET	50%	95%			
1	10	41	37	5	12	5	0	0	0
2	42	72	80	24	29	21	0	0	0
3	73	103	84	40	47	38	0	0	0
4	104	134	35	6	16	7	0	0	0
5	135	162	26	12	44	29	0	0	0
6	171	185	4	3	61	24	0	0	0
7	197	197	1	1	50	5	0	0	0
8	241	258	16	16	95	82	13	30	0
9	259	288	13	12	87	68	0	0	0
10	290	318	14	11	74	53	0	0	0
11	321	347	22	15	65	48	0	0	0
12	352	381	11	8	67	43	0	0	0
13	384	408	3	3	79	36	0	0	0
14	426	444	3	0	0	0	0	0	0
15	458	475	11	7	58	34	0	0	0
16	478	506	22	17	74	58	0	0	0
17	508	535	25	21	81	66	0	0	0
18	538	568	6	6	89	60	0	0	0
19	0	0	0	0	0	0	0	0	0
20	610	610	1	1	50	5	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	710	710	1	1	50	5	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	979	979	1	1	50	5	0	0	0

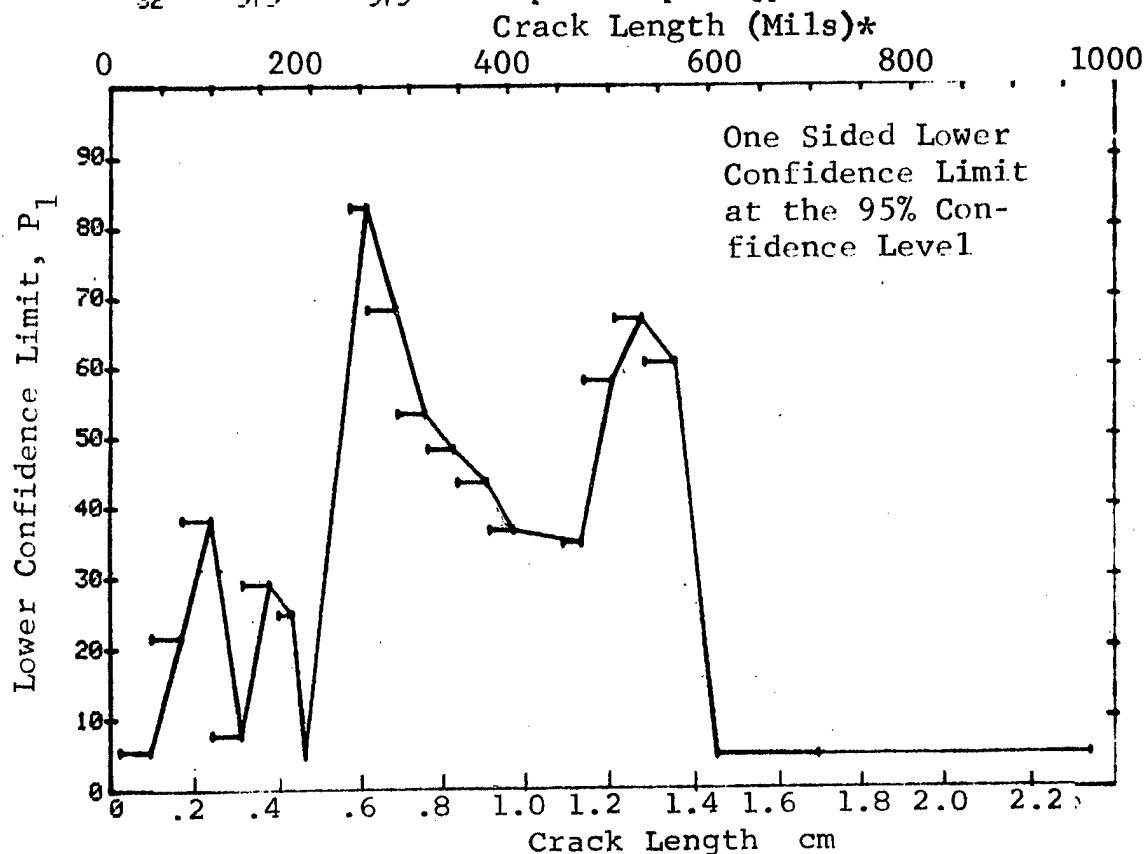


Figure D-32 Probability of Detection for 2219-T87 Al Using X-ray. Etched Fatigue Cracks in Flat Plates Measured by Operator G. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

18-SEP-75		RADIOGRAPHY		N	P-2, (32)		95%	90%	80%
RANGE	MIN	LN *	MAX LN *		OCT	50%			
1		10	41	37	5	0	5	0	0
2		42	72	80	24	0	21	0	0
3		73	103	84	40	0	38	0	0
4		73	134	119	46	0	31	0	0
5		73	162	145	58	0	33	0	0
6		73	185	149	61	0	34	0	0
7		135	197	31	16	0	35	0	0
8		197	258	17	17	0	83	12	0
9		197	288	30	29	0	85	4	0
10		197	318	44	40	0	80	4	0
11		197	347	66	55	0	73	0	0
12		197	381	77	63	0	73	0	0
13		197	408	80	66	0	74	0	0
14		197	444	83	66	0	70	0	0
15		171	475	98	76	0	69	0	0
16		171	506	120	93	0	70	0	0
17		197	535	141	111	0	72	0	0
18		197	568	147	117	0	73	0	0
19		0	0	0	0	0	0	0	0
20		508	610	32	28	0	73	0	0
21		0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0
23		508	710	33	29	0	74	0	0
24		0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0
32		508	979	34	30	0	75	0	0

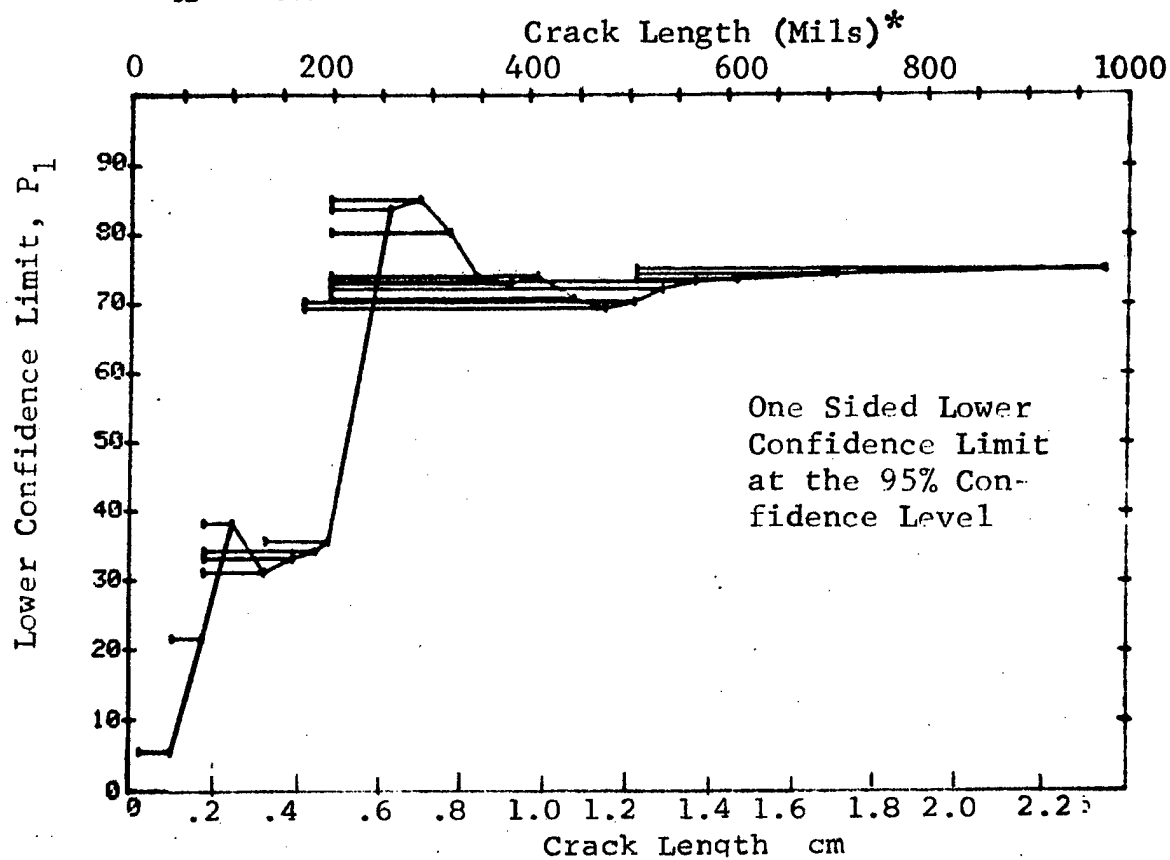


Figure D-32 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

18-SEP-75	RADIOGRAPHY			N	P-3 (32)		G	0.01	0.05
RANGE	MIN LN	* MAX LN	*		DET	50%			
1	0	0	*	0	0	0	0	0	0
2	0	0		0	0	0	0	0	0
3	0	0		0	0	0	0	0	0
4	0	0		0	0	0	0	0	0
5	0	0		0	0	0	0	0	0
6	0	0		0	0	0	0	0	0
7	0	0		0	0	0	0	0	0
8	0	0		0	0	0	0	0	0
9	0	0		0	0	0	0	0	0
10	0	0		0	0	0	0	0	0
11	0	0		0	0	0	0	0	0
12	0	0		0	0	0	0	0	0
13	0	0		0	0	0	0	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	0	0		0	0	0	0	0	0
17	0	0		0	0	0	0	0	0
18	0	0		0	0	0	0	0	0
19	0	0		0	0	0	0	0	0
20	10	49		51	7	12	6	0	0
21	30	63		60	17	27	18	0	0
22	51	70		60	21	34	24	0	0
23	63	79		60	18	29	20	0	0
24	70	87		60	27	44	33	0	0
25	79	103		60	32	52	41	0	0
26	88	130		60	18	29	20	0	0
27	104	158		60	17	27	18	0	0
28	131	275		60	42	69	56	0	0
29	162	333		60	52	85	71	0	0
30	279	458		60	41	67	57	0	0
31	334	506		60	41	67	57	0	0
32	459	550		60	49	80	71	0	0

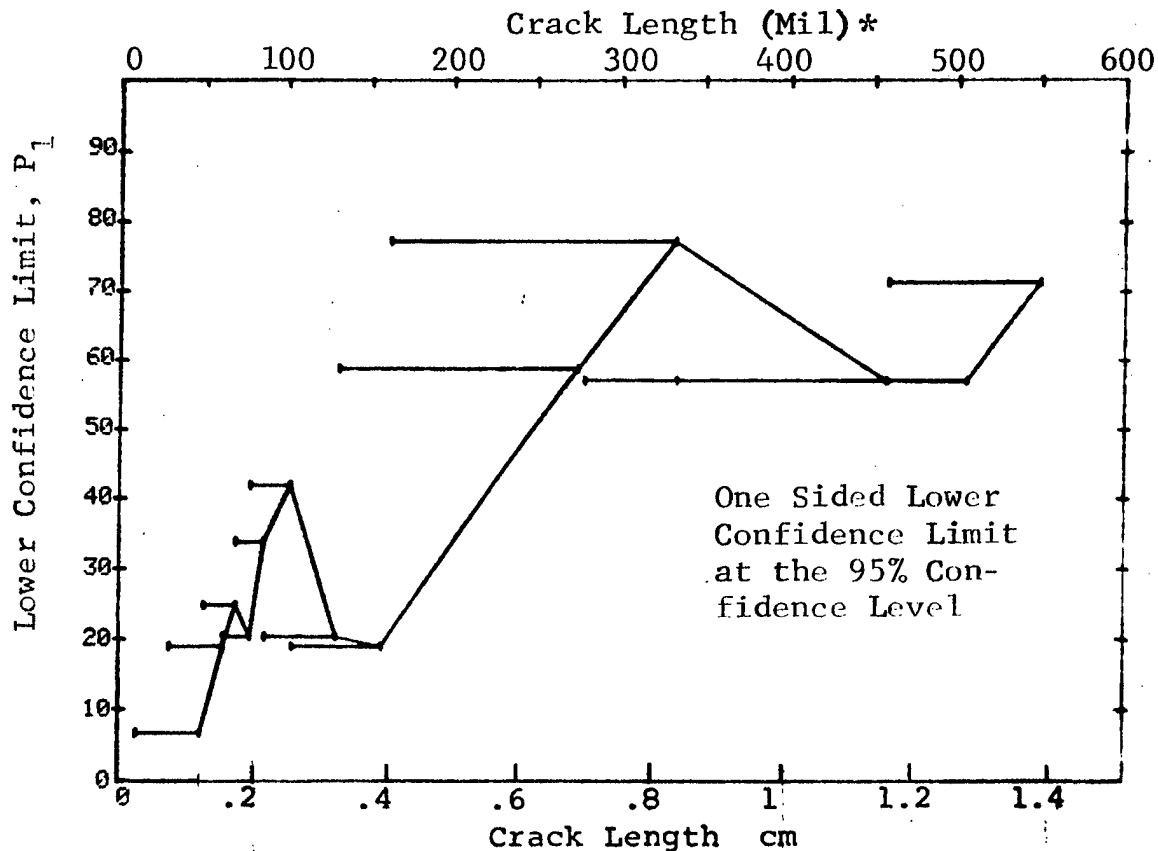


Figure D-32 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75				TEST 1, MERGE, ROCKWELL SC (33)					
RANGE	MIN LN	ULTRASONIC * MAX LN *	N	DET	50%	95%	0 MISS	1 MISS	
1	7	22	65	21	31	22	0	0	
2	25	36	90	61	67	58	0	0	
3	38	52	115	91	78	71	0	0	
4	54	67	231	188	81	76	0	0	
5	68	82	265	232	87	83	0	0	
6	83	97	195	170	86	82	0	0	
7	98	111	85	74	86	79	94	100	
8	115	126	85	73	91	85	44	57	
9	129	141	95	85	88	82	72	94	
10	143	157	75	64	84	76	100	100	
11	158	171	15	13	82	63	0	0	
12	182	185	15	14	89	72	0	0	
13	190	197	10	9	83	60	0	0	
14	207	207	1	1	50	5	0	0	
15	0	0	0	0	0	0	0	0	
16	241	247	20	19	91	78	26	41	
17	248	262	85	85	99	96	0	0	
18	268	275	15	15	95	81	14	31	
19	279	290	34	33	95	86	12	37	
20	295	306	30	29	94	85	16	31	
21	310	322	50	48	94	87	11	26	
22	323	336	60	58	95	89	1	16	
23	338	352	55	49	87	79	61	74	
24	356	362	20	20	96	86	9	26	
25	370	381	25	22	85	71	0	0	
26	384	393	10	10	93	74	0	0	
27	408	408	5	4	68	34	0	0	
28	426	426	5	5	87	54	0	0	
29	442	442	5	5	87	54	0	0	
30	444	450	6	6	89	60	0	0	
31	456	472	38	38	98	92	0	8	
32	474	979	295	295	96	94	0	0	

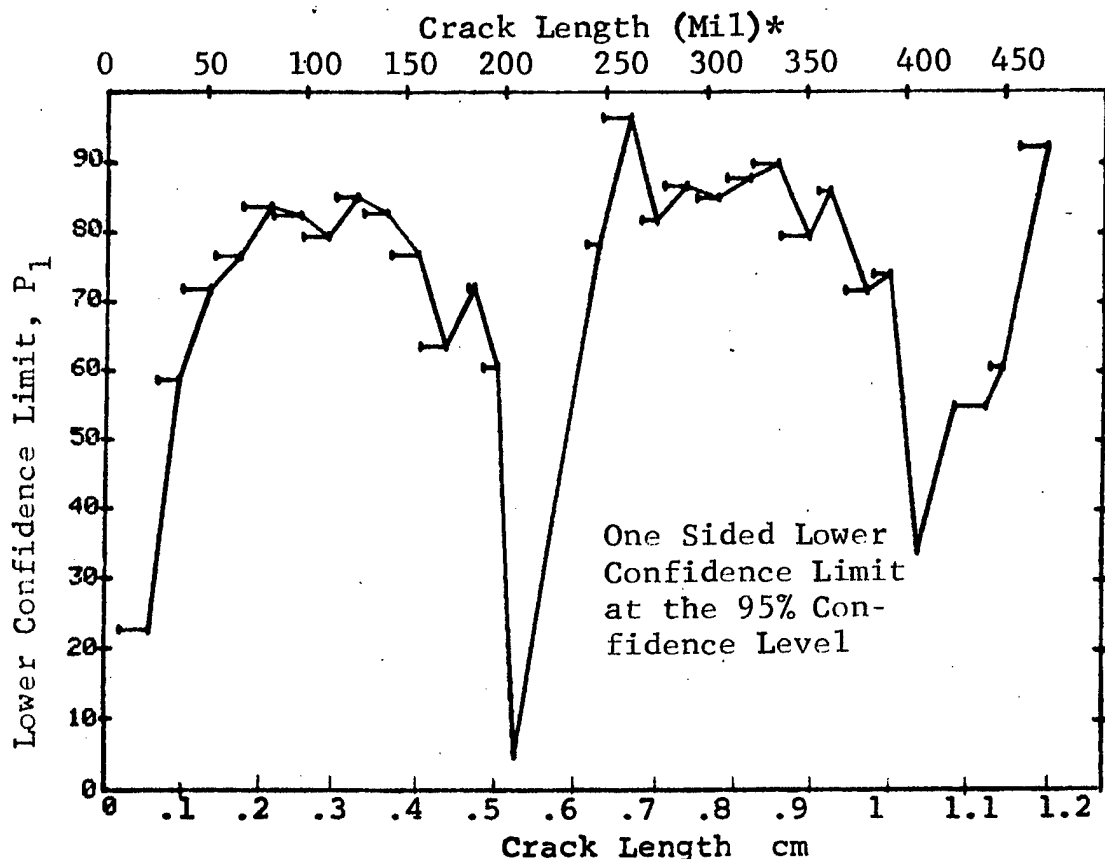


Figure D-33 Probability of Detection for 2219-T87 Al Using Ultrasonics. Etched Fatigue Cracks in Flat Plates Merged for 5 Operators. Lab. Env. D-99

(b) Optimum Probability Method of Data Cumulation

24-JUL-75		ULTRASONIC		TEST 2, MERGE, ROCKWELL SC (33)	
RANGE	MIN LN	* MAX LN *	N	DET	50% 95% 0 MISS 1 MISS
1	7	22	65	21	0 22 0 0
2	25	36x	90	61	0 52 0 0
3	38	52	115	91	0 71 0 0
4	54	67	231	188	0 76 0 0
5	68	82	265	232	0 83 0 0
6	68	97	460	402	0 84 0 0
7	68	111	545	476	0 84 0 0
8	68	126	630	554	0 85 0 0
9	115	141	180	163	0 86 0 0
10	68	157	800	703	0 85 0 0
11	68	171	815	716	0 85 0 0
12	68	185	830	730	0 85 0 0
13	68	197	840	739	0 85 0 0
14	68	207	841	740	0 85 0 0
15	0	0	0	0	0 0 0 0
16	115	247	316	283	0 86 0 0
17	248	262	85	85	0 96 0 0
18	248	275	100	100	0 97 0 0
19	248	290	134	133	0 96 0 0
20	248	306	164	162	0 96 0 0
21	248	322	214	210	0 95 0 0
22	248	336	274	268	0 95 0 0
23	207	352	350	337	0 94 0 0
24	248	362	349	337	0 94 0 0
25	207	381	395	379	0 93 0 0
26	207	393	405	389	0 94 0 0
27	207	408	410	393	0 93 0 0
28	207	426	415	398	0 93 0 0
29	207	442	420	403	0 93 0 0
30	207	450	425	409	0 94 0 0
31	426	472	54	54	0 94 0 0
32	426	979	349	339	0 95 0 0

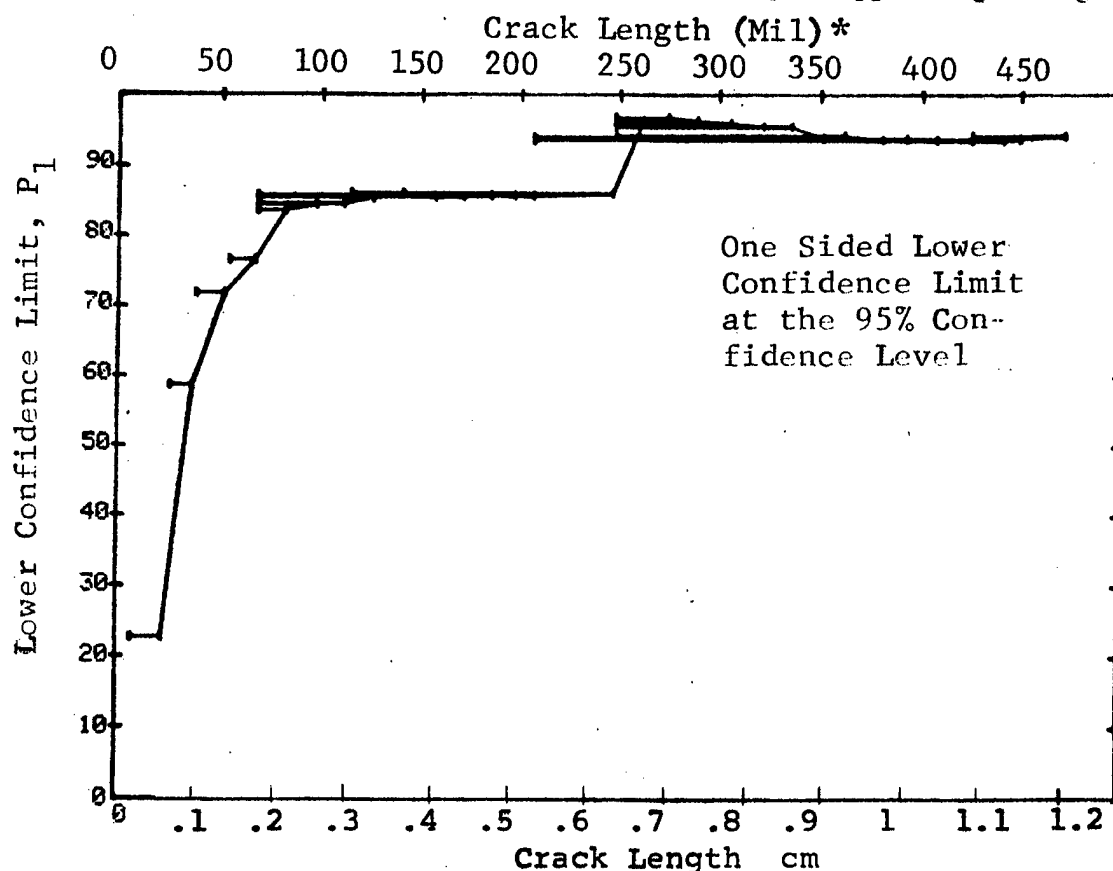


Figure D-33 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75 ULTRASONIC				TEST 3. MERGE. ROCKWELL SC (33)				
RANGE	MIN LN	95%*	MAX LN	N	DFT	50%	95%	0 MISS
1	95	100	60	51	83	75	94	100
2	97	105	60	52	85	77	82	94
3	100	109	60	54	88	81	56	69
4	105	118	60	55	90	83	43	56
5	109	123	60	55	90	83	43	56
6	118	126	60	54	88	81	56	69
7	123	131	60	53	87	79	69	82
8	126	135	60	53	87	79	69	82
9	131	140	60	54	88	81	56	69
10	135	144	60	51	83	75	94	100
11	140	151	60	50	82	73	0	0
12	144	162	60	53	87	79	69	82
13	151	197	60	56	92	85	29	43
14	162	249	60	57	93	87	16	29
15	197	257	60	58	95	89	1	16
16	249	260	60	60	98	95	0	0
17	257	275	60	60	98	95	0	0
18	260	290	60	59	97	92	0	1
19	275	304	60	59	97	92	0	1
20	290	313	60	58	95	89	1	16
21	304	323	60	57	93	87	16	29
22	313	330	60	59	97	92	0	1
23	323	338	60	57	93	87	16	29
24	330	342	60	53	87	79	69	82
25	338	362	60	55	90	83	43	56
26	342	372	60	56	92	85	29	43
27	362	442	60	56	92	85	29	43
28	372	466	60	59	97	92	0	1
29	442	475	60	59	97	92	0	1
30	466	484	60	59	97	92	0	1
31	478	495	60	58	95	89	1	16
32	489	500	60	56	92	85	29	43

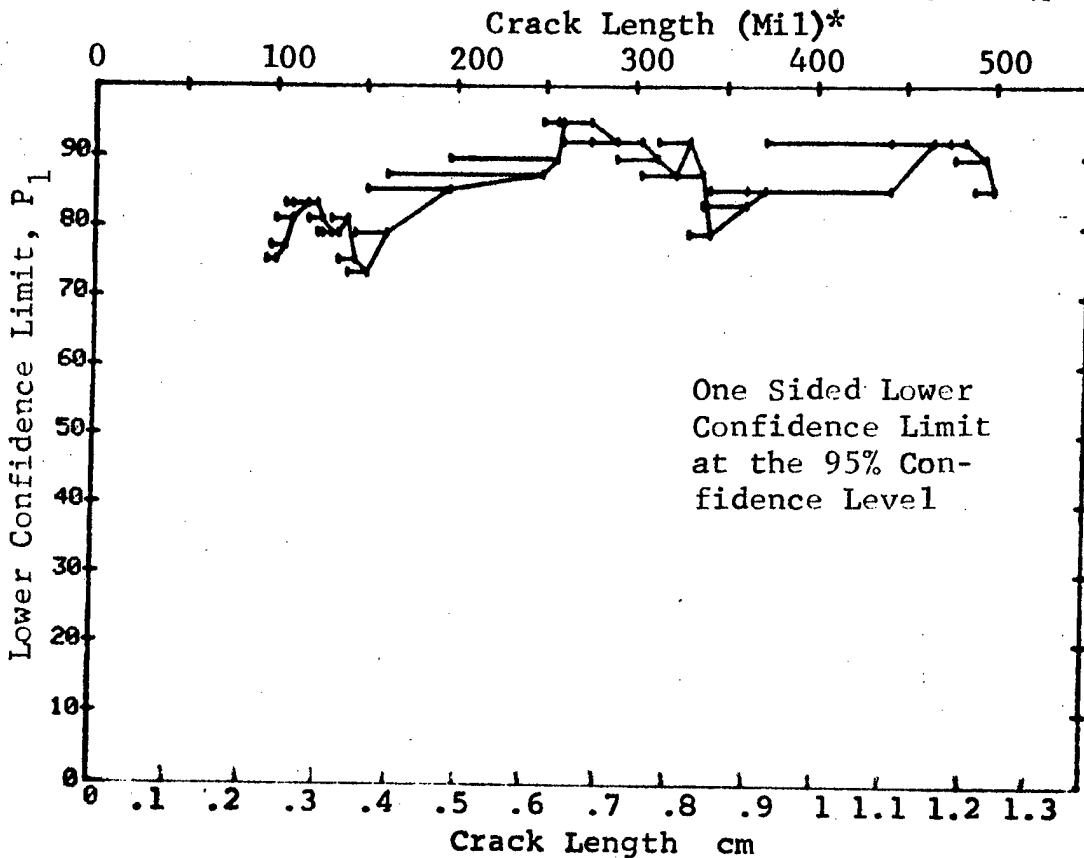


Figure D-33 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75			ULTRASONIC			N	TEST 3, MERGE, ROCKWELLSC (33)				
RANGE	MIN	LN	MAX	LN	*		DET	50%	95%	0 MISS	1 MISS
1		55	*	60	*	60	46	75	65	0	0
2		58		62		60	53	87	79	69	82
3		60		63		60	52	85	77	82	94
4		62		64		60	49	80	71	0	0
5		63		66		60	48	79	69	0	0
6		65		67		60	51	83	75	94	100
7		66		69		60	52	85	77	82	94
8		67		69		60	47	77	67	0	0
9		69		72		60	48	79	69	0	0
10		70		74		60	55	90	83	43	56
11		72		76		60	52	85	77	82	94
12		75		77		60	50	82	73	0	0
13		76		79		60	56	92	85	29	43
14		78		80		60	57	93	87	16	29
15		79		82		60	54	88	81	56	69
16		80		84		60	53	87	79	69	82
17		83		85		60	51	83	75	94	100
18		84		87		60	52	85	77	82	94
19		86		90		60	51	83	75	94	100
20		87		94		60	52	85	77	82	94
21		91		96		60	55	90	83	43	56
22		95		98		60	51	83	75	94	100
23		97		104		60	51	83	75	94	100
24	100			108		60	54	88	81	56	69
25	105			117		60	55	90	83	43	56
26	109			123		60	54	88	81	56	69
27	118			125		60	55	90	83	43	56
28	123			131		60	53	87	79	69	82
29	126			135		60	52	85	77	82	94
30	131			140		60	54	88	81	56	69
31	135			144		60	51	83	75	94	100
32	140			150		60	50	82	73	0	0

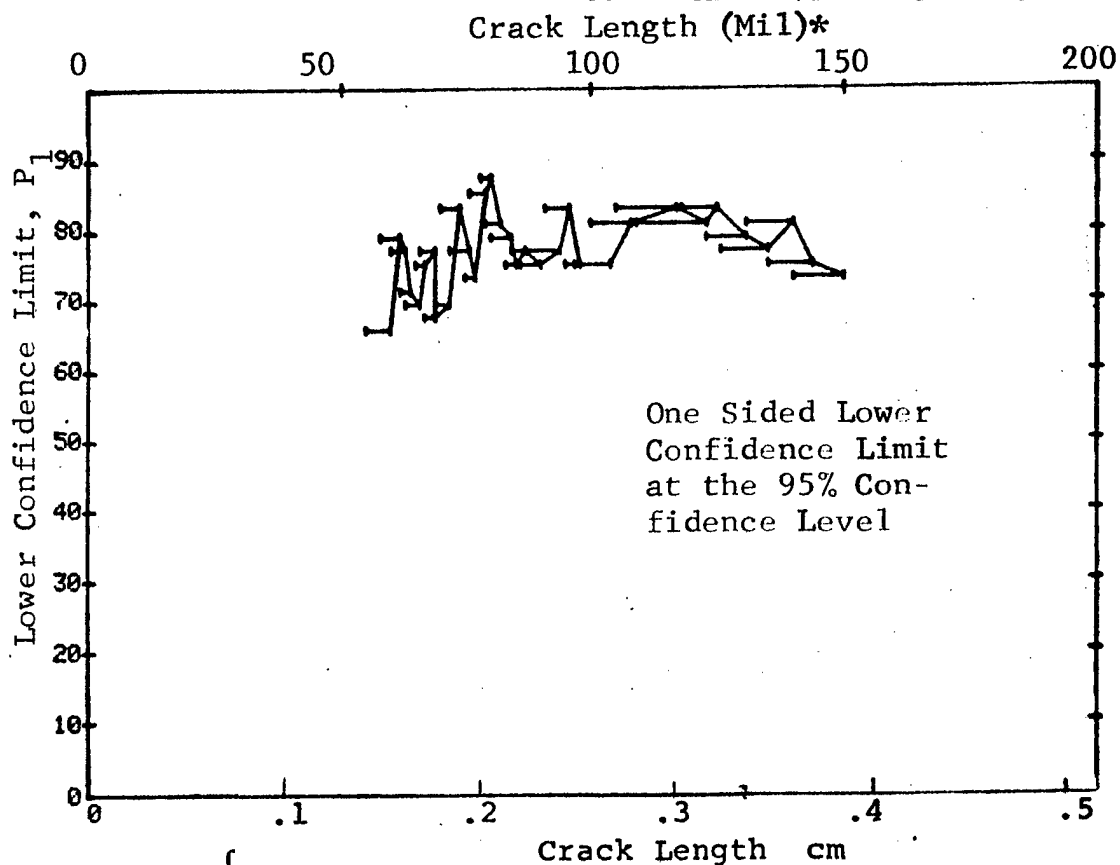


Figure D-33 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75			ULTRASONIC			TEST 3, MERGE, ROCKWELL SC (33)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS		
1	7	21	51	11	20	12	0	0		
2	15	26	60	26	42	32	0	0		
3	21	31	60	41	67	57	0	0		
4	26	35	60	40	65	55	0	0		
5	31	41	60	39	64	53	0	0		
6	35	45	60	42	69	58	0	0		
7	41	47	60	52	85	77	82	94		
8	45	51	60	51	83	75	94	100		
9	47	55	60	44	72	62	0	0		
10	51	58	60	45	74	64	0	0		
11	55	60	60	49	80	71	0	0		
12	59	62	60	52	85	77	82	94		
13	61	63	60	52	85	77	82	94		
14	62	65	60	49	80	71	0	0		
15	64	66	60	46	75	65	0	0		
16	65	67	60	50	82	73	0	0		
17	67	69	60	53	87	79	69	82		
18	68	70	60	49	80	71	0	0		
19	69	72	60	49	80	71	0	0		
20	70	75	60	54	88	81	56	69		
21	73	76	60	50	82	73	0	0		
22	75	78	60	51	83	75	94	100		
23	76	79	60	58	95	89	1	16		
24	78	80	60	56	92	85	29	43		
25	79	83	60	54	88	81	56	69		
26	81	84	60	51	83	75	94	100		
27	83	86	60	51	83	75	94	100		
28	85	87	60	55	90	83	43	56		
29	86	91	60	51	83	75	94	100		
30	90	95	60	51	83	75	94	100		
31	91	97	60	53	87	79	69	82		
32	95	100	60	51	83	75	94	100		

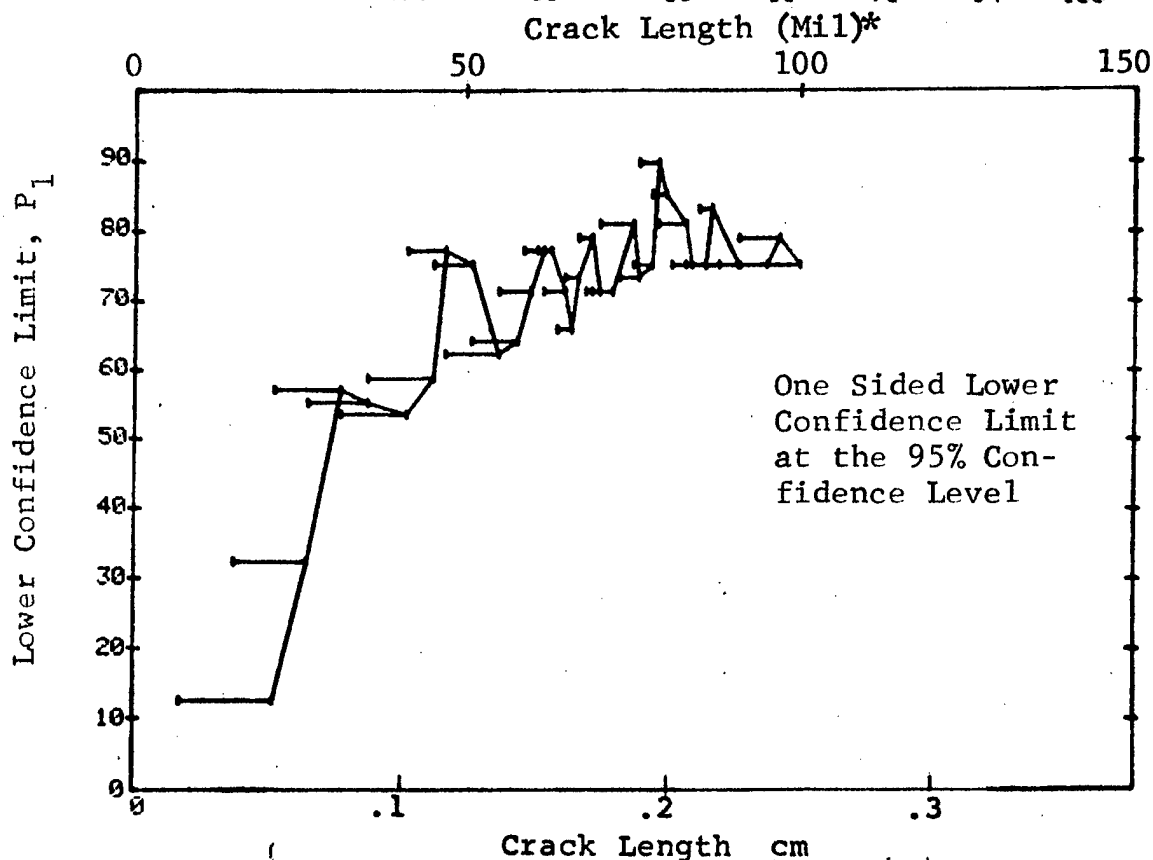


Figure D-33 (Concluded)

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

(a) Range Interval Method of Data Cumulation

22-JUL-75		PENETRANT		H	MERGE PENETRANT		ROCKWELL C		(34)
RANGE	MIN LN	MAX LN			DET	50%	95%	0 MISS	
1	7	22	*	65	13	19	12	0	0
2	25	38		115	46	50	41	0	0
3	38	52		115	78	67	59	0	0
4	54	67		230	171	74	69	0	0
5	68	82		266	219	82	78	0	0
6	83	97		193	172	88	84	0	0
7	98	111		85	80	93	88	18	31
8	115	126		85	75	87	80	82	94
9	129	141		95	87	90	85	47	59
10	143	157		75	66	87	79	79	92
11	158	171		15	15	95	81	14	31
12	182	185		15	15	95	81	14	31
13	190	197		10	7	64	39	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	241	247		20	20	96	86	9	26
17	248	262		85	85	99	96	0	0
18	268	275		15	15	95	81	14	31
19	279	290		35	35	98	91	0	0
20	295	306		30	29	94	85	16	31
21	310	322		50	49	96	90	0	0
22	323	336		60	58	95	89	1	31
23	338	352		55	50	89	81	48	21
24	356	362		20	20	95	86	3	20
25	370	381		25	21	81	66	0	0
26	384	393		10	9	83	60	0	0
27	408	408		5	5	87	54	0	0
28	426	426		5	5	87	54	0	0
29	442	442		5	4	88	54	0	0
30	444	444		5	5	87	54	0	0
31	458	472		40	38	93	86	21	36
32	474	5009		297	290	97	95	0	0

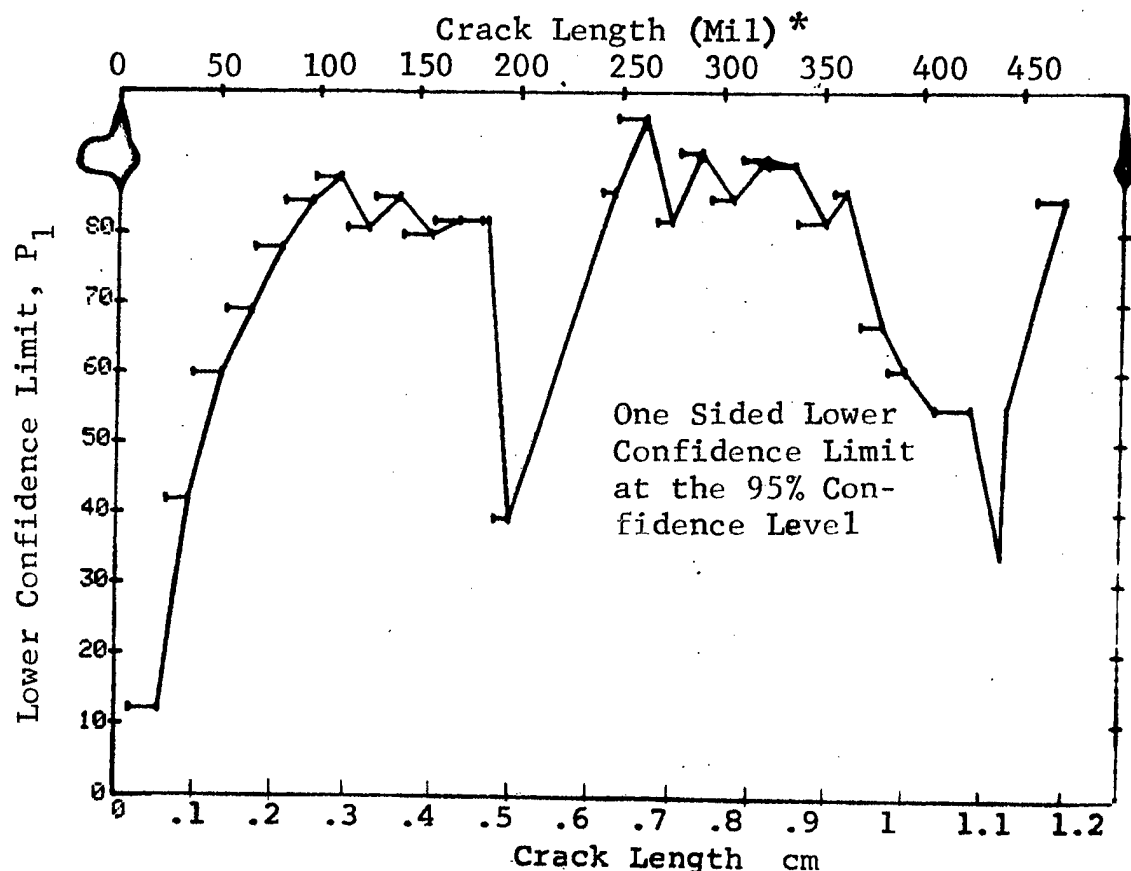


Figure D-34 Probability of Detection for 2219-T87 Al Using Liquid Penetrant. Etched Fatigue Cracks in Lab. Env. Flat Plates Merged for 7 Operators. D-104

(b) Optimum Probability Method of Data Cumulation

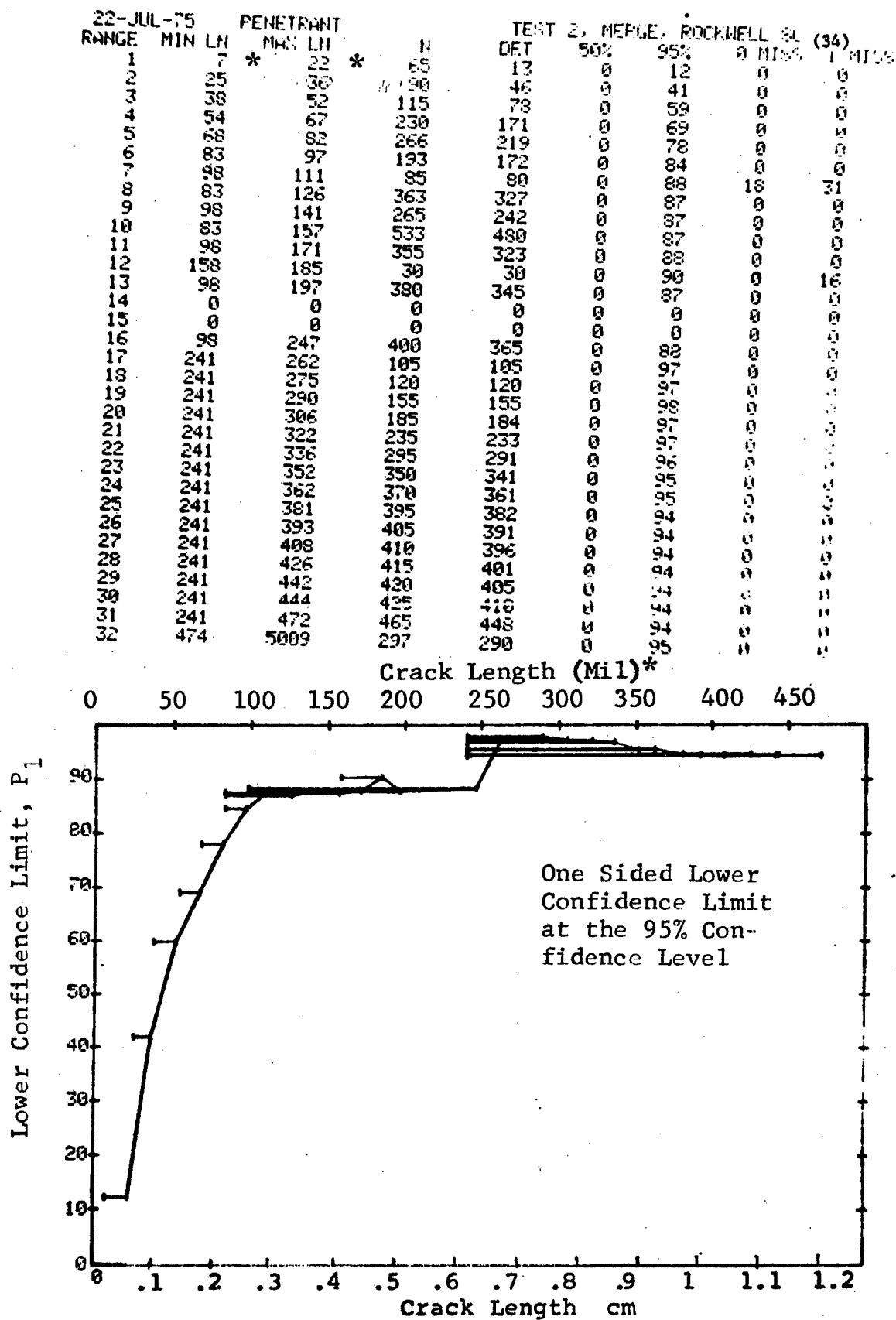


Figure D-34 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

23-JUL-75			PENETRANT		TEST 3, MERGE, ROCKWELL C (34)				
RANGE	MIN	LN	* MAX	LN *	N	DET	50%	95%	0 MISS
1	95		100		60	59	97	93	0
2	97		105		60	57	93	87	16
3	101		109		60	55	90	83	43
4	105		118		60	55	90	83	43
5	111		123		60	53	87	79	69
6	119		126		60	53	87	79	69
7	124		131		60	56	92	85	29
8	129		135		60	54	88	81	56
9	132		140		60	53	87	79	69
10	136		144		60	54	88	81	56
11	141		151		60	52	85	77	82
12	145		162		60	55	90	83	43
13	153		197		60	56	92	85	29
14	171		249		60	57	93	87	16
15	241		257		60	60	98	95	0
16	249		260		60	60	98	95	0
17	257		275		60	60	98	95	0
18	261		290		60	60	98	95	0
19	279		304		60	59	97	92	0
20	290		313		60	58	95	89	1
21	306		323		60	59	97	92	0
22	317		330		60	59	97	92	0
23	326		338		60	57	93	87	16
24	331		342		60	55	90	83	43
25	340		362		60	56	92	85	29
26	345		372		60	55	90	83	43
27	362		442		60	54	88	81	56
28	381		466		60	58	95	89	1
29	444		475		60	57	93	87	16
30	466		484		60	59	97	92	0
31	478		495		60	57	93	87	16
32	489		500		60	57	93	87	16

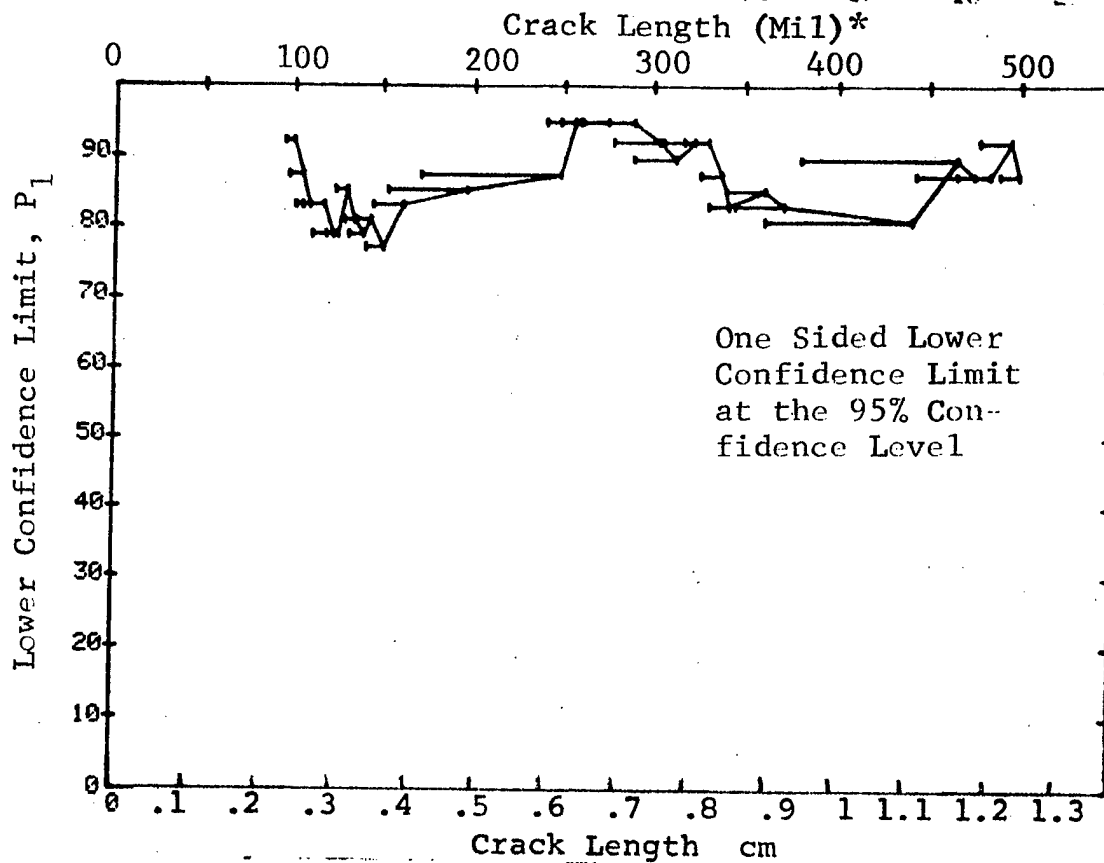


Figure D-34 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

22-JUL-75				TEST 3, MERGE, ROCKWELL SC (34)				
RANGE	MIN	LN	PENETRANT MAX LN	N	DET	50%	95%	0 MISS 1 MISS
1		62*	65*	60	45	74	64	0
2		64	67	60	44	72	62	0
3		65	68	60	46	75	65	0
4		67	69	60	46	75	65	0
5		68	70	60	39	64	53	0
6		69	73	60	43	70	60	0
7		70	75	60	55	90	83	43
8		73	77	60	57	93	87	16
9		75	78	60	56	92	85	29
10		77	80	60	54	88	81	56
11		78	81	60	47	77	67	0
12		80	83	60	47	77	67	0
13		81	85	60	46	75	65	0
14		83	86	60	47	77	67	0
15		85	89	60	55	90	83	43
16		86	92	60	56	92	85	29
17		89	95	60	57	93	87	16
18		92	97	60	58	95	89	1
19		95	102	60	59	97	93	0
20		98	106	60	56	92	85	29
21	103		115	60	55	90	83	43
22	106		119	60	55	90	83	43
23	116		124	60	52	85	77	82
24	121		129	60	54	88	81	56
25	124		134	60	56	92	85	29
26	129		136	60	53	87	79	60
27	134		143	60	53	87	79	60
28	137		146	60	55	90	83	43
29	143		153	60	53	87	79	60
30	140		162	60	55	90	83	43
31	153		242	60	56	92	85	29
32	183		250	60	57	93	87	16

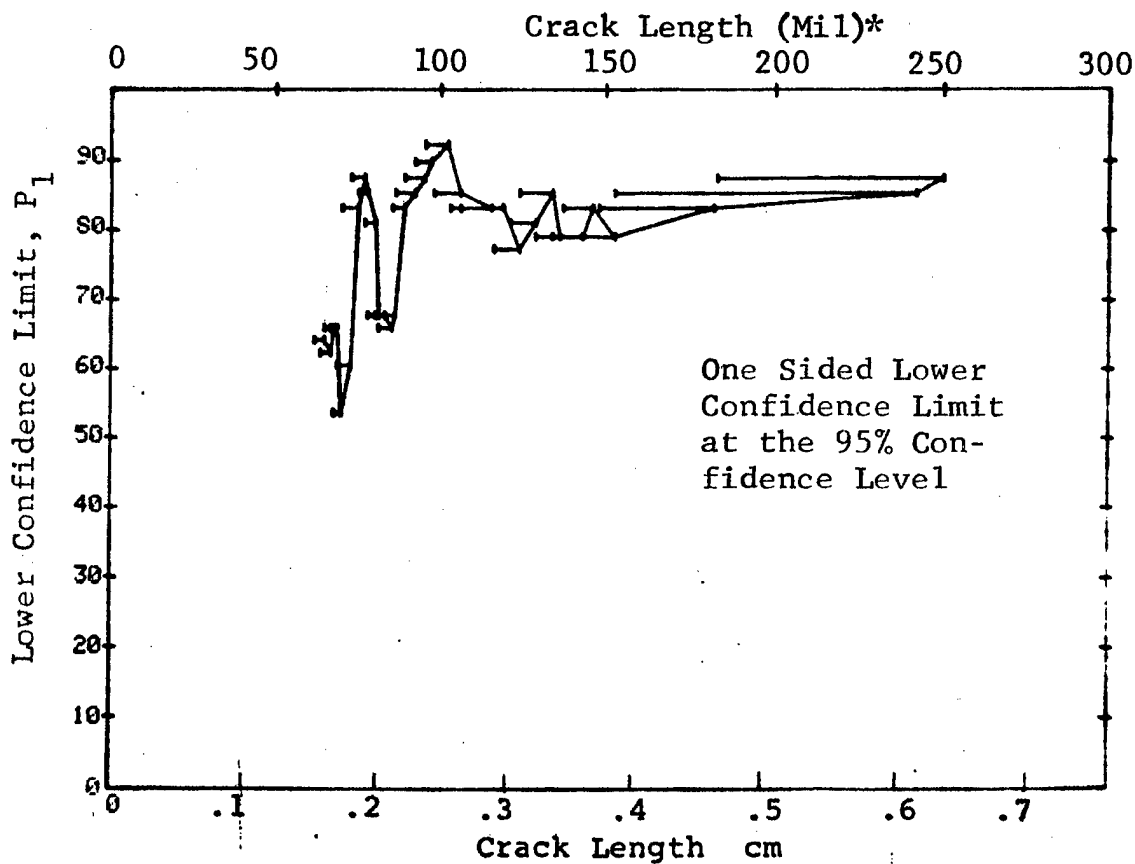


Figure D-34 (Concluded)

(a) Range Interval Method of Data Cumulation

24-JUL-75 EDDY CURRENT				TEST 1, MERGE, ROCKWELL SC (35)					
RANGE	MIN	LN	MAX LN	H	DET	50%	95%	0 MISS	1 MISS
1	7	*	22	65	8	11	6	0	0
2	25		36	90	19	20	14	0	0
3	38		52	116	42	35	28	0	0
4	54		67	234	139	-49	-49	0	0
5	68		82	262	198	75	70	0	0
6	83		97	193	178	91	88	0	0
7	98		111	86	82	94	89	3	17
8	115		126	86	83	95	91	0	3
9	129		141	94	87	91	86	35	48
10	143		157	74	67	89	82	55	68
11	158		171	15	15	95	81	14	31
12	182		185	15	13	82	63	0	0
13	190		197	10	10	93	74	0	0
14	0		0	0	0	0	0	0	0
15	232		232	1	1	50	5	0	0
16	241		247	19	18	91	77	27	42
17	248		262	82	82	99	96	0	0
18	268		275	15	15	95	81	14	31
19	279		290	34	33	95	86	12	27
20	295		306	31	29	91	81	30	45
21	310		322	50	49	96	90	0	11
22	323		336	60	59	97	92	0	1
23	338		352	55	50	89	81	48	61
24	356		362	21	20	92	79	25	40
25	370		381	24	22	89	75	37	52
26	384		393	10	10	93	74	0	0
27	408		408	5	5	87	54	0	0
28	426		426	5	5	87	54	0	0
29	435		442	7	5	63	34	0	0
30	444		444	5	5	87	54	0	0
31	458		472	40	39	95	88	6	21
32	474		979	292	281	96	93	0	0

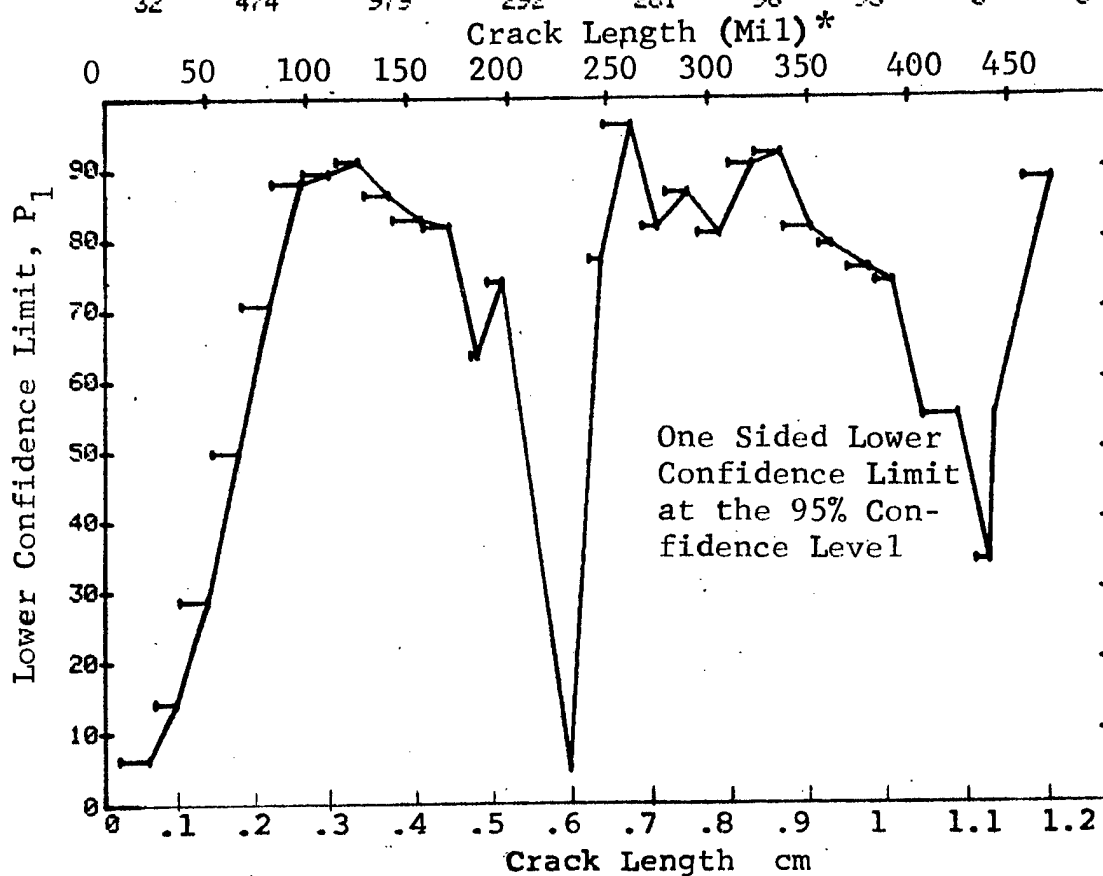


Figure D-35. Probability of Detection for 2219-T87 Al Using Eddy Current. Etched Fatigue Cracks in Flat Plates Merged for 5 Operators. D-108

Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-JUL-75 EDDY CURRENT				TEST 2, MEREGE, ROCKWELL SC (35)					
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	7 *	22 *	65	8	0	6	0	0	
2	25	36	90	19	0	14	0	0	
3	38	52	116	42	0	28	0	0	
4	25	67	440	200	0	41	0	0	
5	68	82	262	198	0	70	0	0	
6	83	97	193	178	0	88	0	0	
7	83	111	279	260	0	90	0	0	
8	98	126	172	165	0	92	0	0	
9	98	141	266	252	0	91	0	0	
10	98	157	340	319	0	91	0	0	
11	98	171	355	334	0	91	0	0	
12	98	185	370	347	0	91	0	0	
13	98	197	380	357	0	91	0	0	
14	0	0	0	0	0	0	0	0	
15	98	232	381	358	0	91	0	0	
16	98	247	400	376	0	91	0	0	
17	248	262	82	82	0	95	0	0	
18	248	275	97	97	0	96	0	0	
19	248	290	131	130	0	96	0	0	
20	190	306	192	188	0	95	0	0	
21	248	322	212	208	0	95	0	0	
22	248	336	272	267	0	96	0	0	
23	190	352	357	346	0	94	0	0	
24	190	362	378	366	0	94	0	0	
25	190	381	402	388	0	94	0	0	
26	190	393	412	398	0	94	0	0	
27	190	408	417	403	0	94	0	0	
28	190	426	422	408	0	94	0	0	
29	190	442	429	413	0	94	0	0	
30	190	444	434	418	0	94	0	0	
31	190	472	474	457	0	94	0	0	
32	190	979	766	738	0	95	0	0	

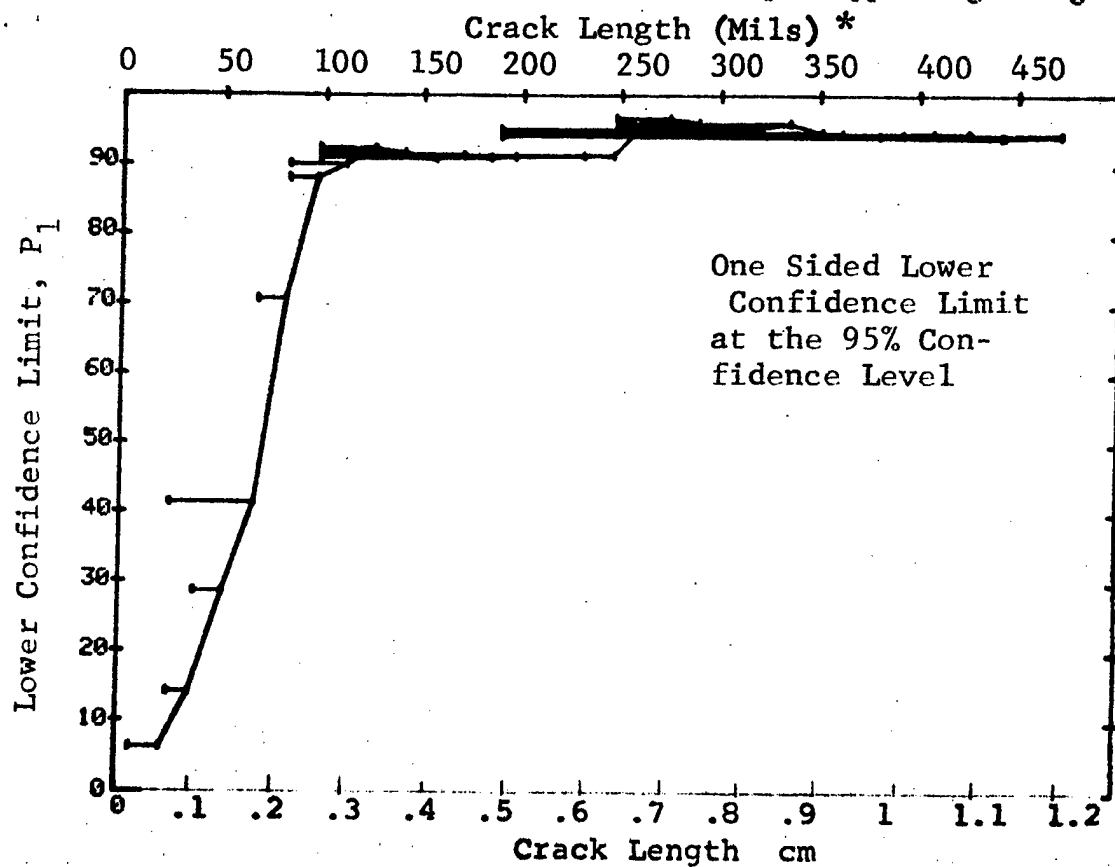


Figure D-35 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75 EDDY CURRENT				TEST 3, MERGE, POOLWELL 50 (35)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MICS	1 MICS
1	95*	100 *	60	57	93	87	16	29
2	97	105	60	57	92	87	16	29
3	100	109	60	58	95	89	1	16
4	105	118	60	57	93	87	16	29
5	109	123	60	57	93	87	16	29
6	118	126	60	59	97	92	0	1
7	123	131	60	55	90	83	43	56
8	126	135	60	55	90	83	43	56
9	131	140	60	58	95	89	1	16
10	135	144	60	53	87	79	69	82
11	140	151	60	52	85	77	82	94
12	144	162	60	58	95	89	1	16
13	151	197	60	58	95	89	1	16
14	162	249	60	57	93	87	16	29
15	197	257	60	59	97	92	0	1
16	249	261	60	60	98	95	0	0
17	257	279	60	60	98	95	0	0
18	261	290	60	59	97	92	0	1
19	279	306	60	57	93	87	16	29
20	290	317	60	58	95	89	1	16
21	306	326	60	59	97	92	0	1
22	317	331	60	59	97	92	0	1
23	326	340	60	57	93	87	16	29
24	331	345	60	54	88	81	56	69
25	340	362	60	56	92	85	29	43
26	345	381	60	57	93	87	16	29
27	362	442	60	56	92	85	29	43
28	381	466	60	57	93	87	16	29
29	444	478	60	58	95	89	1	16
30	466	494	60	56	92	85	29	43
31	478	495	60	57	93	87	16	29
32	489	500	60	57	93	87	16	29

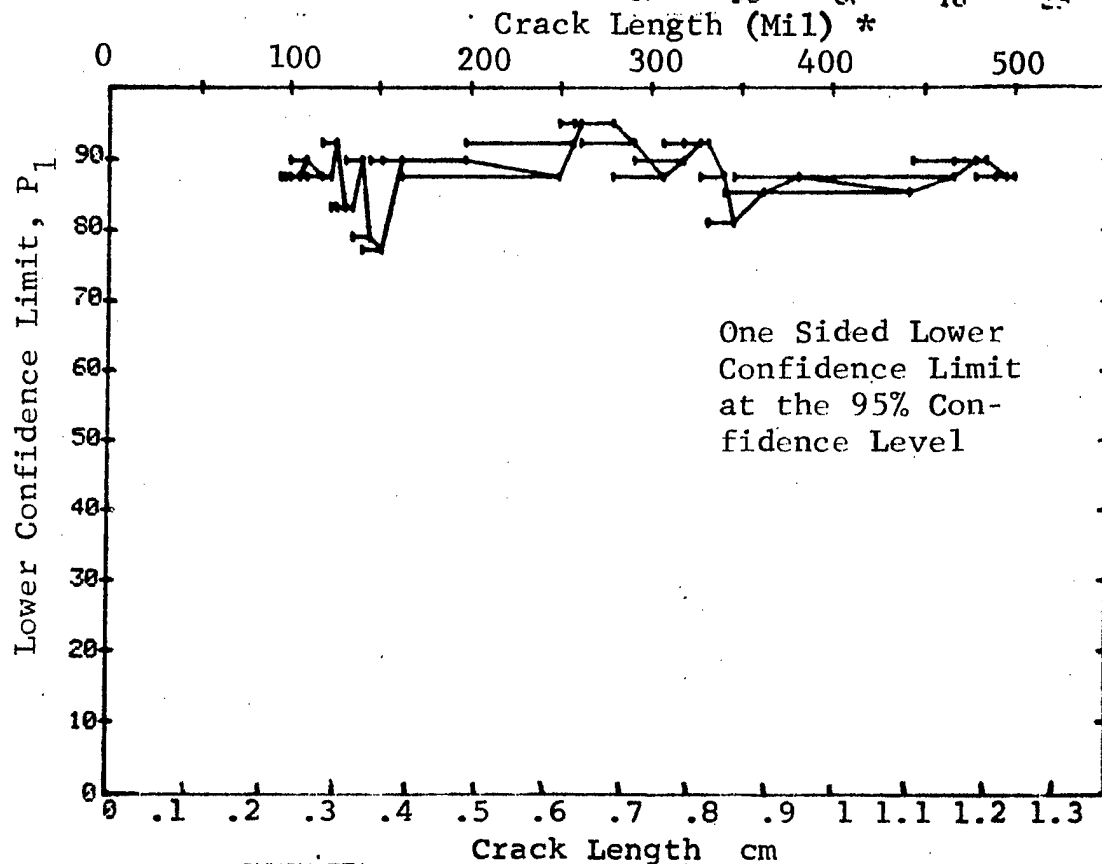


Figure D-35 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-JUL-75 EDDY CURRENT				TEST 3, MERGED, ROCKWELL SC (35)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	7	21	51	5	9	3	0	0
2	15	26	60	10	16	9	0	0
3	21	31	60	12	19	11	0	0
4	26	35	60	12	19	11	0	0
5	31	40	60	18	29	20	0	0
6	35	45	60	19	30	21	0	0
7	41	47	60	18	29	20	0	0
8	45	49	60	21	34	24	0	0
9	47	55	60	27	44	33	0	0
10	49	58	60	25	40	30	0	0
11	55	60	60	29	47	37	0	0
12	58	62	60	33	54	43	0	0
13	60	63	60	38	62	51	0	0
14	62	65	60	44	72	62	0	0
15	63	66	60	37	60	50	0	0
16	65	67	60	37	60	50	0	0
17	66	69	60	41	67	57	0	0
18	67	70	60	39	64	53	0	0
19	69	72	60	37	60	50	0	0
20	70	75	60	42	69	58	0	0
21	72	76	60	44	72	62	0	0
22	75	78	60	44	72	62	0	0
23	76	79	60	52	85	77	82	94
24	78	80	60	57	93	87	16	29
25	79	83	60	51	83	75	94	100
26	80	84	60	48	79	69	0	0
27	83	86	60	55	90	83	43	55
28	84	87	60	58	95	89	1	16
29	86	91	60	54	89	81	55	29
30	87	95	60	55	90	83	43	55
31	91	97	60	57	93	87	16	29
32	95	100	60	57	93	87	16	29

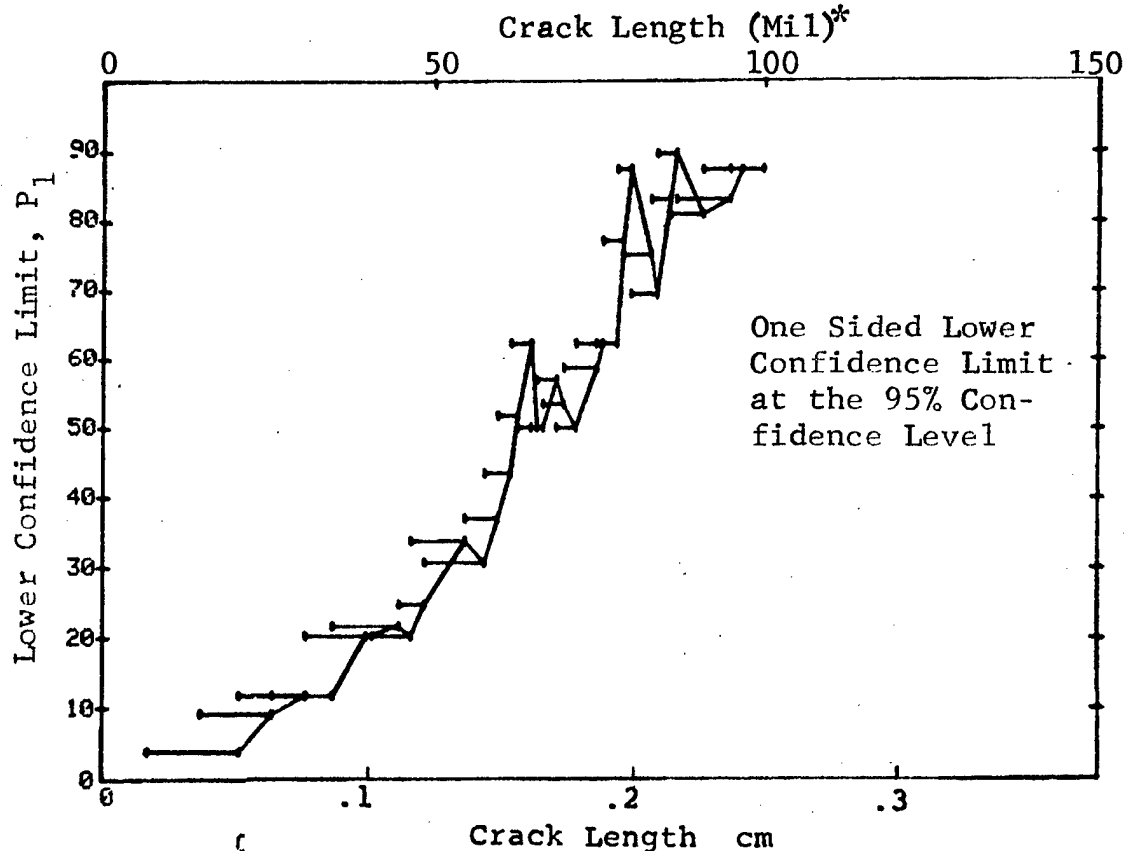


Figure D-35 (Concluded)

(a) Range Interval Method of Data Cumulation

29-JUL-75	PENETRANT		TEST 1.		(36) ROCKWELL B-1			
RANGE	MIN	LN	N	DET	50%	95%	0 MISS	1 MISS
1	31	31*	2	2	70	22	0	0
2	0	0	0	0	0	0	0	0
3	47	47	3	3	79	36	0	0
4	54	55	8	8	91	68	0	0
5	62	62	4	4	94	47	0	0
6	67	72	14	14	95	80	15	32
7	75	80	23	23	97	87	6	23
8	0	0	0	0	0	0	0	0
9	91	92	14	14	95	80	15	32
10	0	0	0	0	0	0	0	0
11	105	105	4	4	84	47	0	0
12	113	114	14	14	95	80	15	32
13	0	0	0	0	0	0	0	0
14	124	124	5	5	87	54	0	0
15	130	133	8	8	91	68	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	184	184	7	7	90	65	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	205	205	4	4	84	47	0	0
26	0	0	0	0	0	0	0	0
27	215	218	11	11	93	76	18	35
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	245	245	7	7	90	65	0	0
32	250	250	1	1	50	5	0	0

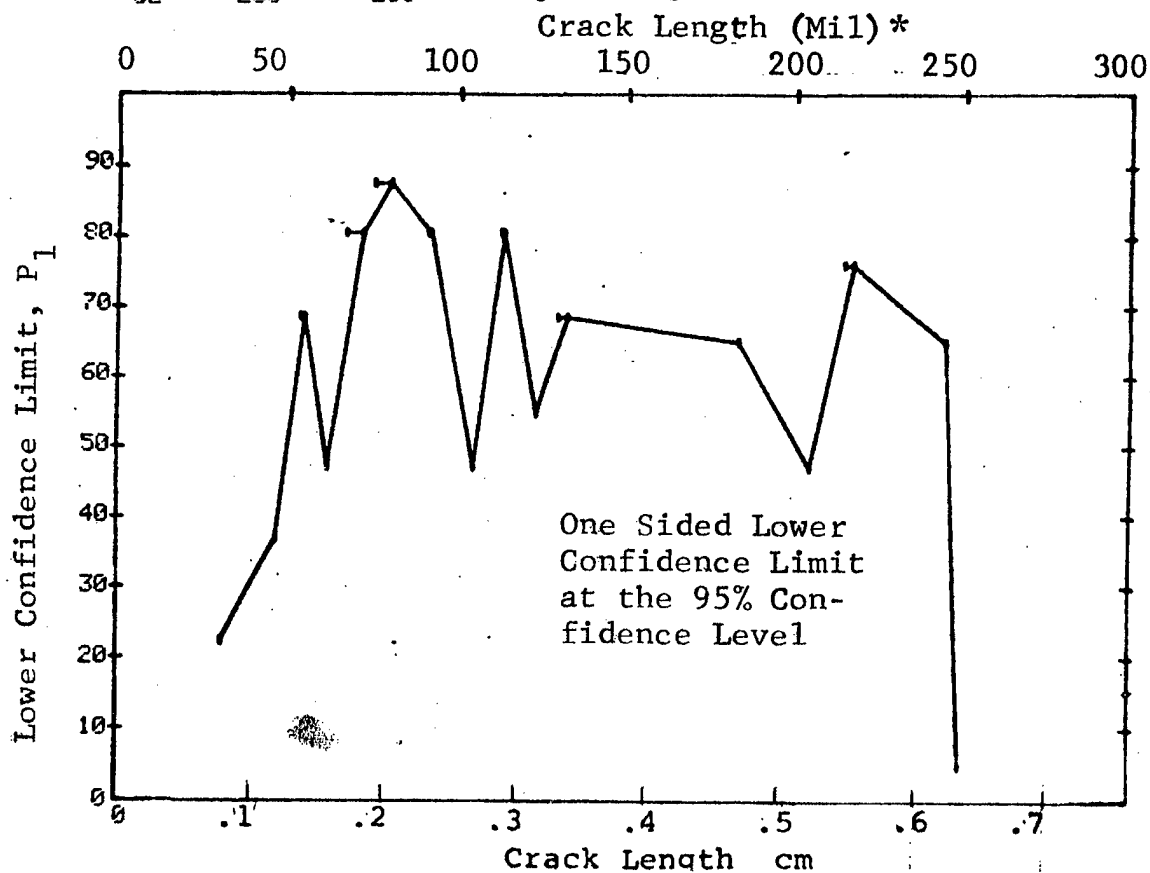


Figure D-36 Probability of Detection for Ti-6Al-4V Using Liquid Penetrant. Fatigue Cracks in Flat Plates. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

29-JUL-75		PENETRANT		N	TEST 2, (36)		ROCKWELL B-1		
RANGE	MIN	LN *	MAX LN		DET	50%	95%	0 MISS	1 MISS
1	31	31	31	2	2	0	22	0	0
2	0	0	0	0	0	0	0	0	0
3	31	47	5	5	5	0	54	0	0
4	31	55	13	13	13	0	79	0	0
5	31	62	17	17	17	0	83	12	29
6	31	72	31	31	31	0	90	0	15
7	31	80	54	54	54	0	94	0	0
8	0	0	0	0	0	0	0	0	0
9	31	92	68	68	68	0	95	0	0
10	0	0	0	0	0	0	0	0	0
11	31	105	72	72	72	0	95	0	0
12	31	114	86	86	86	0	96	0	0
13	0	0	0	0	0	0	0	0	0
14	31	124	91	91	91	0	96	0	0
15	31	133	99	99	99	0	97	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	31	184	106	106	106	0	97	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
25	31	205	110	110	110	0	97	0	0
26	0	0	0	0	0	0	0	0	0
27	31	218	121	121	121	0	97	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	31	245	128	128	128	0	97	0	0
32	31	250	129	129	129	0	97	0	0

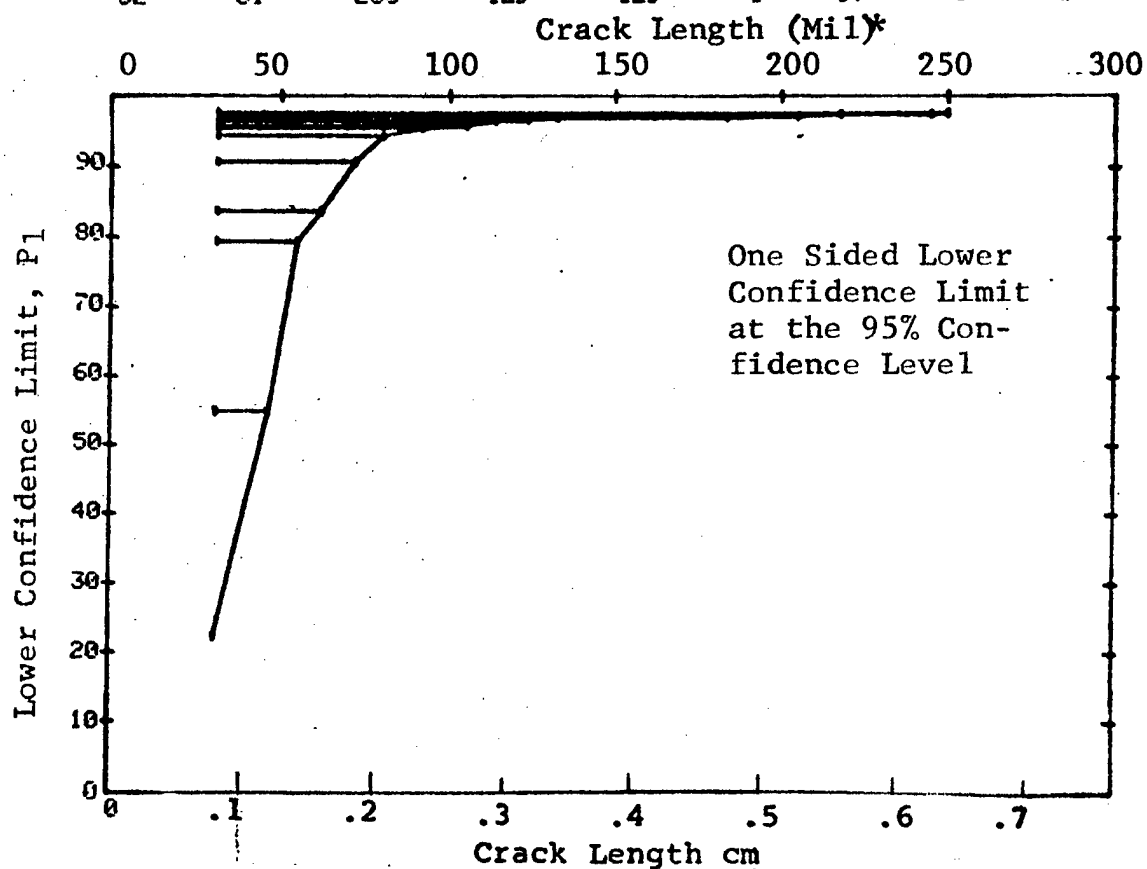


Figure D-36 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

29-JUL-75		PENETRANT		TEST 3.		(36) ROCKWELL B-1				
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		0	*	0	*	0	0	0	0	0
2		0		0		0	0	0	0	0
3		0		0		0	0	0	0	0
4		0		0		0	0	0	0	0
5		0		0		0	0	0	0	0
6		0		0		0	0	0	0	0
7		0		0		0	0	0	0	0
8		0		0		0	0	0	0	0
9		0		0		0	0	0	0	0
10		0		0		0	0	0	0	0
11		0		0		0	0	0	0	0
12		0		0		0	0	0	0	0
13		0		0		0	0	0	0	0
14		0		0		0	0	0	0	0
15		0		0		0	0	0	0	0
16		0		0		0	0	0	0	0
17		0		0		0	0	0	0	0
18		0		0		0	0	0	0	0
19		0		0		0	0	0	0	0
20		0		0		0	0	0	0	0
21		0		0		0	0	0	0	0
22		0		0		0	0	0	0	0
23		0		0		0	0	0	0	0
24		0		0		0	0	0	0	0
25		0		0		0	0	0	0	0
26		0		0		0	0	0	0	0
27		0		0		0	0	0	0	0
28		0		0		0	0	0	0	0
29	31		78		39	39	98	92	0	0
30	55		105		60	60	98	95	0	0
31	78		133		60	60	98	95	0	0
32	105		250		60	60	98	95	0	0

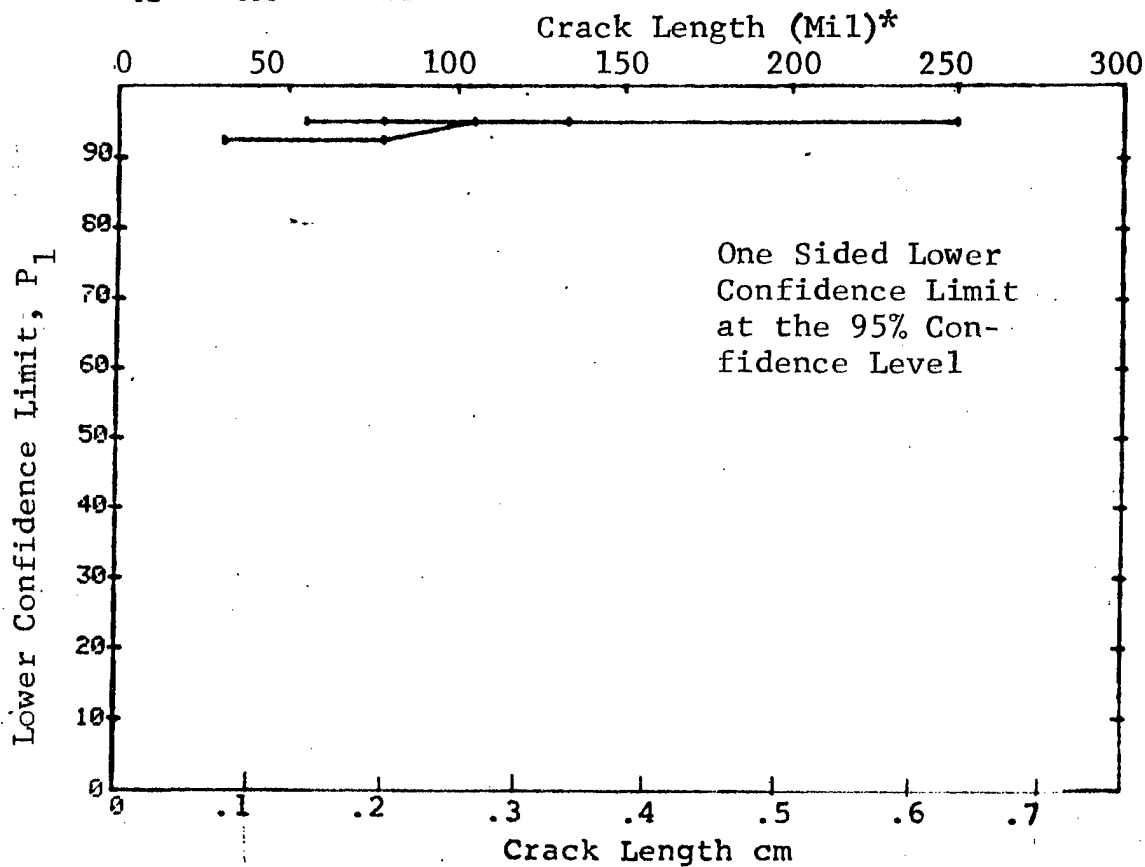


Figure D-36 (Concluded)

(a) Range Interval Method of Data Cumulation

29-JUL-75			PENETRANT		TEST 1, (37)		ROCKWELL B-1			
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1	31*	31*	31*	31*	4	3	61	24	0	0
2	0	0	0	0	0	0	0	0	0	0
3	47	47	47	47	9	9	32	71	0	0
4	54	55	55	55	18	18	96	84	11	29
5	0	0	0	0	0	0	0	0	0	0
6	62	67	67	67	20	20	96	86	9	26
7	70	70	70	70	10	10	92	74	0	0
8	78	78	78	78	8	8	91	68	0	0
9	80	80	80	80	7	7	90	65	0	0
10	91	91	91	91	8	8	91	68	0	0
11	92	92	92	92	8	8	91	68	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	113	114	114	114	13	13	94	79	16	33
15	0	0	0	0	0	0	0	0	0	0
16	124	124	124	124	7	7	90	65	0	0
17	130	133	133	133	11	11	93	76	18	35
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	184	184	184	184	8	8	91	68	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	205	205	205	205	5	5	87	54	0	0
30	0	0	0	0	0	0	0	0	0	0
31	215	215	215	215	5	5	87	54	0	0
32	218	245	245	245	12	12	94	77	17	34

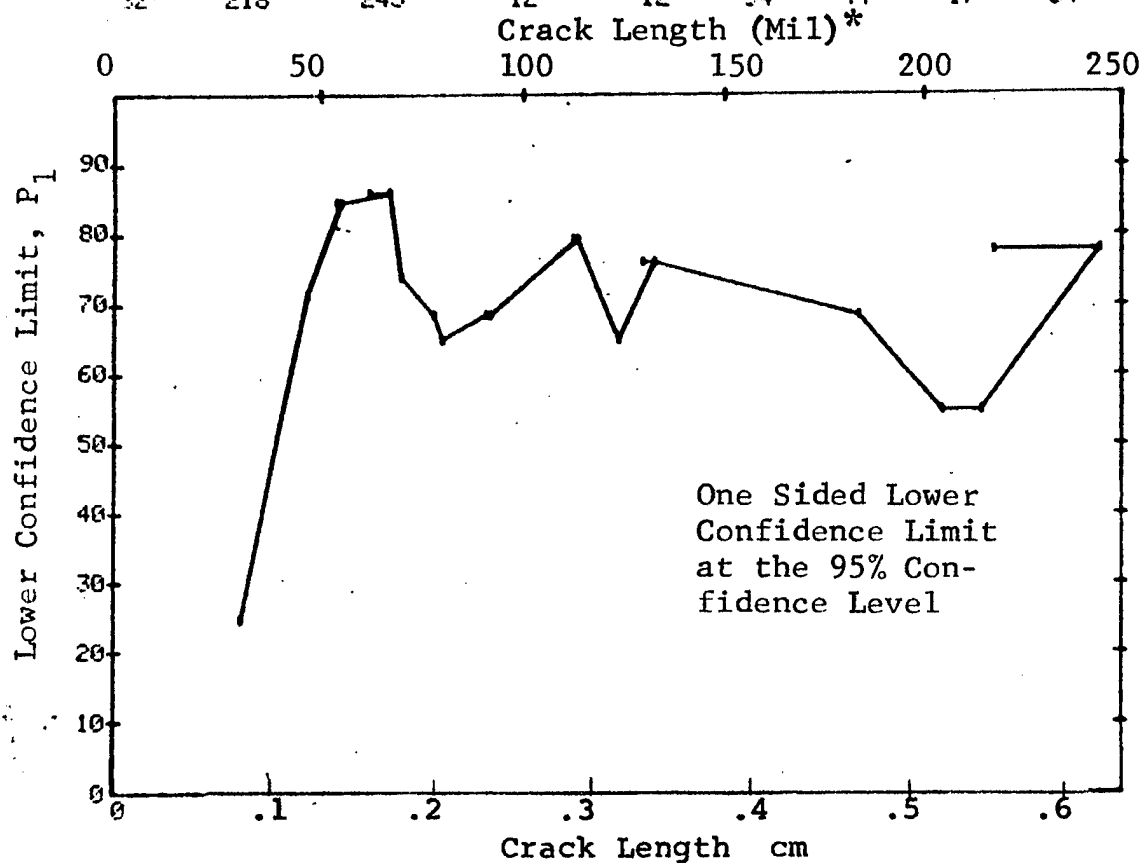


Figure D-37 Probability of Detection for Ti-6Al-4V Using Liquid Penetrant. Fatigue Cracks in Flat Plates.
Prod. Env.

(b) Optimum Probability Method of Data Cumulation

29-JUL-75		PENETRANT			TEST 2, (37)		ROCKWELL I & -1			
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		31*		31*	4	3	0	24	0	0
2		0		0	0	0	0	0	0	0
3		47		47	9	9	0	71	0	0
4		47		55	27	27	0	89	2	19
5		0		0	0	0	0	0	0	0
6		47		67	47	47	0	93	0	0
7		47		70	57	57	0	94	0	0
8		47		78	65	65	0	95	0	0
9		47		80	72	72	0	95	0	0
10		47		91	80	80	0	96	0	0
11		47		92	88	88	0	96	0	0
12		0		0	0	0	0	0	0	0
13		0		0	0	0	0	0	0	0
14		47		114	101	101	0	97	0	0
15		0		0	0	0	0	0	0	0
16		47		124	108	108	0	97	0	0
17		47		133	119	119	0	97	0	0
18		0		0	0	0	0	0	0	0
19		0		0	0	0	0	0	0	0
20		0		0	0	0	0	0	0	0
21		0		0	0	0	0	0	0	0
22		0		0	0	0	0	0	0	0
23		0		0	0	0	0	0	0	0
24		0		0	0	0	0	0	0	0
25		0		0	0	0	0	0	0	0
26		47		184	127	127	0	97	0	0
27		0		0	0	0	0	0	0	0
28		0		0	0	0	0	0	0	0
29		47		205	132	132	0	97	0	0
30		0		0	0	0	0	0	0	0
31		47		215	137	137	0	97	0	0
32		47		245	149	149	0	98	0	0

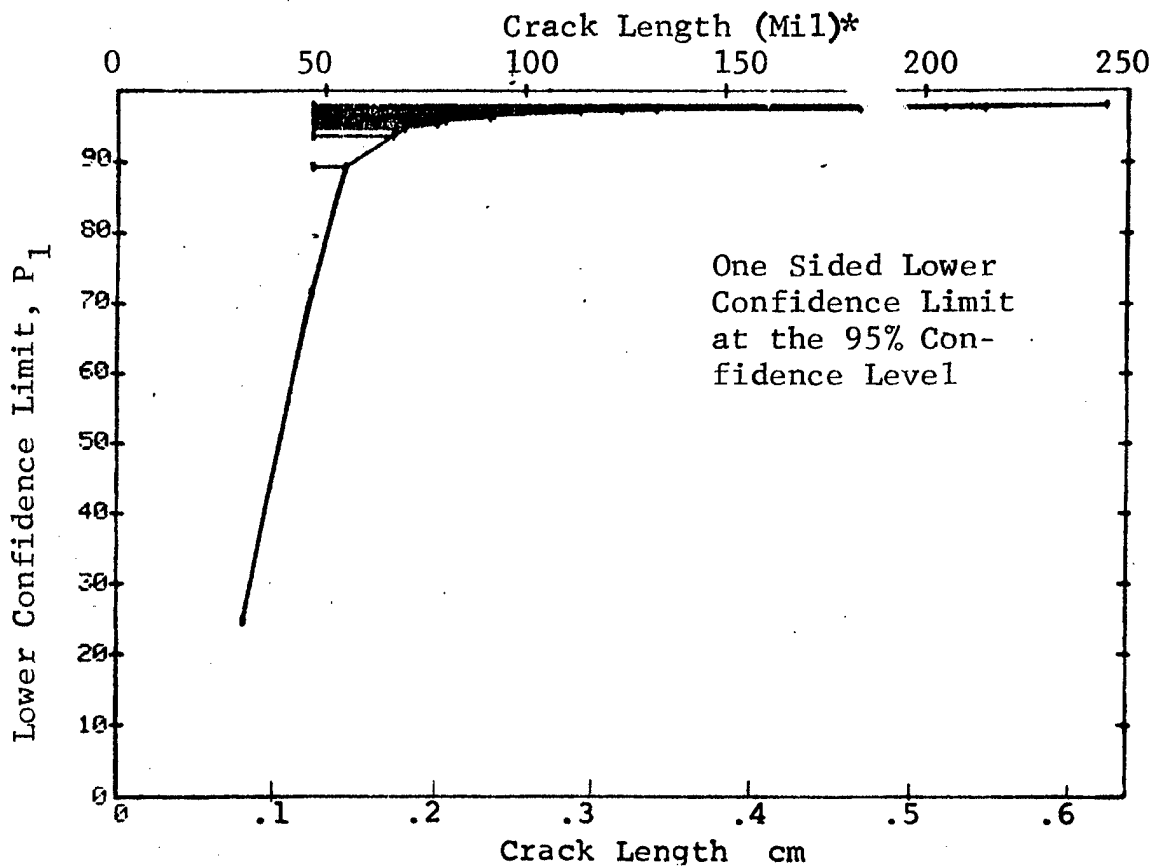


Figure D-37 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

29-JUL-75		PENETRANT		N	TEST 3, (37)		ROCKWELL I D-1	
RANGE	MIN LN	* MAX LN	*		DET	50%	95%	0 MISS
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	31	62	33	32	94	86	13	28
29	31	78	60	59	97	92	0	1
30	62	113	60	60	98	95	0	0
31	78	133	60	60	98	95	0	0
32	113	245	60	60	98	95	0	0

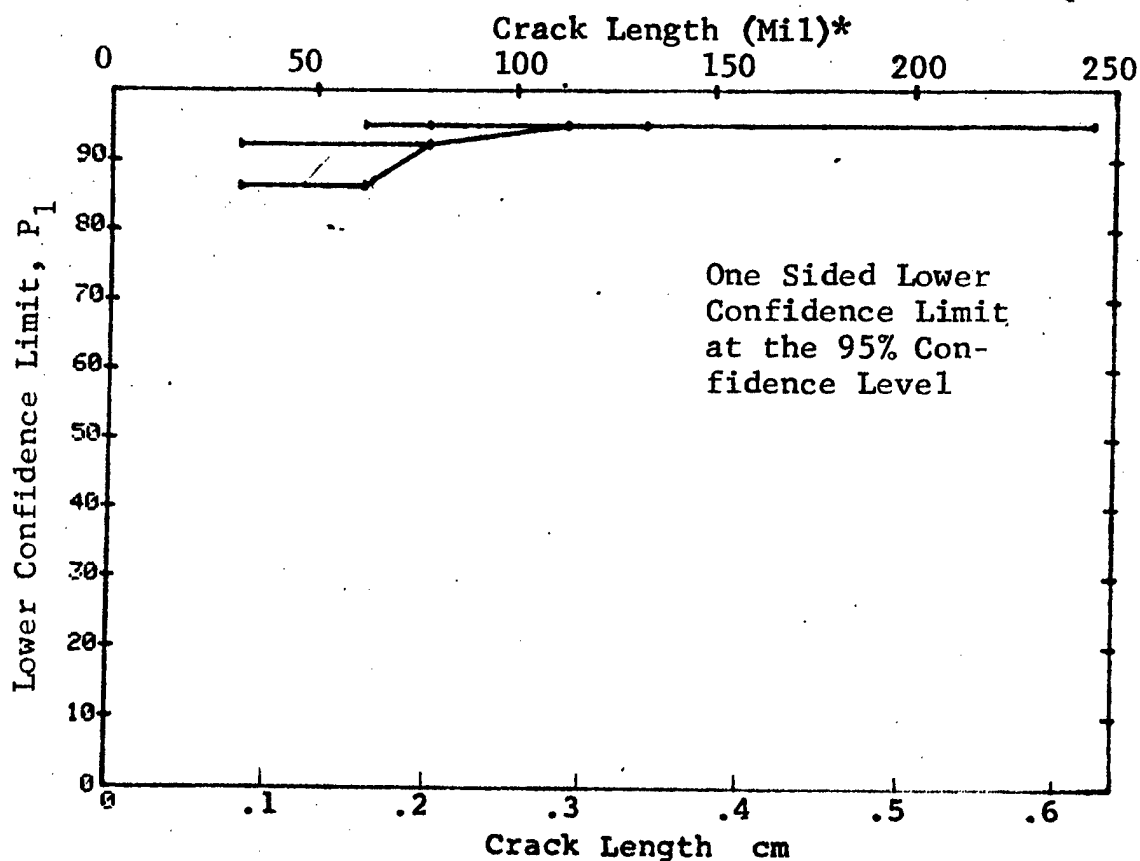


Figure D-37 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST-1		(38)	0 MISS	1 MISS
RANGE	MIN LN	47 *	MAX LN		DET	50%			
1	0	0	0	4	4	34	47	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	54		70	26	26	97	89	3	20

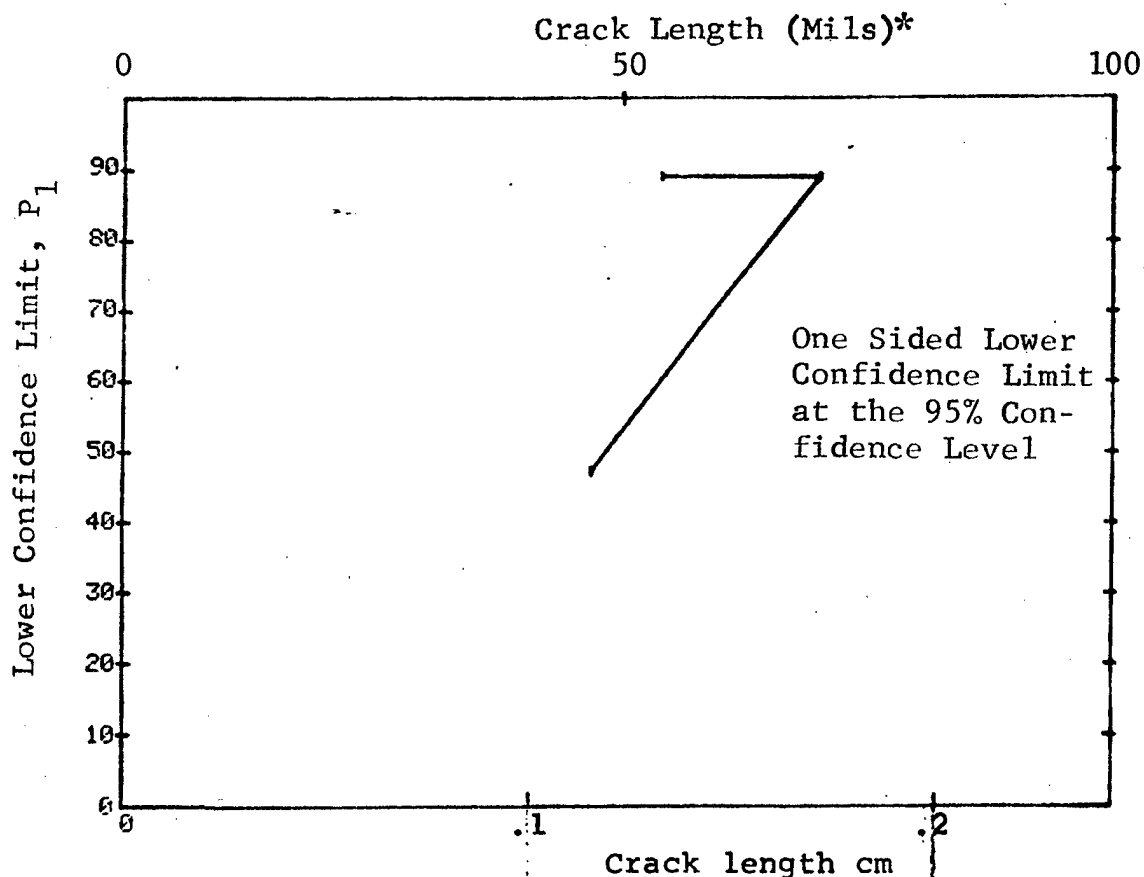


Figure D-38 Probability of Detection for Ti-6Al-4V Using Liquid Penetrant. Fatigue Cracks in Flat Plates.
Prod. Env. D-118

(b) Optimum Probability Method of Data Cumulation

09-OCT-75		PENETRANT			TEST 2			(38)		
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		47*		47*	4	4	0	47	0	0
2		0		0	0	0	0	0	0	0
3		0		0	0	0	0	0	0	0
4		0		0	0	0	0	0	0	0
5		0		0	0	0	0	0	0	0
6		0		0	0	0	0	0	0	0
7		0		0	0	0	0	0	0	0
8		0		0	0	0	0	0	0	0
9		0		0	0	0	0	0	0	0
10		0		0	0	0	0	0	0	0
11		0		0	0	0	0	0	0	0
12		0		0	0	0	0	0	0	0
13		0		0	0	0	0	0	0	0
14		0		0	0	0	0	0	0	0
15		0		0	0	0	0	0	0	0
16		0		0	0	0	0	0	0	0
17		0		0	0	0	0	0	0	0
18		0		0	0	0	0	0	0	0
19		0		0	0	0	0	0	0	0
20		0		0	0	0	0	0	0	0
21		0		0	0	0	0	0	0	0
22		0		0	0	0	0	0	0	0
23		0		0	0	0	0	0	0	0
24		0		0	0	0	0	0	0	0
25		0		0	0	0	0	0	0	0
26		0		0	0	0	0	0	0	0
27		0		0	0	0	0	0	0	0
28		0		0	0	0	0	0	0	0
29		0		0	0	0	0	0	0	0
30		0		0	0	0	0	0	0	0
31		0		0	0	0	0	0	0	0
32	47		70		30	30	0	90	0	16

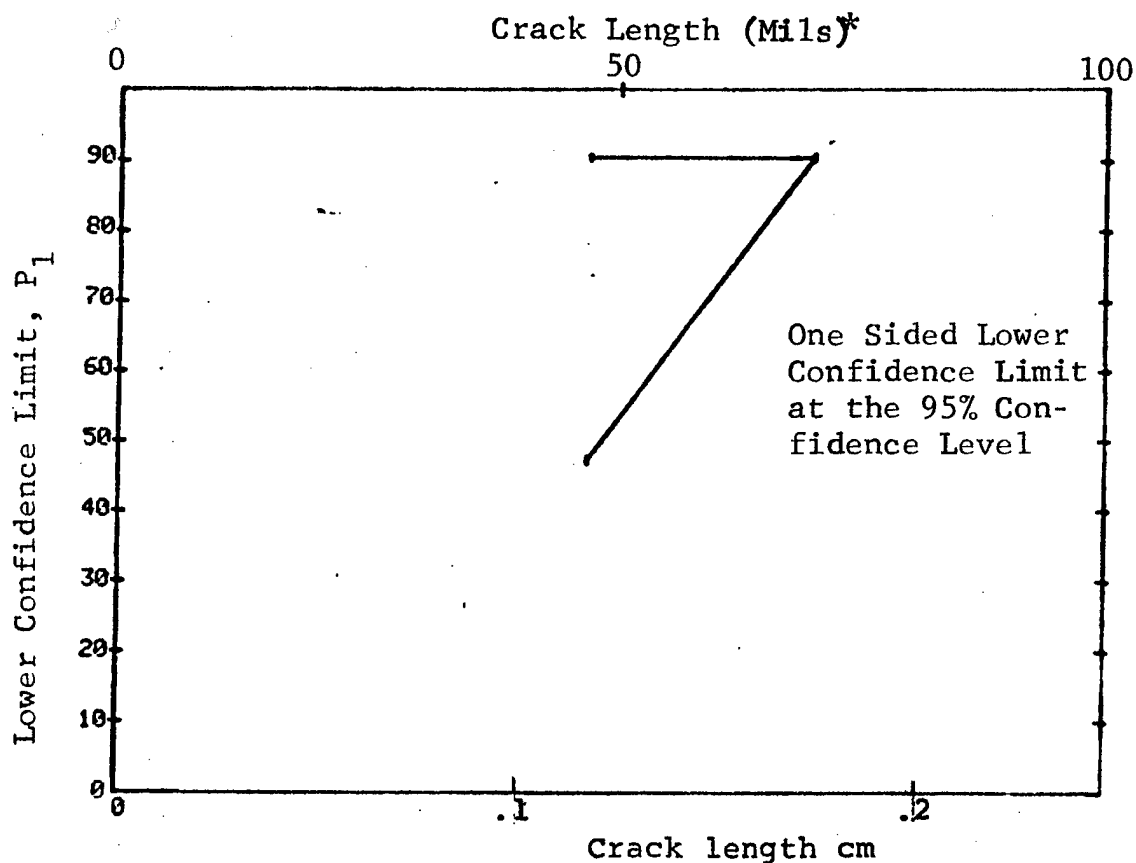


Figure D-38 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 3		(38)	
RANGE	MIN LN	* MAX LN	* LN		DET	50%	95%	0 MISS 1 MISS
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	47	70	30	30	97	90	0	16

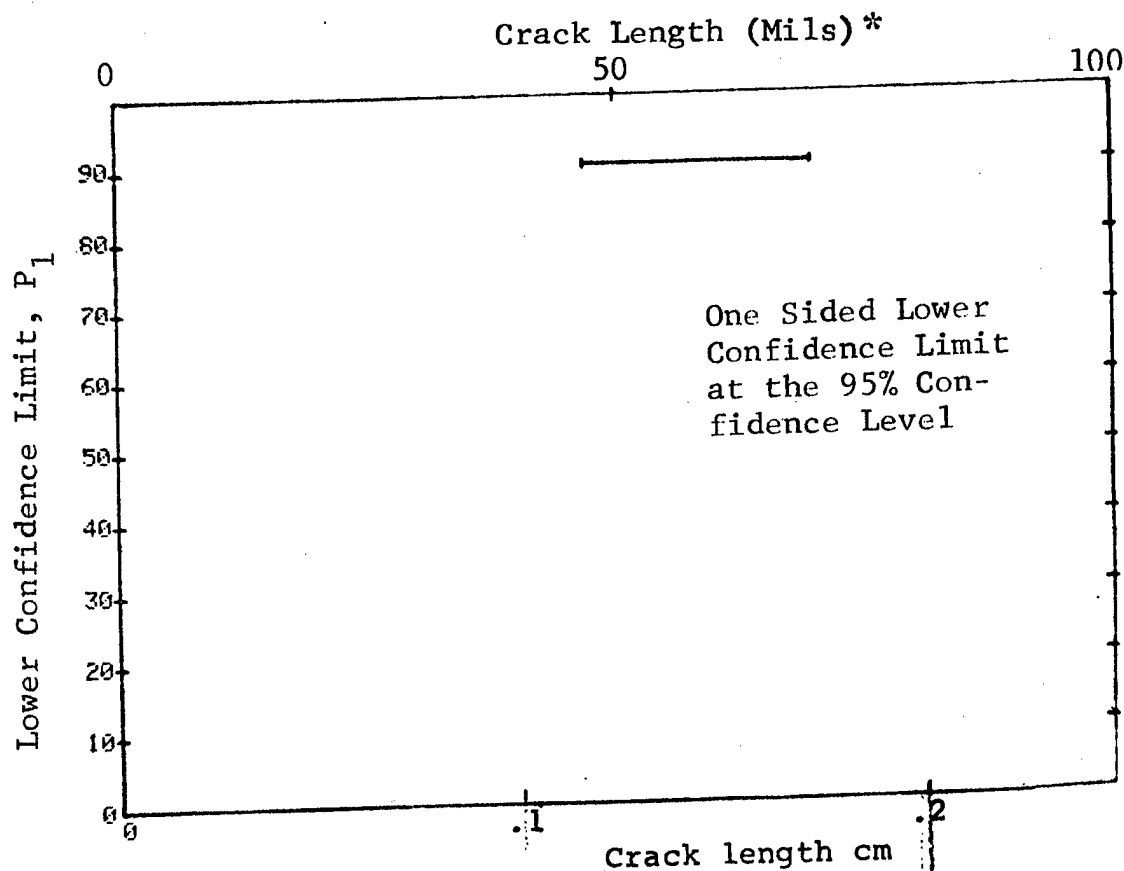


Figure D-38 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 1		(39)		
RANGE	MIN LN	MAX LN			DET	50%	95%	0 MISS	1 MISS
1	8	8	*	3	0	0	0	0	0
2	10	10	*	3	0	50	13	0	0
3	0	0		0	0	0	0	0	0
4	12	12		4	1	15	1	0	0
5	13	13		2	2	70	22	0	0
6	14	14		3	3	79	36	0	0
7	15	15		3	3	79	36	0	0
8	0	0		0	0	0	0	0	0
9	17	17		3	3	79	36	0	0
10	0	0		0	0	0	0	0	0
11	19	19		3	3	79	36	0	0
12	0	0		0	0	0	0	0	0
13	21	21		6	5	73	41	0	0
14	0	0		0	0	0	0	0	0
15	23	23		4	3	61	24	0	0
16	0	0		0	0	0	0	0	0
17	25	25		14	13	88	70	0	0
18	26	26		3	3	79	36	0	0
19	27	27		3	3	79	36	0	0
20	0	0		0	0	0	0	0	0
21	0	0		0	0	0	0	0	0
22	0	0		0	0	0	0	0	0
23	31	31		7	7	90	65	0	0
24	32	32		4	3	61	24	0	0
25	33	33		4	4	84	47	0	0
26	0	0		0	0	0	0	0	0
27	35	35		2	2	70	22	0	0
28	36	36		6	6	89	60	0	0
29	0	0		0	0	0	0	0	0
30	0	0		0	0	0	0	0	0
31	39	39		7	7	90	65	0	0
32	47	50		13	13	94	79	15	33

Crack Length (Mils) *

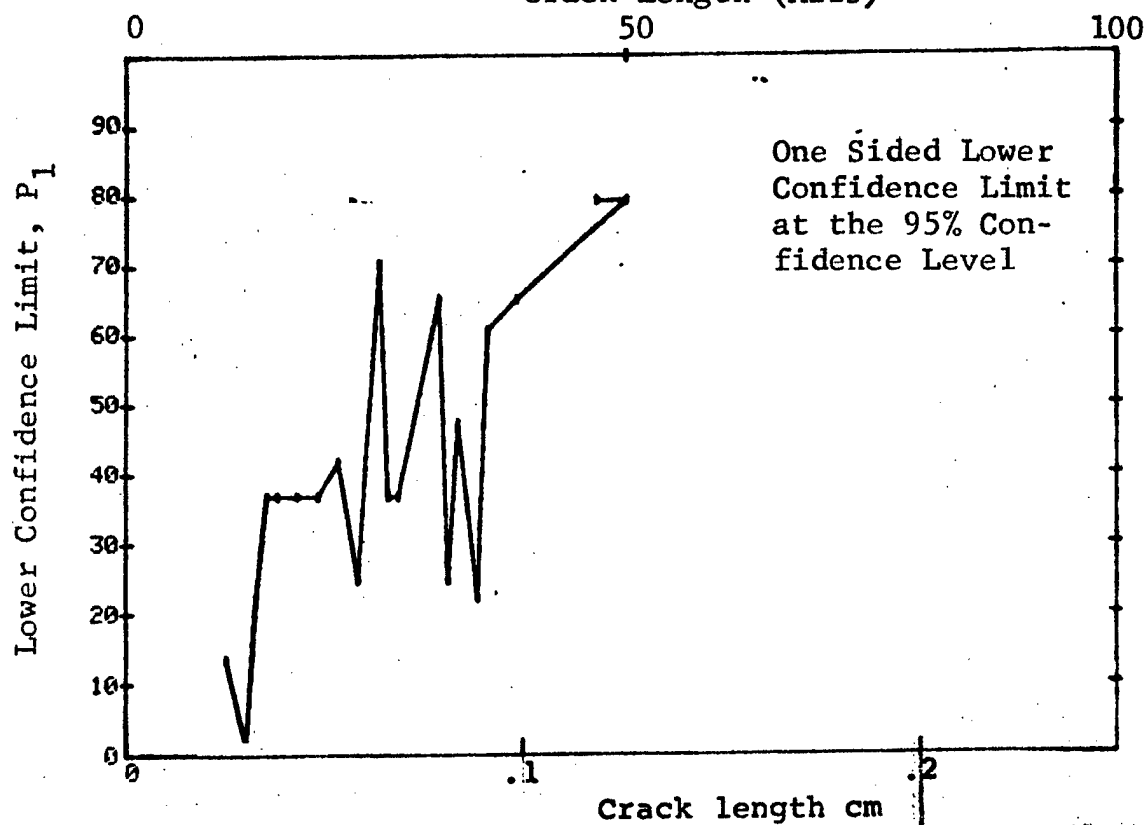


Figure D-39 Probability of Detection for Ti-6Al-4V Using Liquid Penetrant. Fatigue Cracks in Flat Plates. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 2		(39)		
RANGE	MIN	LN	MAX LN		DET	50%	95%	0 MISS	1 MISS
1		8*	8*	3	0	0	0	0	0
2		10	10	3	2	0	13	0	0
3		0	0	0	0	0	0	0	0
4		10	12	7	3	0	12	0	0
5		10	13	9	5	0	25	0	0
6		13	14	5	5	0	54	0	0
7		13	15	8	8	0	68	0	0
8		0	0	0	0	0	0	0	0
9		13	17	11	11	0	76	0	0
10		0	0	0	0	0	0	0	0
11		13	19	14	14	0	80	15	32
12		0	0	0	0	0	0	0	0
13		13	21	20	19	0	78	0	0
14		0	0	0	0	0	0	0	0
15		13	23	24	22	0	75	0	0
16		0	0	0	0	0	0	0	0
17		13	25	38	35	0	80	38	51
18		13	26	41	38	0	82	35	48
19		13	27	44	41	0	83	32	45
20		0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0
23		13	31	51	48	0	85	25	38
24		13	32	55	51	0	84	34	48
25		13	33	59	55	0	85	30	44
26		0	0	0	0	0	0	0	0
27		13	35	61	57	0	85	28	42
28		13	36	67	63	0	86	22	36
29		0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0
31		13	39	74	70	0	88	15	29
32		33	50	32	32	0	91	0	14

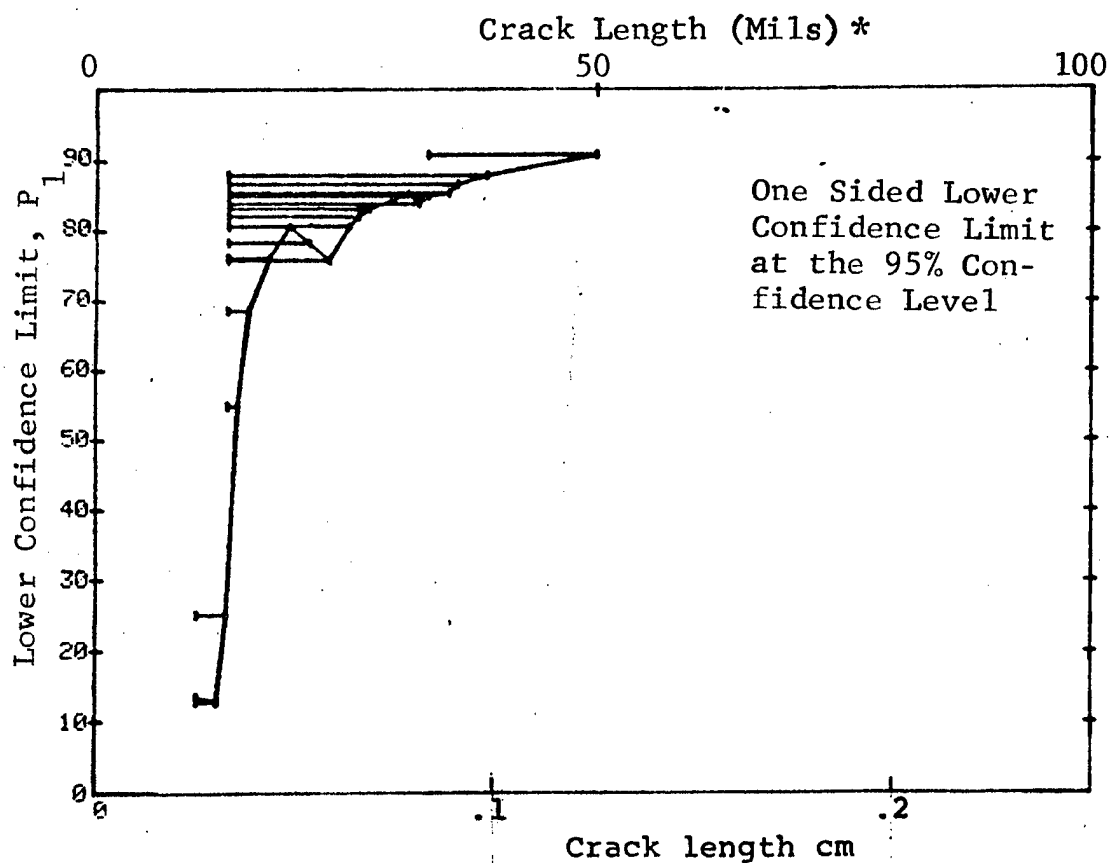


Figure D-39 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75	PENETRANT		TEST 3			(39)	
RANGE	MIN LN	MAX LN	DET	50%	95%	0 MISS	1 MISS
1	0 *	0 *	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	25	37	28	74	61	0
31	12	33	60	53	87	79	69
32	25	50	60	58	95	89	82
						1	16

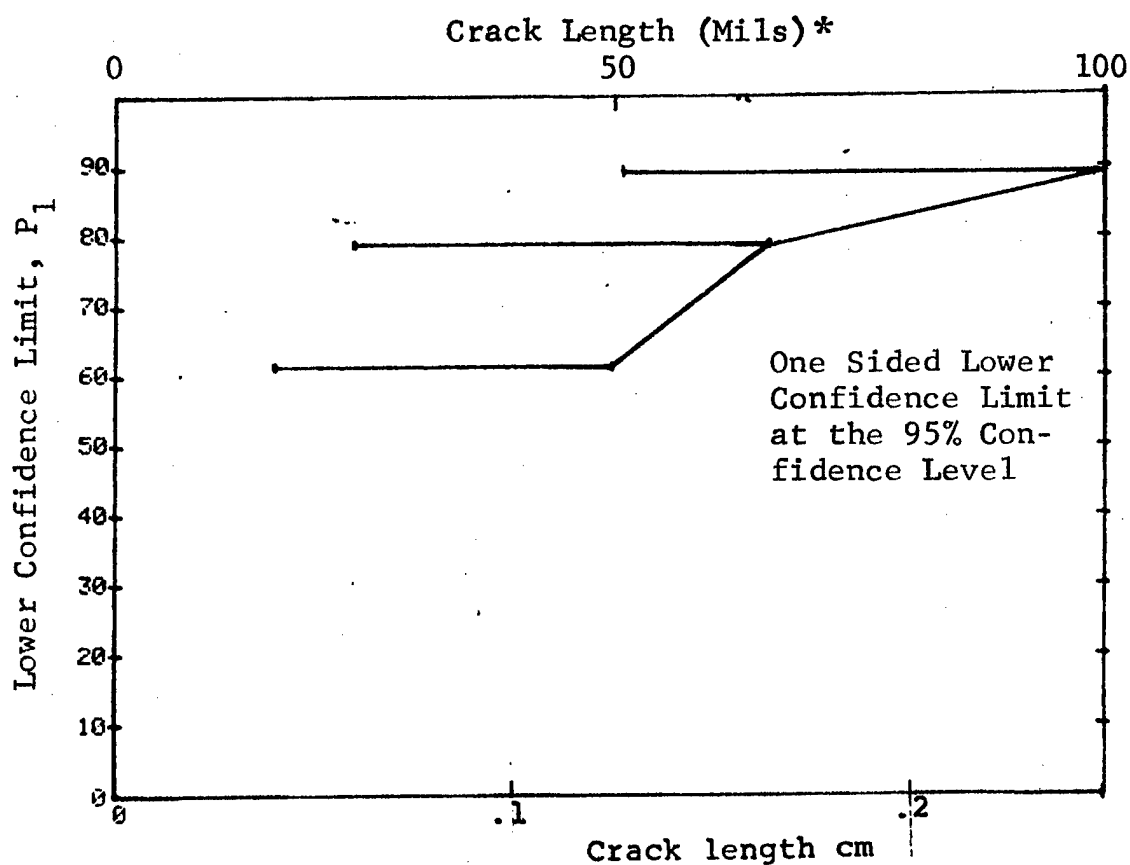


Figure D-39 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 1		(40)	
RANGE	MIN	LN	MAX LN		DET	50%	95%	0 MISS
1	37	*	37	5	5	87	54	0
2	44		44	7	7	90	65	0
3	51		51	7	7	90	65	0
4	0		0	0	0	0	0	0
5	60		60	5	5	87	54	0
6	0		0	0	0	0	0	0
7	68		68	7	7	90	65	0
8	76		76	3	3	79	36	0
9	0		0	0	0	0	0	0
10	85		86	2	2	70	22	0
11	88		91	12	12	94	77	17
12	93		97	12	12	94	77	17
13	99		101	7	7	90	65	0
14	105		105	5	5	87	54	0
15	110		110	5	5	87	54	0
16	113		115	4	4	84	47	0
17	0		0	0	0	0	0	0
18	125		125	10	10	93	74	0
19	0		0	0	0	0	0	0
20	135		135	4	4	84	47	0
21	0		0	0	0	0	0	0
22	147		147	2	2	70	22	0
23	0		0	0	0	0	0	0
24	153		156	12	12	94	77	17
25	162		162	3	3	79	36	0
26	164		164	4	4	84	47	0
27	0		0	0	0	0	0	0
28	176		176	3	3	79	36	0
29	0		0	0	0	0	0	0
30	0		0	0	0	0	0	0
31	189		189	5	5	87	54	0
32	194		194	3	3	79	36	0

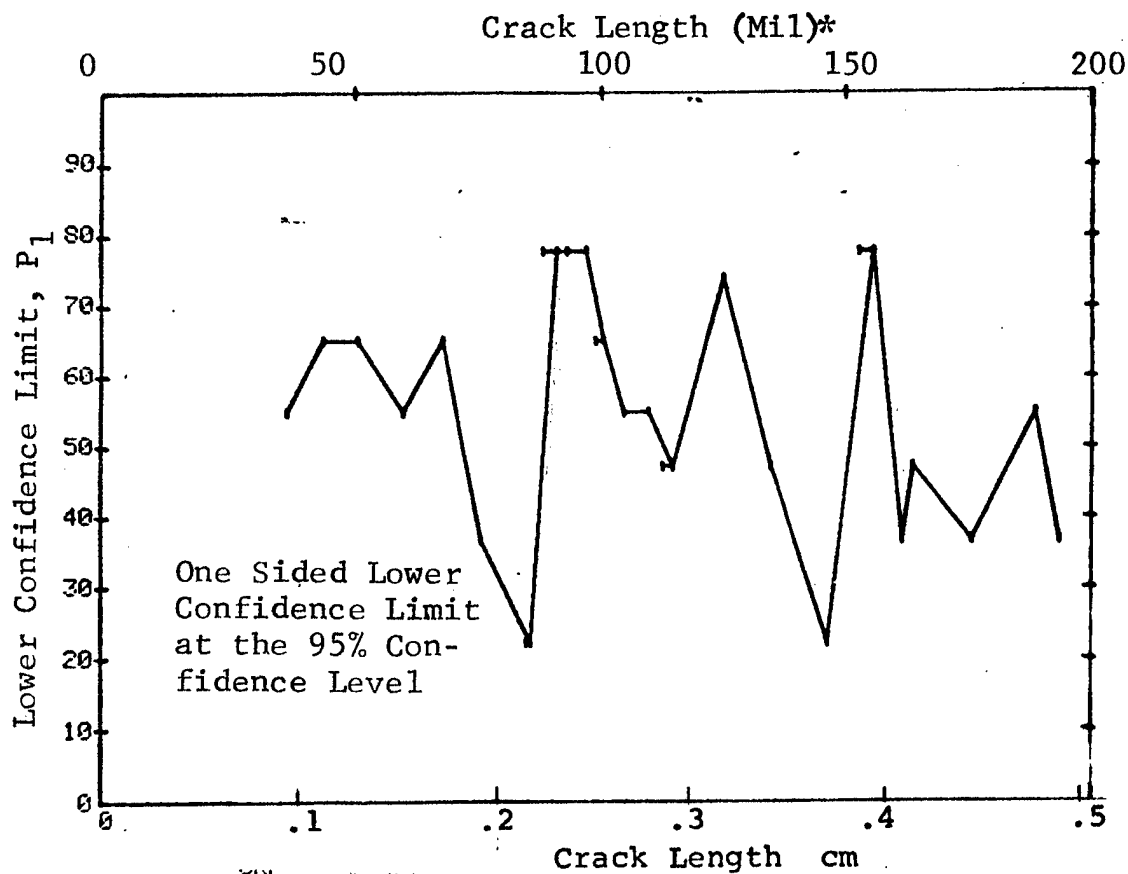


Figure D-40 Probability of Detection for 7075-T6511 Al Using Liquid Penetrant. Fatigue Cracks in Flat Plates.
Prod. Env. D-124

(b) Optimum Probability Method of Data Cumulation

09-OCT-75		PENETRANT			N	TEST 2		(40)	0 MISS	1 MISS
RANGE	MIN	LN	* MAX	LN *		DET	50%	95%		
1	37	37	*	37	5	5	0	54	0	0
2	37	37		44	12	12	0	77	0	0
3	37	37		51	19	19	0	85	10	27
4	0	0		0	0	0	0	0	0	0
5	37	37		60	24	24	0	88	5	22
6	0	0		0	0	0	0	0	0	0
7	37	37		68	31	31	0	90	0	15
8	37	37		76	34	34	0	91	0	12
9	0	0		0	0	0	0	0	0	0
10	37	37		86	36	36	0	92	0	10
11	37	37		91	48	48	0	93	0	0
12	37	37		97	60	60	0	95	0	0
13	37	37		101	67	67	0	95	0	0
14	37	37		105	72	72	0	95	0	0
15	37	37		110	77	77	0	96	0	0
16	37	37		115	81	81	0	96	0	0
17	0	0		0	0	0	0	0	0	0
18	37	37		125	91	91	0	96	0	0
19	0	0		0	0	0	0	0	0	0
20	37	37		135	95	95	0	96	0	0
21	0	0		0	0	0	0	0	0	0
22	37	37		147	97	97	0	96	0	0
23	0	0		0	0	0	0	0	0	0
24	37	37		156	109	109	0	97	0	0
25	37	37		162	112	112	0	97	0	0
26	37	37		164	116	116	0	97	0	0
27	0	0		0	0	0	0	0	0	0
28	37	37		176	119	119	0	97	0	0
29	0	0		0	0	0	0	0	0	0
30	0	0		0	0	0	0	0	0	0
31	37	37		189	124	124	0	97	0	0
32	37	37		194	127	127	0	97	0	0

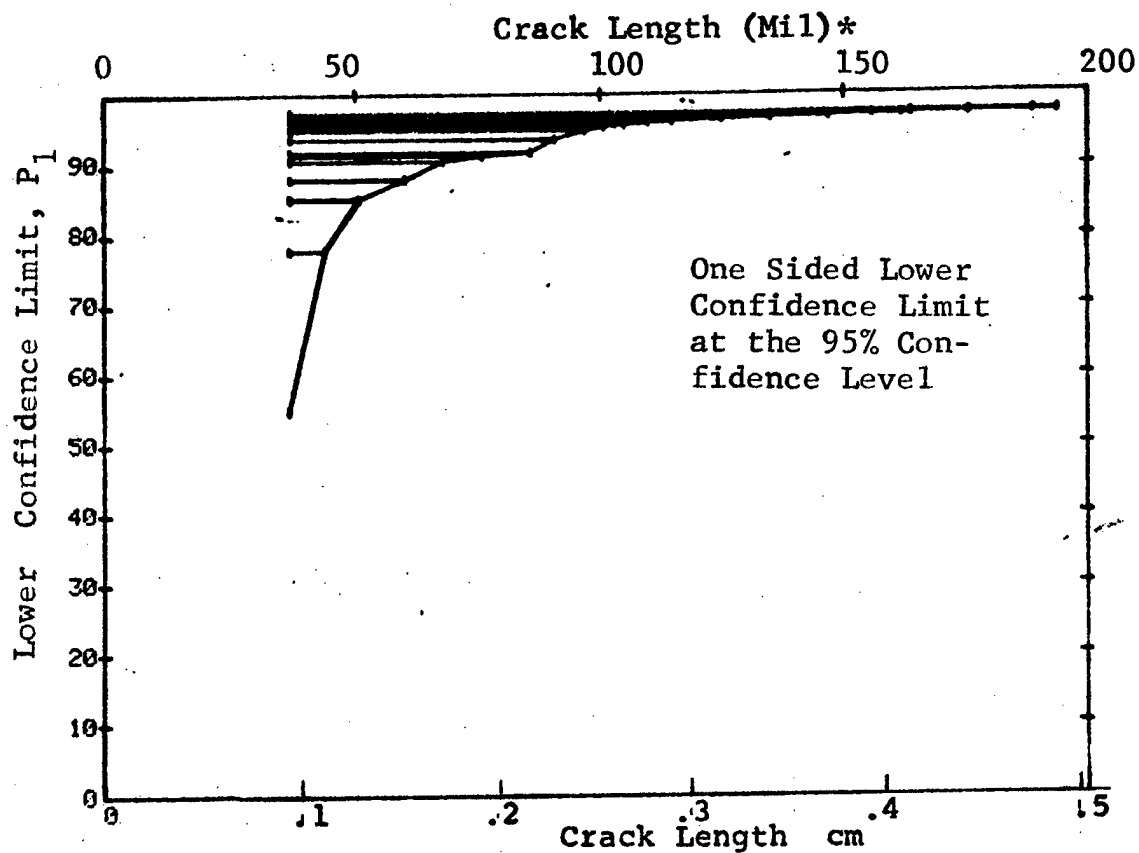


Figure D-40 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 3		(40)	0 MISS	1 MISS
RANGE	MIN LN	* MAX LN	*		DET	50%	95%		
1	0	0	*	0	0	0	0	0	0
2	0	0		0	0	0	0	0	0
3	0	0		0	0	0	0	0	0
4	0	0		0	0	0	0	0	0
5	0	0		0	0	0	0	0	0
6	0	0		0	0	0	0	0	0
7	0	0		0	0	0	0	0	0
8	0	0		0	0	0	0	0	0
9	0	0		0	0	0	0	0	0
10	0	0		0	0	0	0	0	0
11	0	0		0	0	0	0	0	0
12	0	0		0	0	0	0	0	0
13	0	0		0	0	0	0	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	0	0		0	0	0	0	0	0
17	0	0		0	0	0	0	0	0
18	0	0		0	0	0	0	0	0
19	0	0		0	0	0	0	0	0
20	0	0		0	0	0	0	0	0
21	0	0		0	0	0	0	0	0
22	0	0		0	0	0	0	0	0
23	0	0		0	0	0	0	0	0
24	0	0		0	0	0	0	0	0
25	0	0		0	0	0	0	0	0
26	0	0		0	0	0	0	0	0
27	0	0		0	0	0	0	0	0
28	0	0		0	0	0	0	0	0
29	37	88		37	37	98	95	0	0
30	44	101		60	60	98	95	0	0
31	88	147		60	60	98	95	0	0
32	105	194		60	60	98	95	0	0

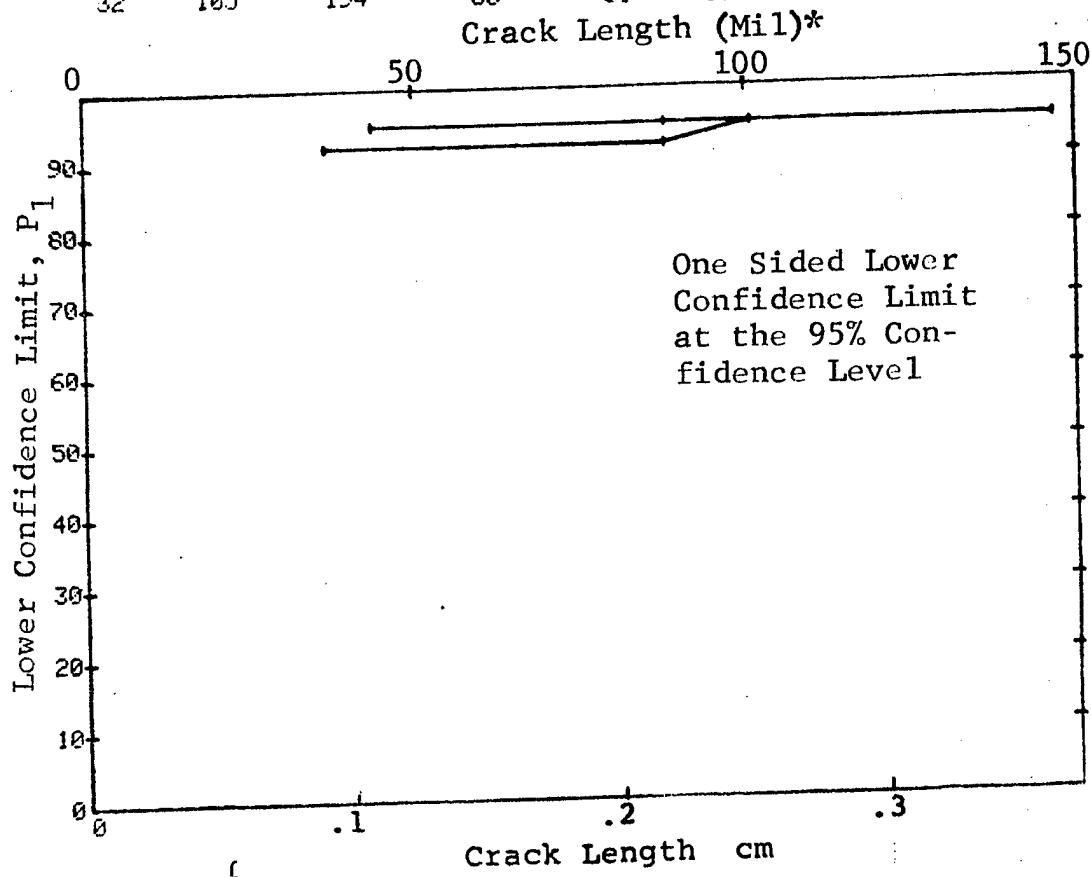


Figure D-40 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		PENETRANT		TEST 1		(41)		MISS	
RANGE	MIN LN	MAX LN	H	DET	50%	95%	0	1	
1	44	44	10	10	93	74	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	0	0	0	0	0	0	0	0	
32	51	68	21	21	96	86	0	0	

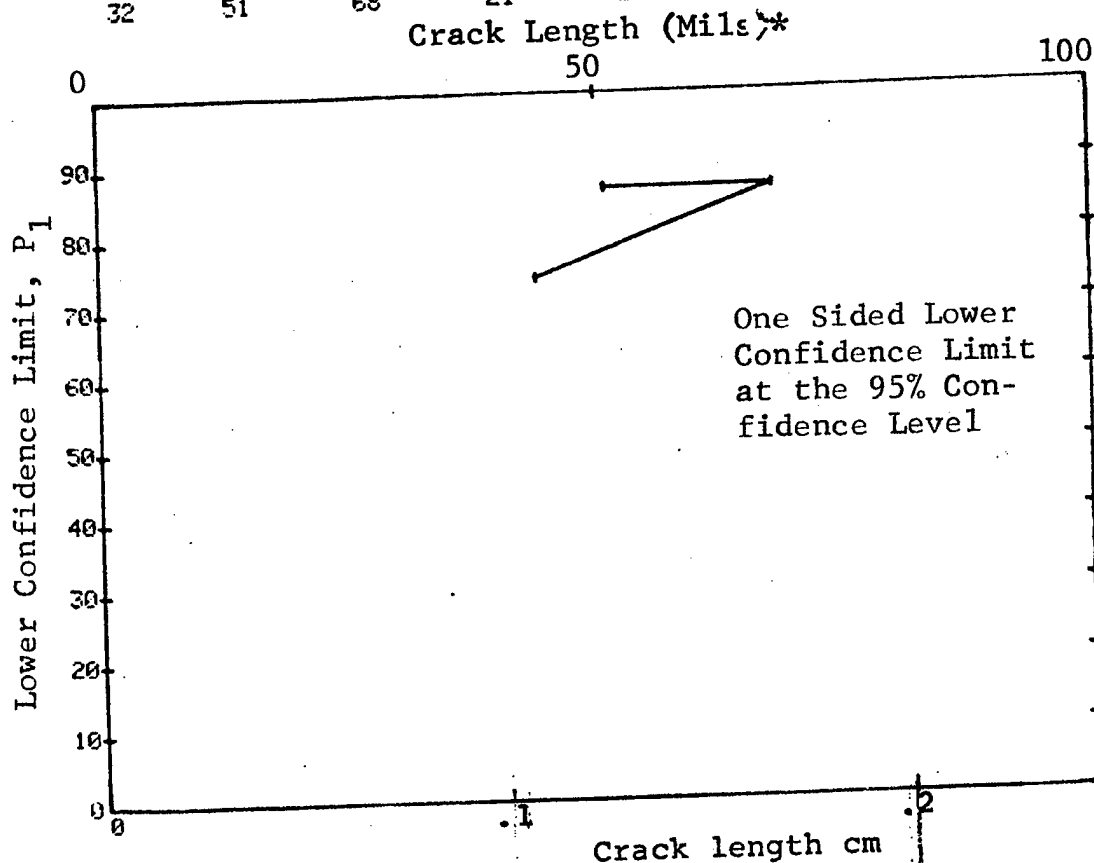


Figure D-41 Probability of Detection for 7075-T6511 Al Using Liquid Penetrant. Fatigue Cracks in Flat Plates.

(b) Optimum Probability Method of Data Cumulation

09-OCT-75	PENETRANT		TEST 2		(41)		0 MISS	1 MISS
RANGE	MIN	LN	MAX LN	N	DET	50%	95%	
1		44*	44*	10	10	0	74	0
2		0	0	0	0	0	0	0
3		0	0	0	0	0	0	0
4		0	0	0	0	0	0	0
5		0	0	0	0	0	0	0
6		0	0	0	0	0	0	0
7		0	0	0	0	0	0	0
8		0	0	0	0	0	0	0
9		0	0	0	0	0	0	0
10		0	0	0	0	0	0	0
11		0	0	0	0	0	0	0
12		0	0	0	0	0	0	0
13		0	0	0	0	0	0	0
14		0	0	0	0	0	0	0
15		0	0	0	0	0	0	0
16		0	0	0	0	0	0	0
17		0	0	0	0	0	0	0
18		0	0	0	0	0	0	0
19		0	0	0	0	0	0	0
20		0	0	0	0	0	0	0
21		0	0	0	0	0	0	0
22		0	0	0	0	0	0	0
23		0	0	0	0	0	0	0
24		0	0	0	0	0	0	0
25		0	0	0	0	0	0	0
26		0	0	0	0	0	0	0
27		0	0	0	0	0	0	0
28		0	0	0	0	0	0	0
29		0	0	0	0	0	0	0
30		0	0	0	0	0	0	0
31		0	0	0	0	0	0	0
32	44		68	31	31	0	90	15

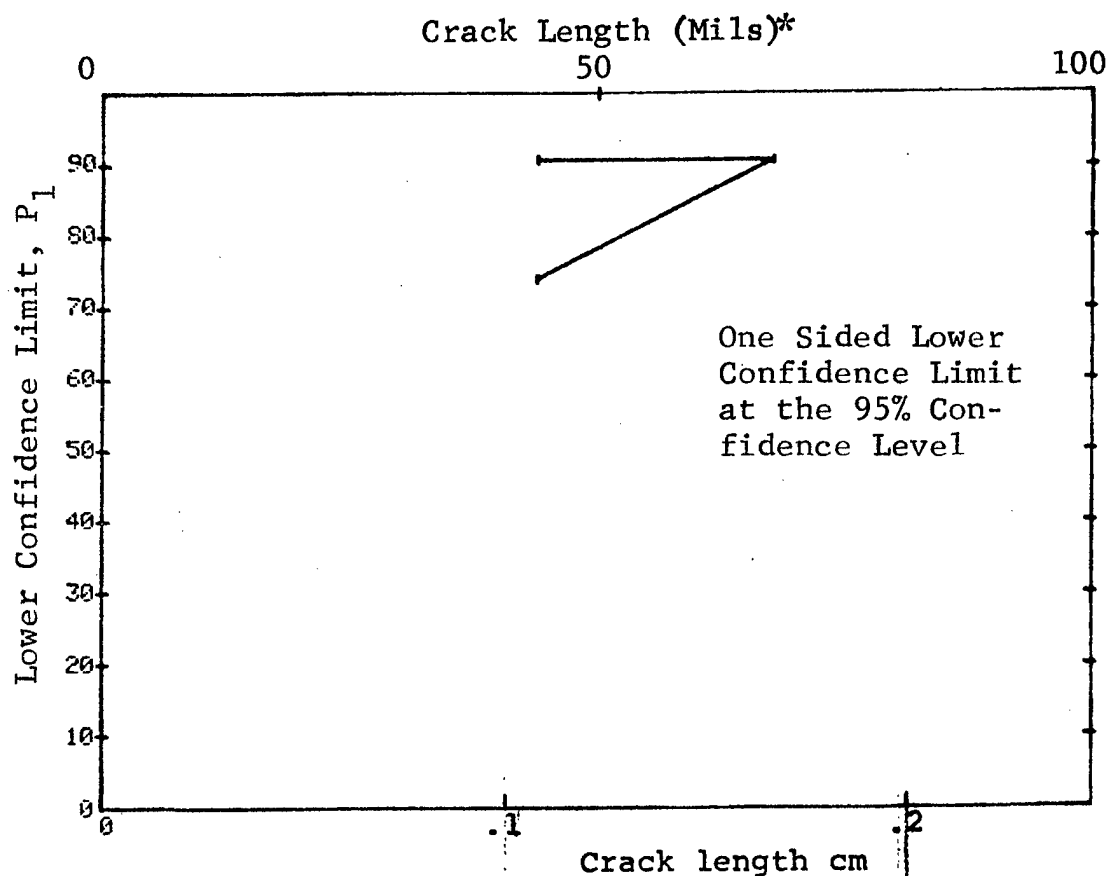


Figure D-41 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75		PENETRANT		TEST 3			(41)			
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		0*		0*	0	0	0	0	0	0
2		0		0	0	0	0	0	0	0
3		0		0	0	0	0	0	0	0
4		0		0	0	0	0	0	0	0
5		0		0	0	0	0	0	0	0
6		0		0	0	0	0	0	0	0
7		0		0	0	0	0	0	0	0
8		0		0	0	0	0	0	0	0
9		0		0	0	0	0	0	0	0
10		0		0	0	0	0	0	0	0
11		0		0	0	0	0	0	0	0
12		0		0	0	0	0	0	0	0
13		0		0	0	0	0	0	0	0
14		0		0	0	0	0	0	0	0
15		0		0	0	0	0	0	0	0
16		0		0	0	0	0	0	0	0
17		0		0	0	0	0	0	0	0
18		0		0	0	0	0	0	0	0
19		0		0	0	0	0	0	0	0
20		0		0	0	0	0	0	0	0
21		0		0	0	0	0	0	0	0
22		0		0	0	0	0	0	0	0
23		0		0	0	0	0	0	0	0
24		0		0	0	0	0	0	0	0
25		0		0	0	0	0	0	0	0
26		0		0	0	0	0	0	0	0
27		0		0	0	0	0	0	0	0
28		0		0	0	0	0	0	0	0
29		0		0	0	0	0	0	0	0
30		0		0	0	0	0	0	0	0
31		0		0	0	0	0	0	0	0
32	44		68		31	31	97	90	0	15

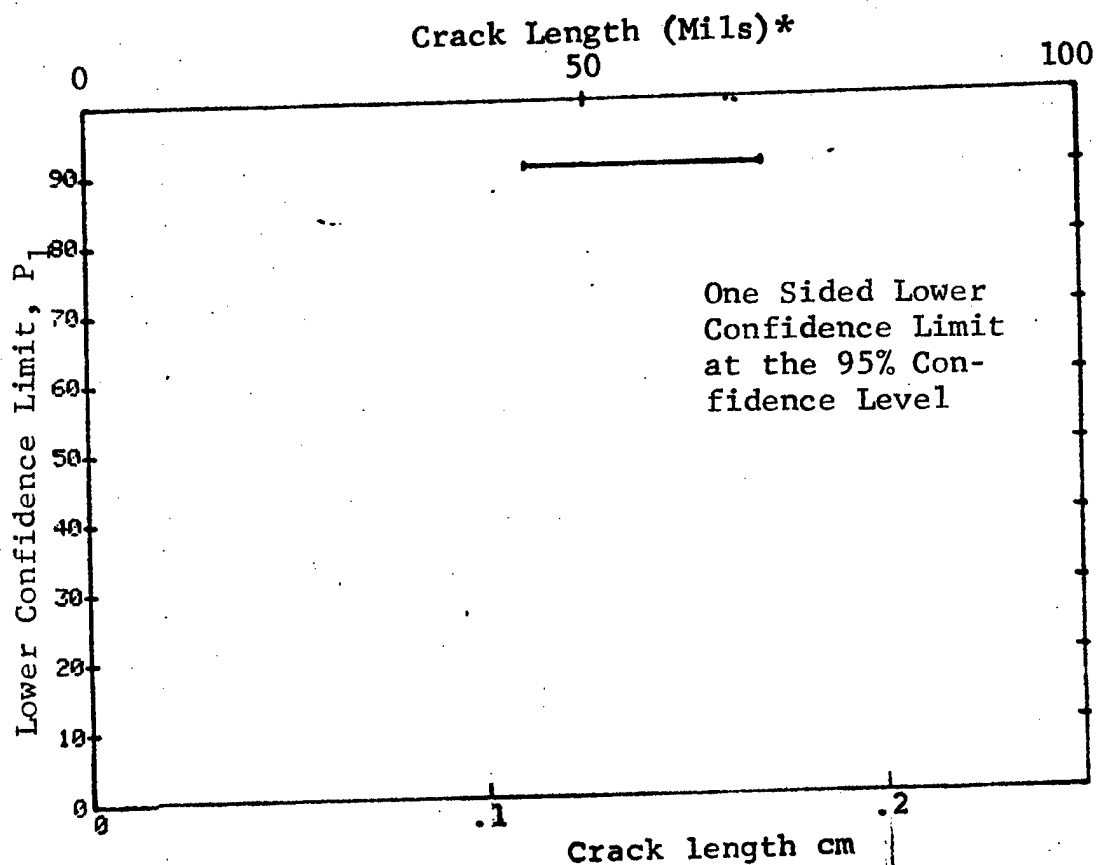


Figure D-41 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 1			(42)	
RANGE	MIN	LN	MAX LN		DET	50%	95%	0 MISS	1 MISS
1		44 *	44 *	10	10	93	74	0	0
2		0	0	0	0	0	0	0	0
3		0	0	0	0	0	0	0	0
4		0	0	0	0	0	0	0	0
5		0	0	0	0	0	0	0	0
6		0	0	0	0	0	0	0	0
7		0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0
32	51		68	21	21	96	86	8	25

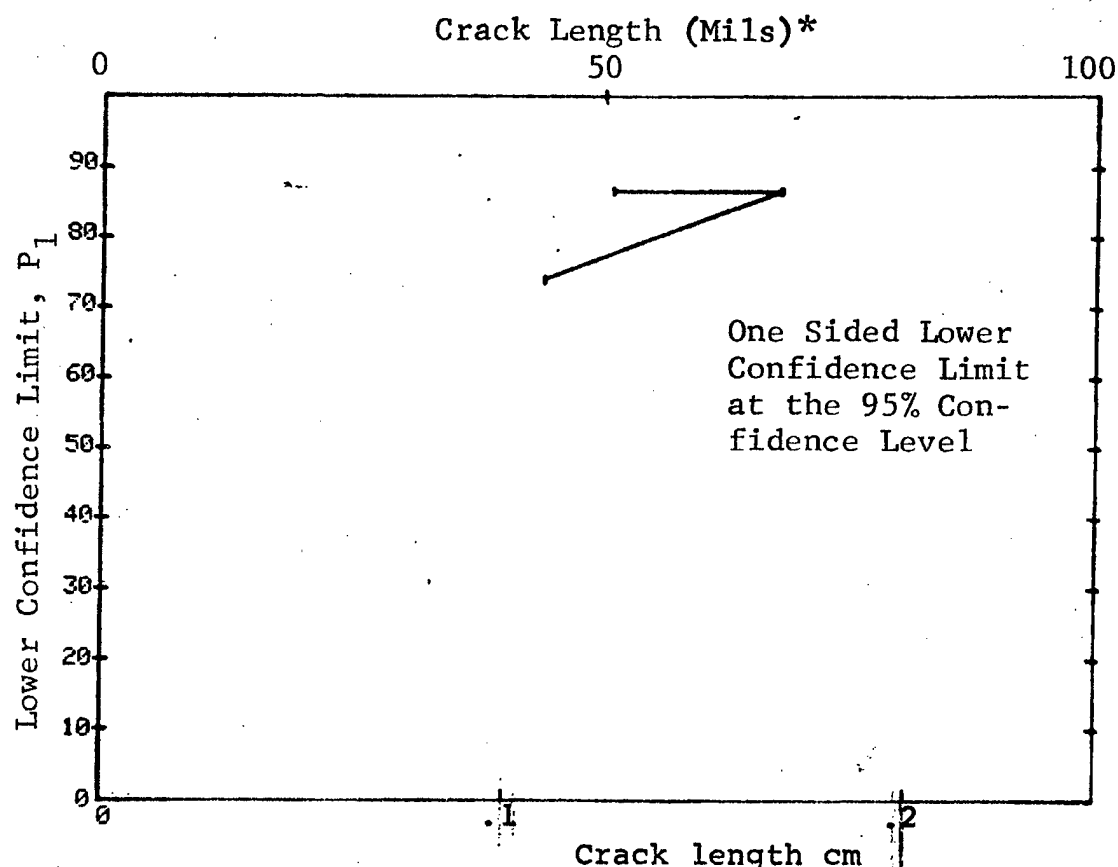


Figure D-42 Probability of Detection for 7075-T6511 Al Using Liquid Penetrant. Fatigue Cracks in Flat Plates.

(b) Optimum Probability Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 2		(42)		0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DET	50%	95%	74		
1		44*	44*	10	10	0	0	0	0	0
2		0	0	0	0	0	0	0	0	0
3		0	0	0	0	0	0	0	0	0
4		0	0	0	0	0	0	0	0	0
5		0	0	0	0	0	0	0	0	0
6		0	0	0	0	0	0	0	0	0
7		0	0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0	15
32		44	68	31	31	0	90	0		

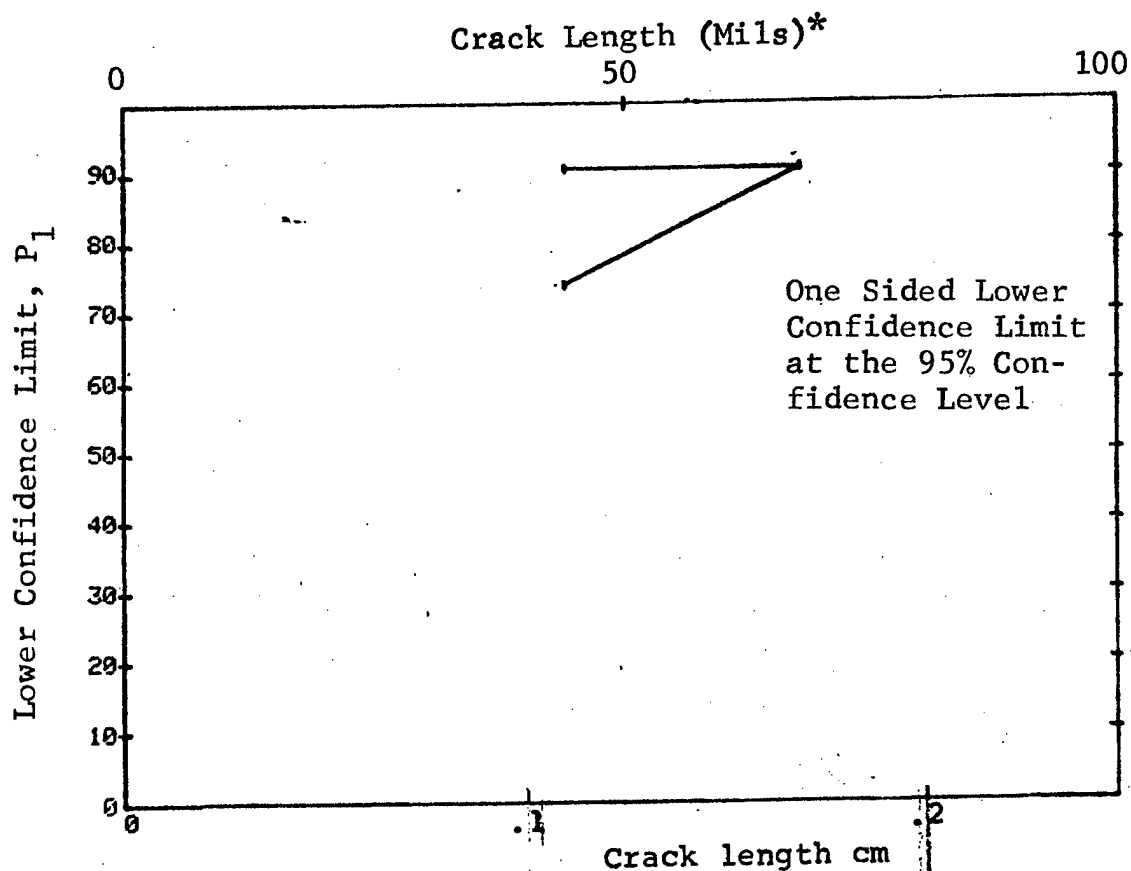


Figure D-42 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75		PENETRANT			N	TEST 3		(42)	0 MISS	1 MISS
RANGE	MIN	LN	* MAX	LN *		DET	50%			
1		0	0	0	0	0	0	0	0	0
2		0	0	0	0	0	0	0	0	0
3		0	0	0	0	0	0	0	0	0
4		0	0	0	0	0	0	0	0	0
5		0	0	0	0	0	0	0	0	0
6		0	0	0	0	0	0	0	0	0
7		0	0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0	0
32		0	0	0	0	0	0	0	0	0
		44	68		31	31	97	90	0	15

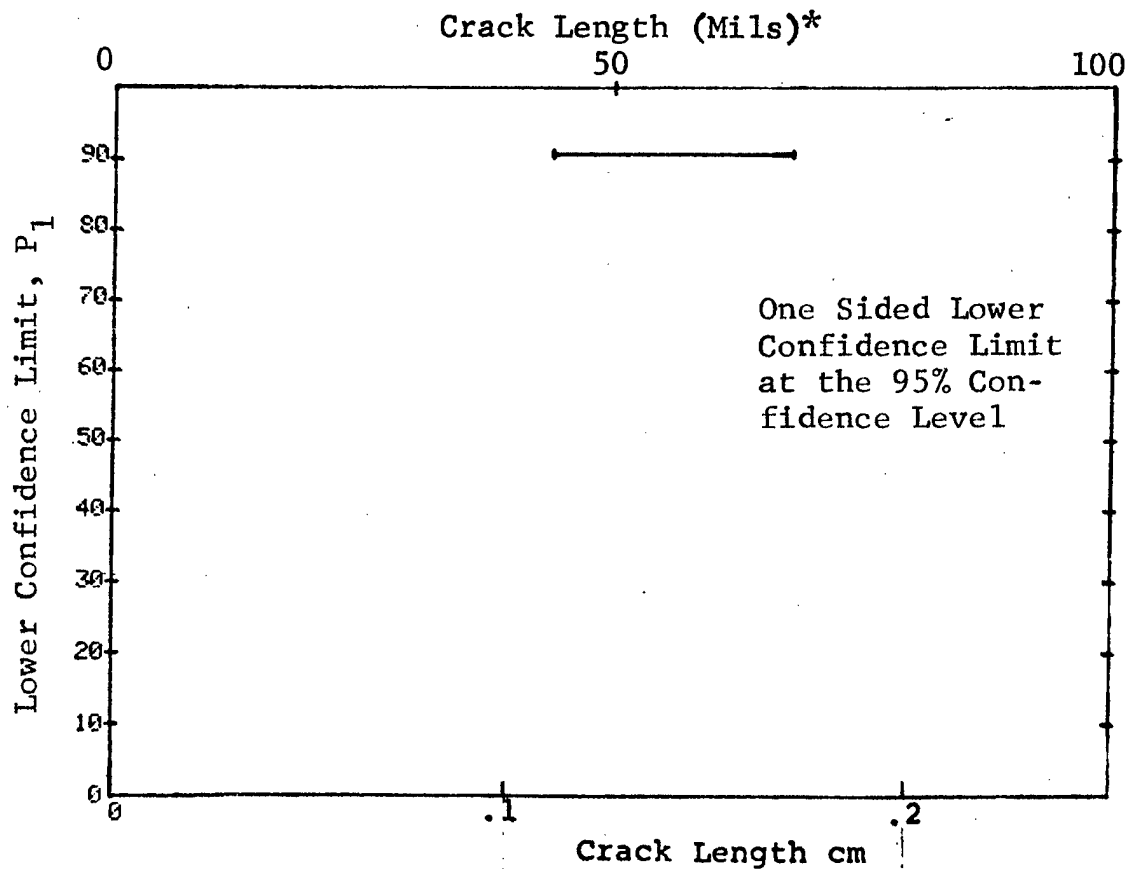


Figure D-42 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		PENETRANT		N	TEST 1		(43)		0 MISS	1 MISS
RANGE	NIN	LN	* MAX LN *		DET	50%	95%	95%		
1	19	0	19	3	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	39	39	39	5	5	87	54	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	49	49	49	7	7	90	65	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	60	60	60	24	24	97	86	0	0	0

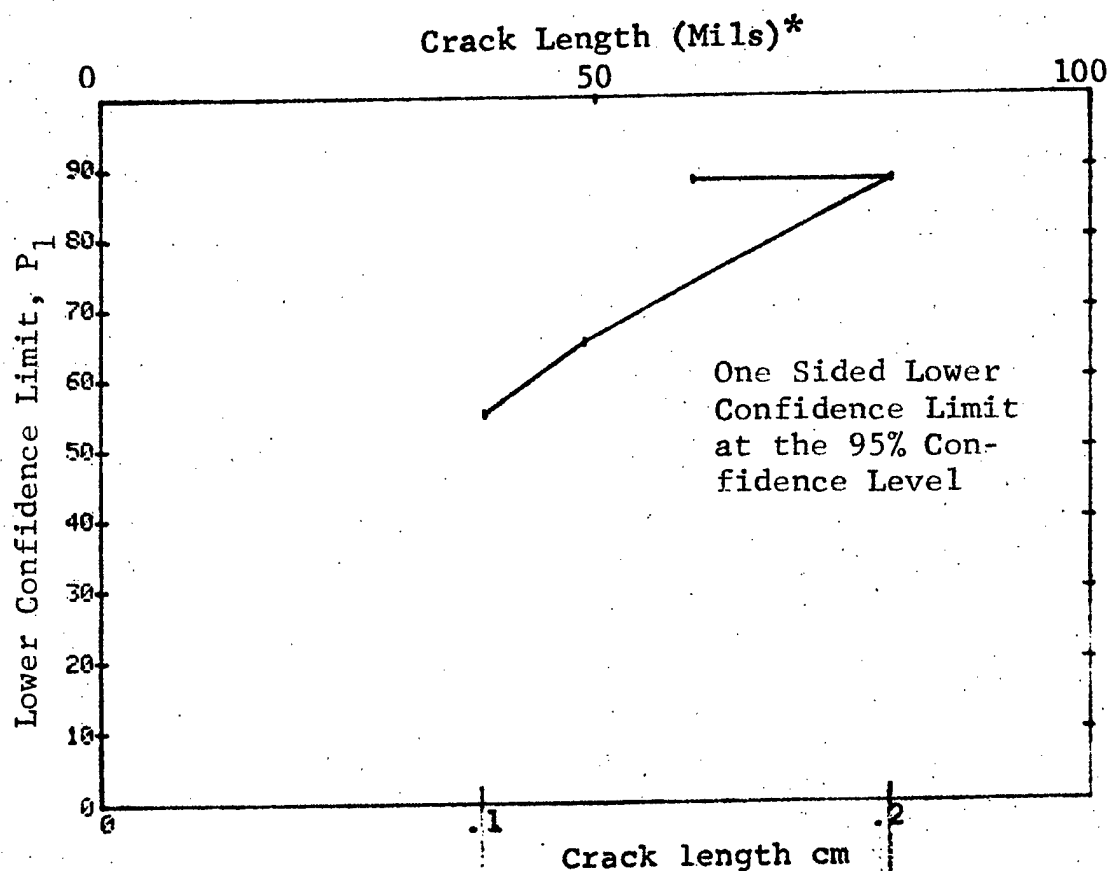


Figure D-43 Probability of Detection for PH13-8 Mo. St. Using Liquid Penetrant. Fatigue Cracks in Flat Plates. Prod. Env. D-133

(b) Optimum Probability Method of Data Cumulation

09-OCT-75	PENETRANT		TEST		(43)		
RANGE	MIN LN	MAX LN	NET	50%	95%	0 MISS	1 MISS
1	19 *	19 *	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	39	39	5	0	54	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	39	49	12	0	77	0	0
31	0	0	0	0	0	0	0
32	39	80	36	0	92	0	10

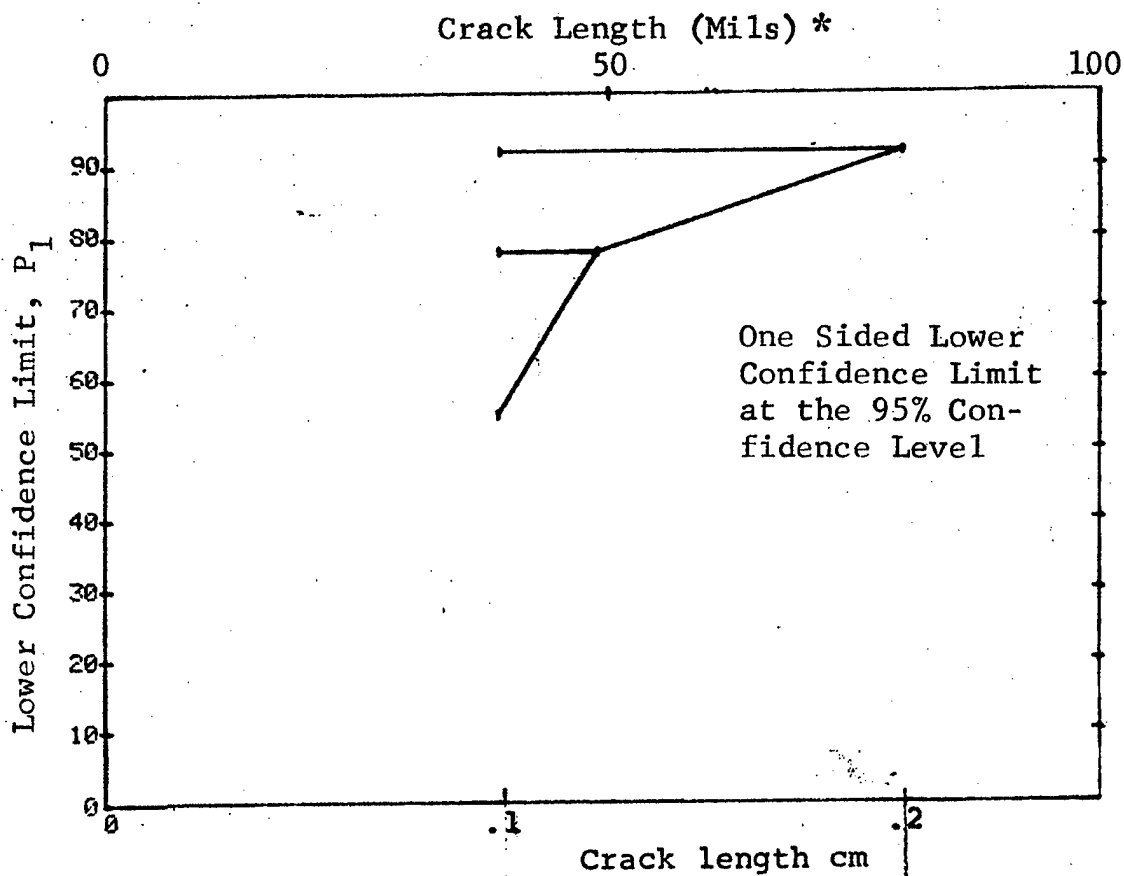


Figure D-43 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75		PENETRANT		TEST 3			(43)	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	0	0 *	0 *	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	19	80	39	36	90	81	37	50

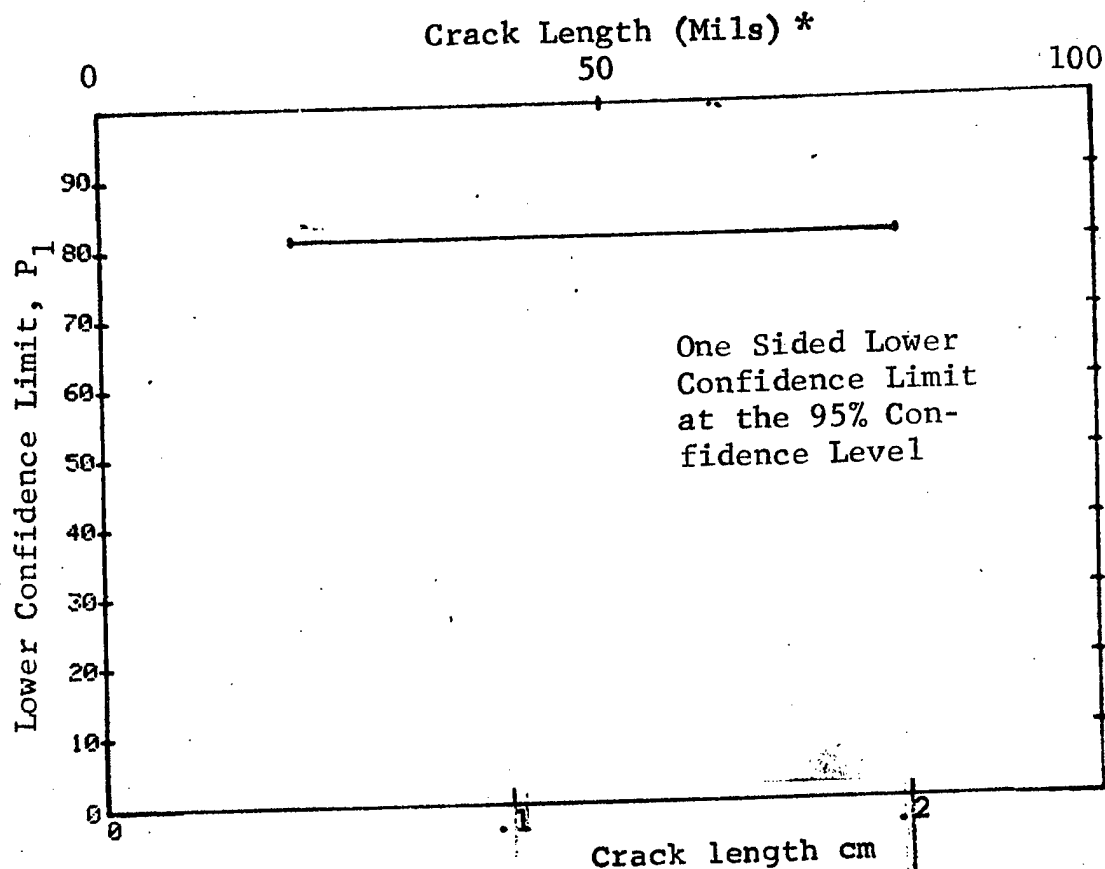


Figure D-43 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		ULTRASONIC		N	TEST 1		(44)	
RANGE	MIN	LN	* MAX LN *		DET	50%	95%	0 MISS
1	48	52	*	29	28	94	84	17
2	0	0		0	0	0	0	0
3	60	62		16	16	95	82	13
4	68	68		9	9	92	71	0
5	0	0		0	0	0	0	0
6	75	75		6	6	89	60	0
7	0	0		0	0	0	0	0
8	0	0		0	0	0	0	0
9	90	90		11	11	93	76	18
10	95	98		20	20	96	86	9
11	102	102		4	4	84	47	0
12	0	0		0	0	0	0	0
13	110	110		7	7	90	65	0
14	0	0		0	0	0	0	0
15	0	0		0	0	0	0	0
16	0	0		0	0	0	0	0
17	0	0		0	0	0	0	0
18	0	0		0	0	0	0	0
19	142	142		5	5	87	54	0
20	145	148		7	7	90	65	0
21	0	0		0	0	0	0	0
22	155	158		8	8	91	68	0
23	160	160		4	4	84	47	0
24	165	165		4	4	84	47	0
25	0	0		0	0	0	0	0
26	0	0		0	0	0	0	0
27	0	0		0	0	0	0	0
28	0	0		0	0	0	0	0
29	0	0		0	0	0	0	0
30	195	195		3	3	79	36	0
31	0	0		0	0	0	0	0
32	218	218		4	4	84	47	0

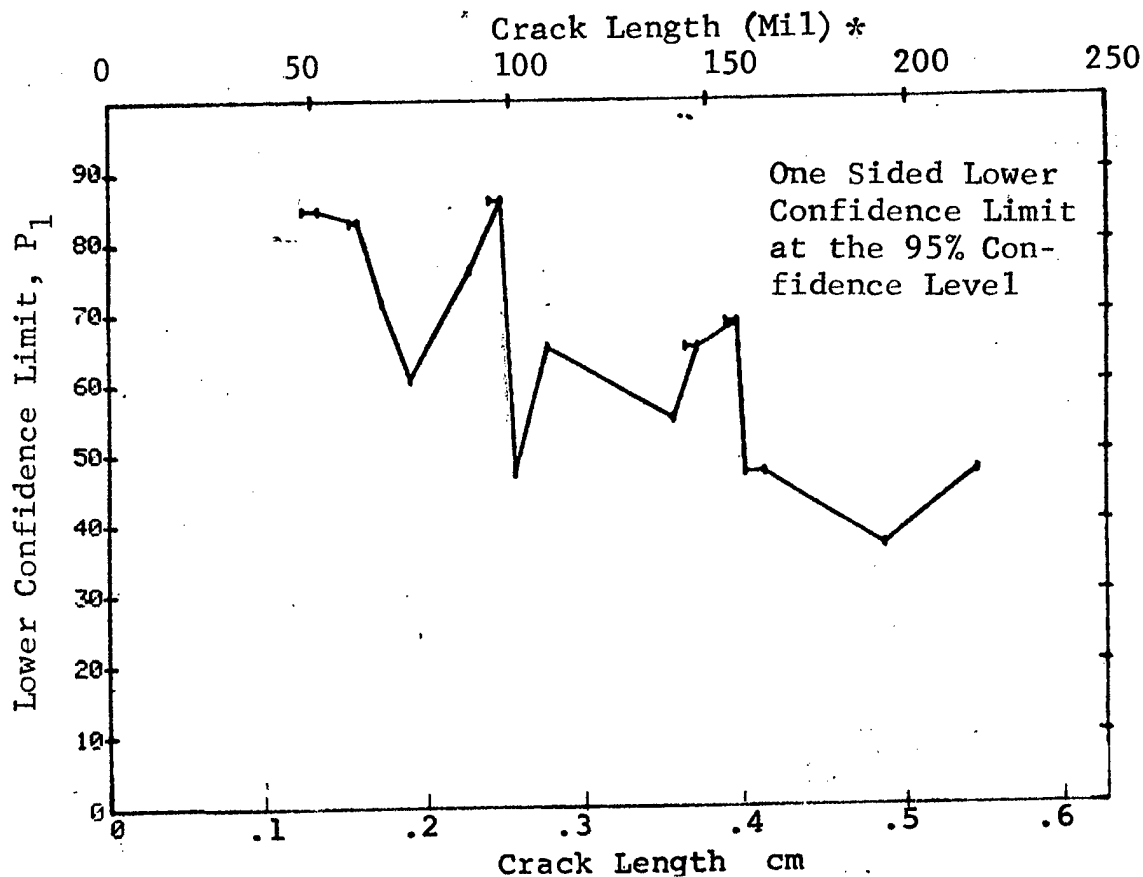


Figure D-44 Probability of Detection for Ti-6Al-4V Using Ultrasonic Shear Wave. Fatigue Cracks in Welded Flat Corroded Plates. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

09-OCT-75		ULTRASONIC		N	TEST 2		(44)		
RANGE	MIN	LN	MAX LN		DET	50%	95%	0 MISS	1 MISS
1		48 *	52 *	29	28	0	84	17	32
2		0	0	0	0	0	0	0	0
3		48	62	45	44	0	89	1	16
4		48	68	54	53	0	91	0	7
5		0	0	0	0	0	0	0	0
6		48	75	60	59	0	92	0	1
7		0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0
9		48	90	71	70	0	93	0	0
10		60	98	62	62	0	95	0	0
11		60	102	66	66	0	95	0	0
12		0	0	0	0	0	0	0	0
13		60	110	73	73	0	95	0	0
14		0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0
19		60	142	78	78	0	96	0	0
20		60	148	85	85	0	96	0	0
21		0	0	0	0	0	0	0	0
22		60	158	93	93	0	96	0	0
23		60	160	97	97	0	96	0	0
24		60	165	101	101	0	97	0	0
25		0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		60	195	104	104	0	97	0	0
31		0	0	0	0	0	0	0	0
32		60	218	108	108	0	97	0	0

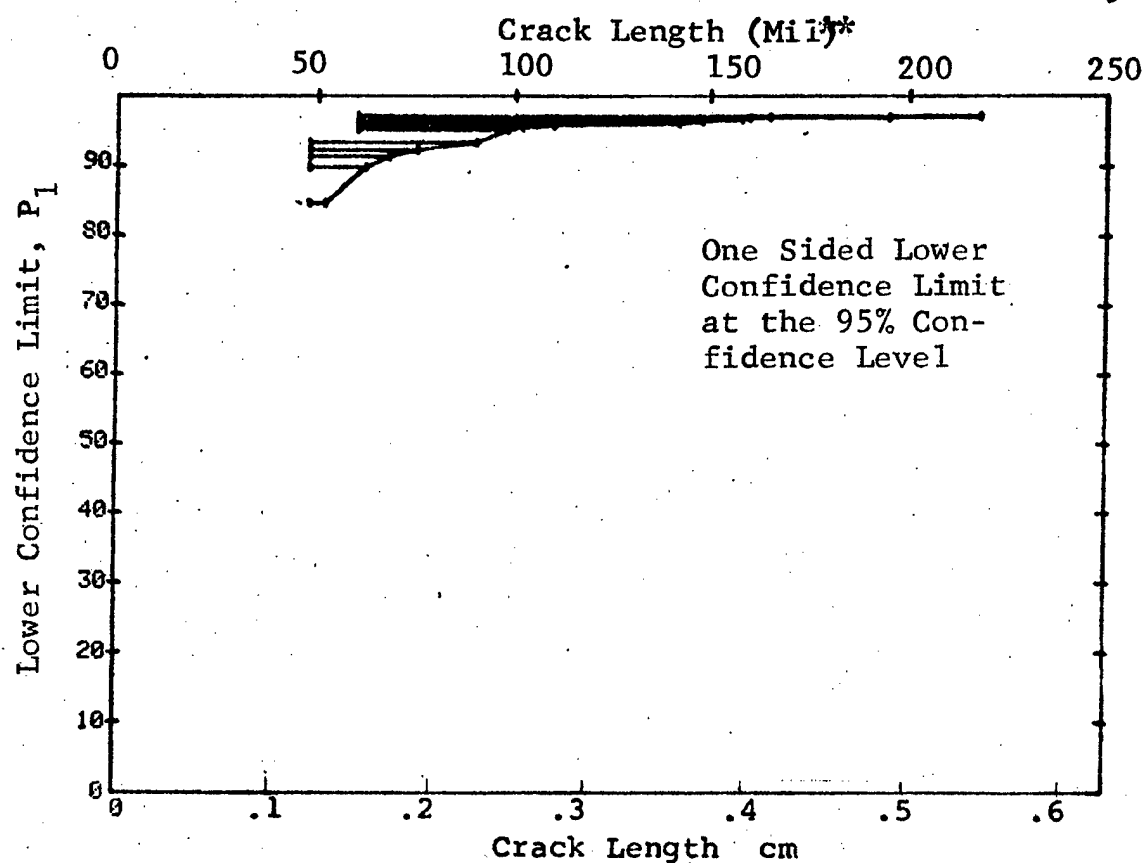


Figure D-44 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75		ULTRASONIC		TEST 3		(44)			
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	48	68	47	46	95	95	0	14	
30	50	95	60	60	98	95	0	0	
31	68	142	60	60	98	95	0	0	
32	95	218	60	60	98	95	0	0	

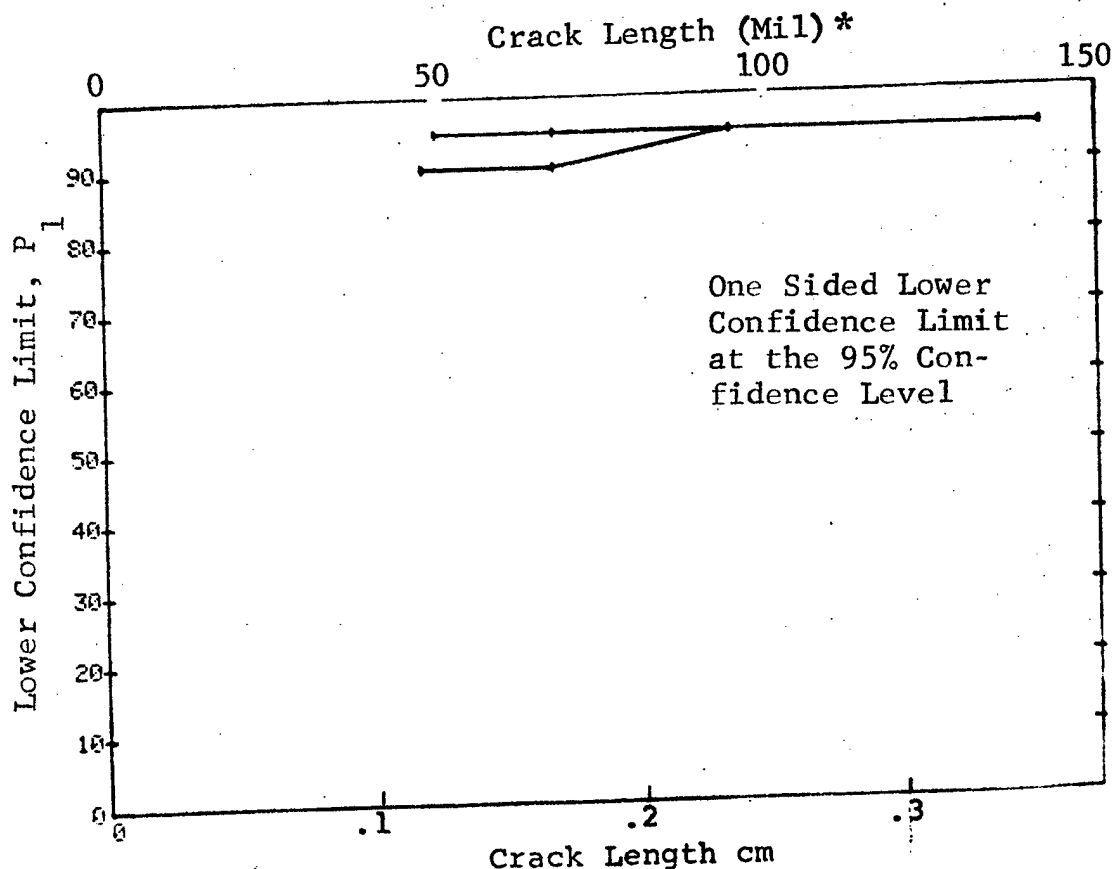


Figure D-44 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		ULTRASONIC		N	TEST 1		(45)		0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DET	50%	95%			
1	58	*	62	11	4	32	13	0	0	0
2	64		67	8	8	91	68	0	0	0
3	72		73	5	5	87	54	0	0	0
4	76		76	9	9	92	71	0	0	0
5	83		83	13	13	94	79	16	33	0
6	86		86	10	10	93	74	0	0	0
7	90		91	14	11	74	53	0	0	0
8	95		97	15	15	95	81	14	31	0
9	99		99	14	14	95	80	15	32	0
10	106		108	8	8	91	68	0	0	0
11	109		113	11	11	93	76	18	35	0
12	117		118	8	8	91	68	0	0	0
13	119		119	3	3	79	36	0	0	0
14	126		126	4	4	84	47	0	0	0
15	0		0	0	0	0	0	0	0	0
16	0		0	0	0	0	0	0	0	0
17	0		0	0	0	0	0	0	0	0
18	0		0	0	0	0	0	0	0	0
19	0		0	0	0	0	0	0	0	0
20	0		0	0	0	0	0	0	0	0
21	161		161	4	4	84	47	0	0	0
22	0		0	0	0	0	0	0	0	0
23	0		0	0	0	0	0	0	0	0
24	0		0	0	0	0	0	0	0	0
25	0		0	0	0	0	0	0	0	0
26	184		184	5	5	87	54	0	0	0
27	0		0	0	0	0	0	0	0	0
28	0		0	0	0	0	0	0	0	0
29	199		201	11	11	93	76	18	35	0
30	204		204	4	4	84	47	0	0	0
31	0		0	0	0	0	0	0	0	0
32	216		216	6	6	89	60	0	0	0

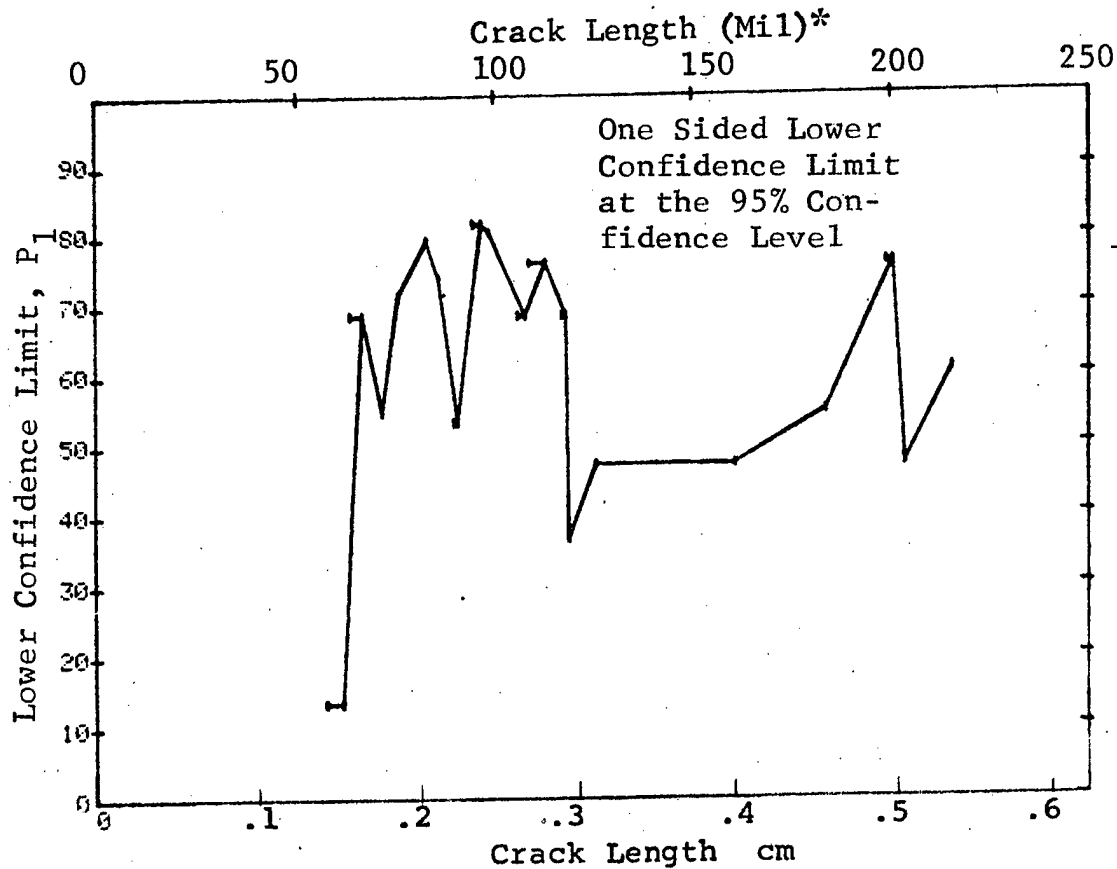


Figure D-45 Probability of Detection for 4330V Steel Using Ultrasonic Shear Wave. Simulated Weld Flaws Prod. Env.

(b) Optimum Probability Method of Data Cumulation

09-OCT-75	ULTRASONIC				TEST 2				(45)	
RANGE	MIN	LN	* MAX	LN *	N	DET	50%	95%	0 MISS	1 MISS
1	58		* 62	*	11	4	0	13	0	0
2	64		63		8	8	0	68	0	0
3	64		72		13	13	0	79	0	0
4	64		76		22	22	0	87	7	24
5	64		83		35	35	0	91	0	11
6	64		86		45	45	0	93	0	1
7	64		91		59	56	0	87	17	30
8	64		97		74	71	0	89	2	15
9	64		99		88	85	0	91	0	1
10	95		108		37	37	0	92	0	9
11	95		113		48	48	0	93	0	0
12	95		118		56	56	0	94	0	0
13	95		119		59	59	0	95	0	0
14	95		126		63	63	0	95	0	0
15	0		0		0	0	0	0	0	0
16	0		0		0	0	0	0	0	0
17	0		0		0	0	0	0	0	0
18	0		0		0	0	0	0	0	0
19	0		0		0	0	0	0	0	0
20	0		0		0	0	0	0	0	0
21	95		161		67	67	0	95	0	0
22	0		0		0	0	0	0	0	0
23	0		0		0	0	0	0	0	0
24	0		0		0	0	0	0	0	0
25	0		0		0	0	0	0	0	0
26	95		184		72	72	0	95	0	0
27	0		0		0	0	0	0	0	0
28	0		0		0	0	0	0	0	0
29	95		201		83	83	0	96	0	0
30	95		204		87	87	0	96	0	0
31	0		0		0	0	0	0	0	0
32	95		216		93	93	0	96	0	0

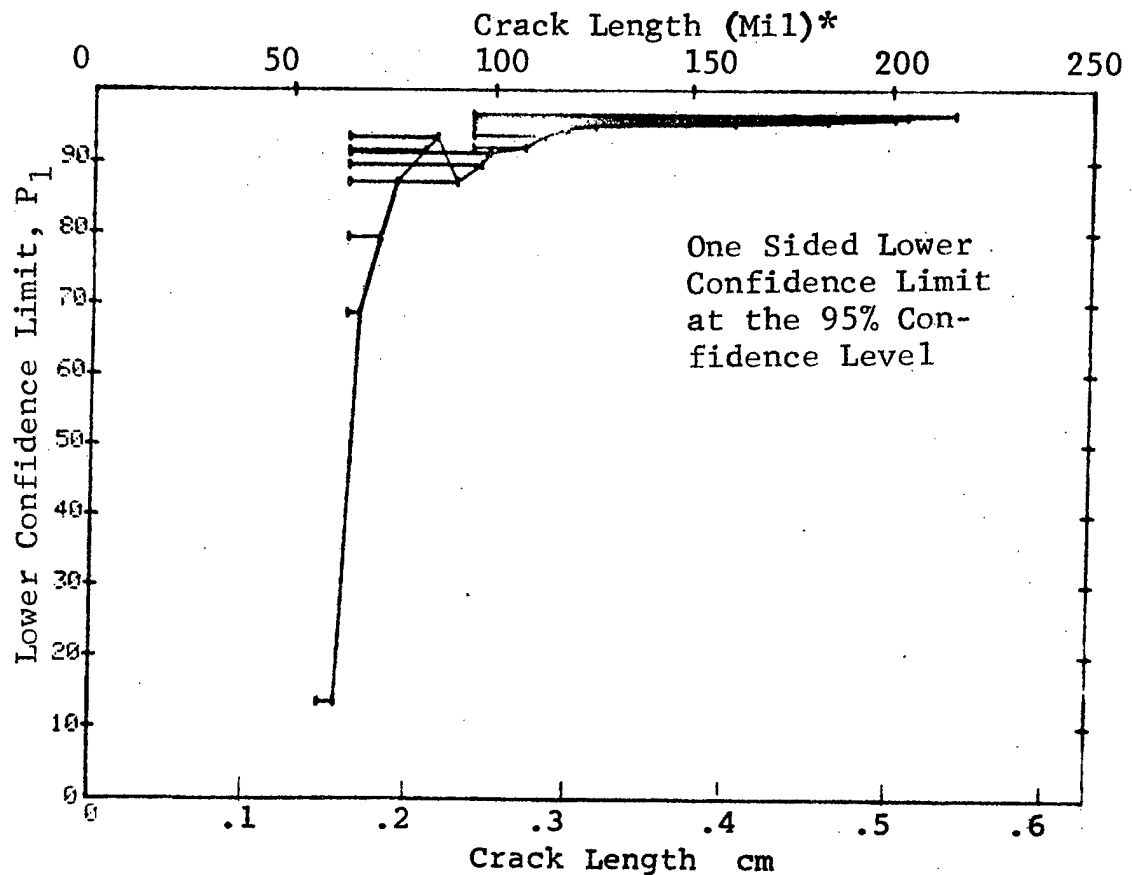


Figure D-45 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75		ULTRASONIC		TEST 3			(45)		
RANGE	MIN	LN *	MAX LN *	N	DET	50%	95%	0 MISS	1 MISS
1		0	0	0	0	0	0	0	0
2		0	0	0	0	0	0	0	0
3		0	0	0	0	0	0	0	0
4		0	0	0	0	0	0	0	0
5		0	0	0	0	0	0	0	0
6		0	0	0	0	0	0	0	0
7		0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0
28	58		83	43	36	82	71	0	0
29	64		95	60	57	93	87	10	10
30	83		106	60	57	93	87	16	16
31	95		126	60	60	98	95	0	0
32	108		216	60	60	98	95	0	0

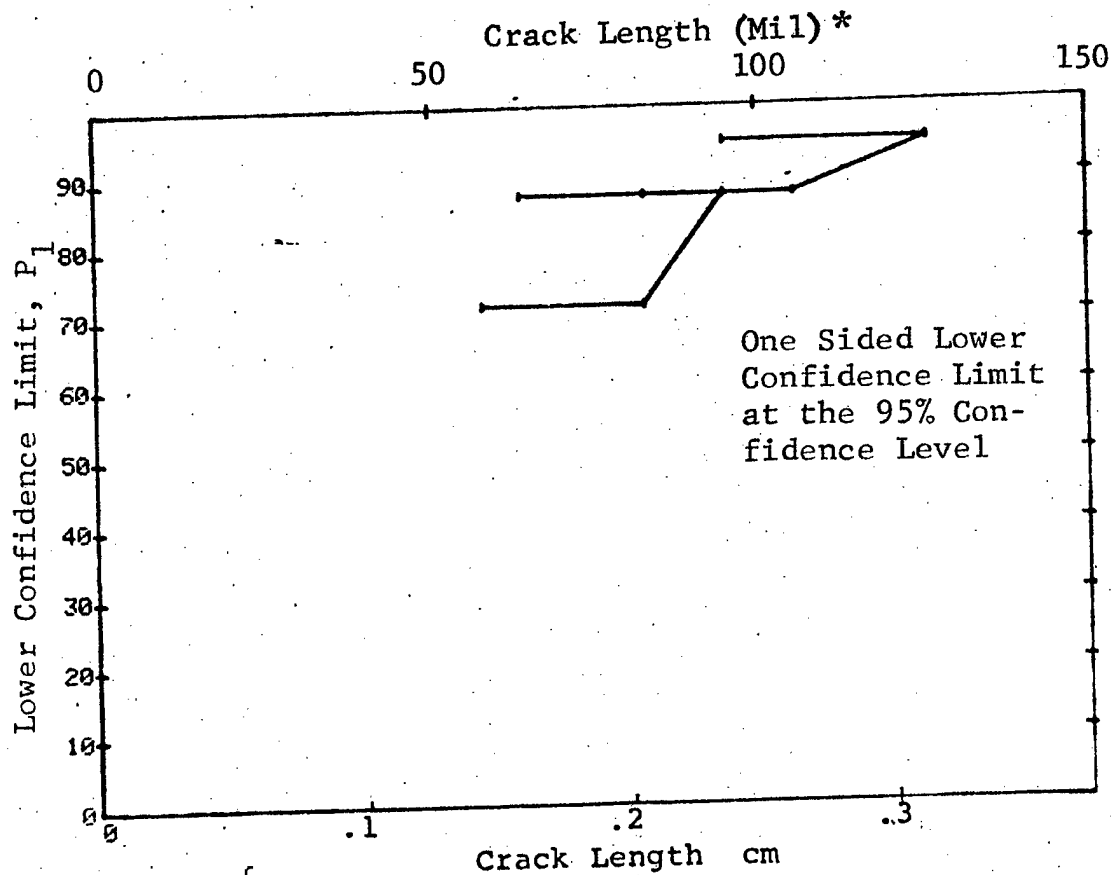


Figure D-45 Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		ULTRASONIC		TEST 1		(46)				
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		58	*	58	*	4	84	47	0	0
2		64		65		8	91	68	0	0
3		72		72		5	87	54	0	0
4		76		76		4	84	47	0	0
5		83		83		4	84	47	0	0
6		86		86		4	84	47	0	0
7		91		91		3	79	36	0	0
8		95		98		12	94	77	17	34
9		99		99		4	84	47	0	0
10		106		108		8	91	68	0	0
11		109		113		11	93	76	18	35
12		117		118		8	91	68	0	0
13		0		0		0	0	0	0	0
14		126		126		4	84	47	0	0
15		0		0		0	0	0	0	0
16		0		0		0	0	0	0	0
17		0		0		0	0	0	0	0
18		0		0		0	0	0	0	0
19		0		0		0	0	0	0	0
20		0		0		0	0	0	0	0
21		161		161		3	79	36	0	0
22		0		0		0	0	0	0	0
23		0		0		0	0	0	0	0
24		0		0		0	0	0	0	0
25		0		0		0	0	0	0	0
26		184		184		4	84	47	0	0
27		0		0		0	0	0	0	0
28		0		0		0	0	0	0	0
29		199		201		8	91	68	0	0
30		204		204		3	79	36	0	0
31		0		0		0	0	0	0	0
32		215		215		4	84	47	0	0

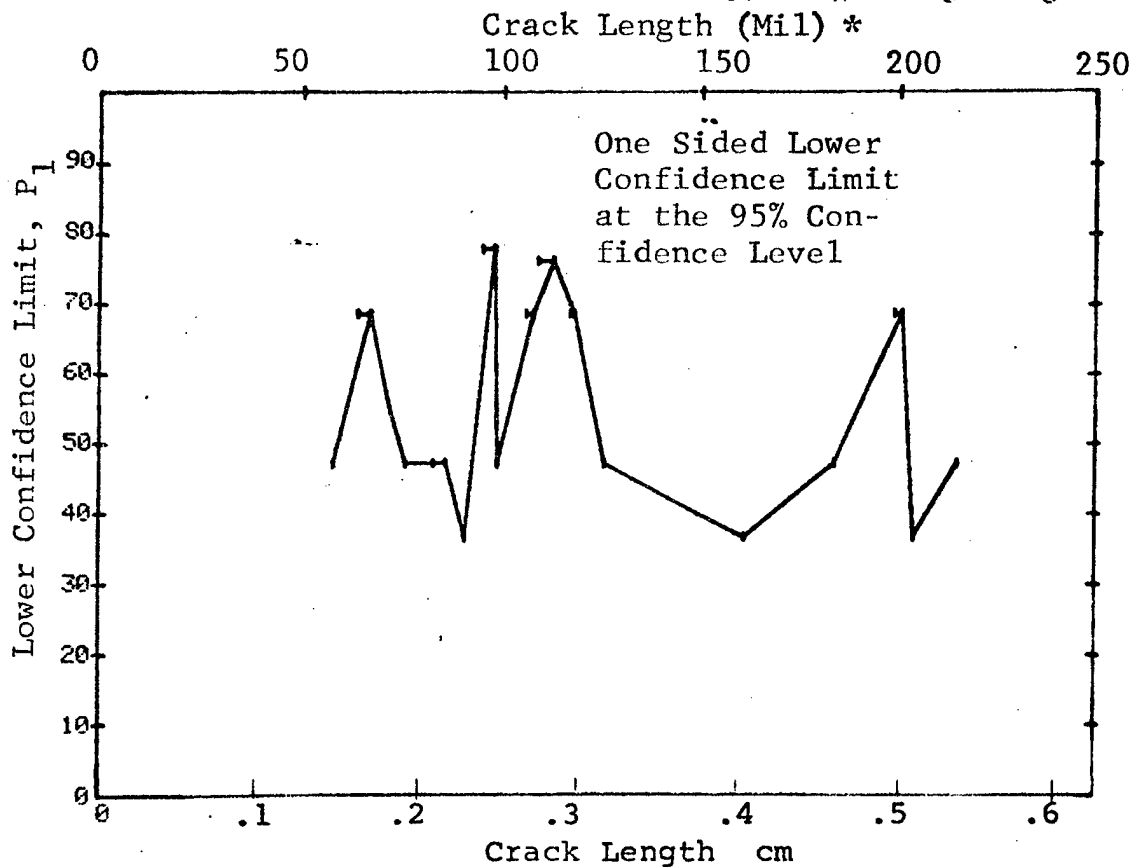


Figure D-46 Probability of Detection for PH17-4 Steel Using Ultrasonic Shear Wave. Simulated Flaws in Wrought Steel. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

09-OCT-75		ULTRASONIC		N	TEST 2		(46)		0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DET	50%	95%			
1		58 *	58 *	4	4	0	47	0	0	0
2		58	67	12	12	0	77	0	0	0
3		58	72	17	17	0	83	12	29	29
4		58	76	21	21	0	86	8	25	25
5		58	83	25	25	0	88	4	21	21
6		58	86	29	29	0	90	0	17	17
7		58	91	32	32	0	91	0	14	14
8		58	98	44	44	0	93	0	2	2
9		58	99	48	48	0	93	0	0	0
10		58	108	56	56	0	94	0	0	0
11		58	113	67	67	0	95	0	0	0
12		58	118	75	75	0	96	0	0	0
13		0	0	0	0	0	0	0	0	0
14		58	126	79	79	0	96	0	0	0
15		0	0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0	0
21		58	161	82	82	0	96	0	0	0
22		0	0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0	0
26		58	184	86	86	0	96	0	0	0
27		0	0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0	0
29		58	201	94	94	0	96	0	0	0
30		58	204	97	97	0	96	0	0	0
31		0	0	0	0	0	0	0	0	0
32		58	215	101	101	0	97	0	0	0

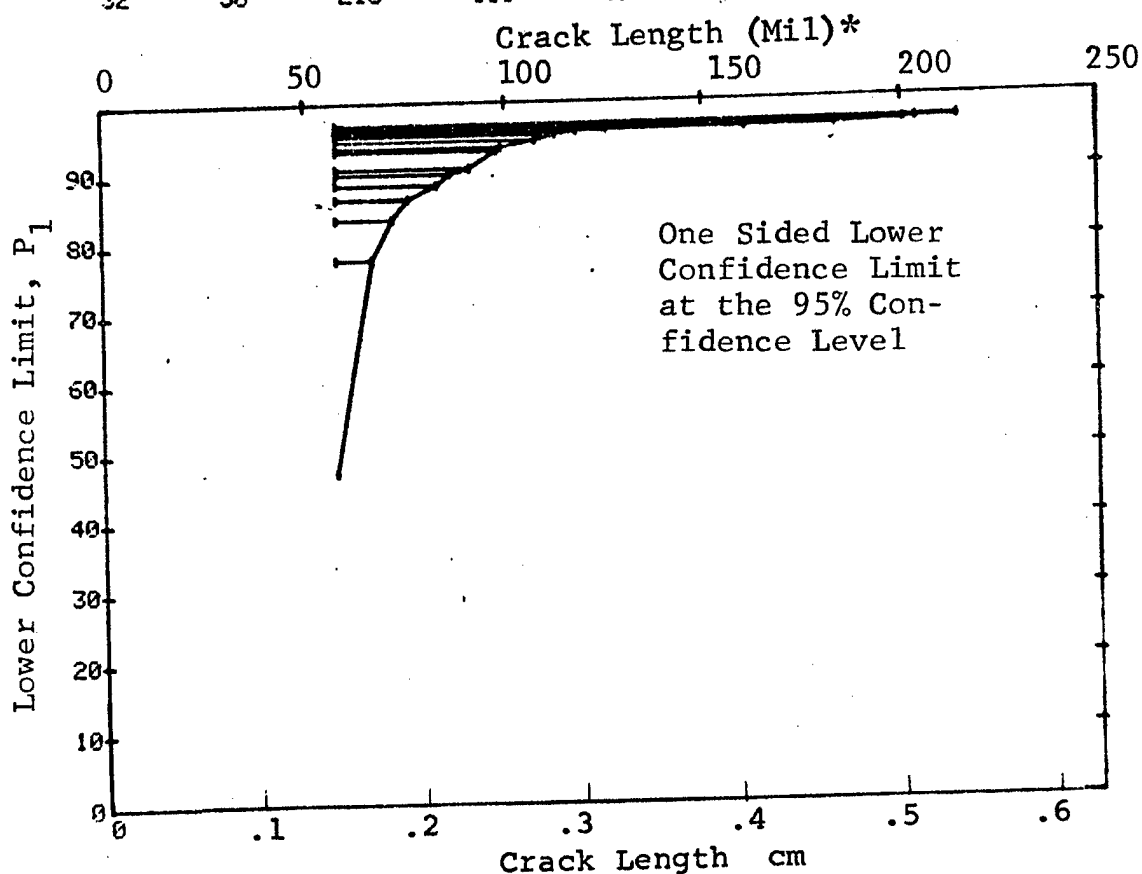


Figure D-46 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75			ULTRASONIC			TEST 3			(46)	
RANGE	MIN	LN	* MAX	LN *	N	DET	50%	95%	0 MISS	1 MISS
1		0		0	0	0	0	0	0	0
2		0		0	0	0	0	0	0	0
3		0		0	0	0	0	0	0	0
4		0		0	0	0	0	0	0	0
5		0		0	0	0	0	0	0	0
6		0		0	0	0	0	0	0	0
7		0		0	0	0	0	0	0	0
8		0		0	0	0	0	0	0	0
9		0		0	0	0	0	0	0	0
10		0		0	0	0	0	0	0	0
11		0		0	0	0	0	0	0	0
12		0		0	0	0	0	0	0	0
13		0		0	0	0	0	0	0	0
14		0		0	0	0	0	0	0	0
15		0		0	0	0	0	0	0	0
16		0		0	0	0	0	0	0	0
17		0		0	0	0	0	0	0	0
18		0		0	0	0	0	0	0	0
19		0		0	0	0	0	0	0	0
20		0		0	0	0	0	0	0	0
21		0		0	0	0	0	0	0	0
22		0		0	0	0	0	0	0	0
23		0		0	0	0	0	0	0	0
24		0		0	0	0	0	0	0	0
25		0		0	0	0	0	0	0	0
26		0		0	0	0	0	0	0	0
27		0		0	0	0	0	0	0	0
28		0		0	0	0	0	0	0	0
29		0		0	0	0	0	0	0	0
30	58		98		41	41	98	92	0	5
31	67		117		60	60	98	95	0	0
32	98		215		60	60	98	95	0	0

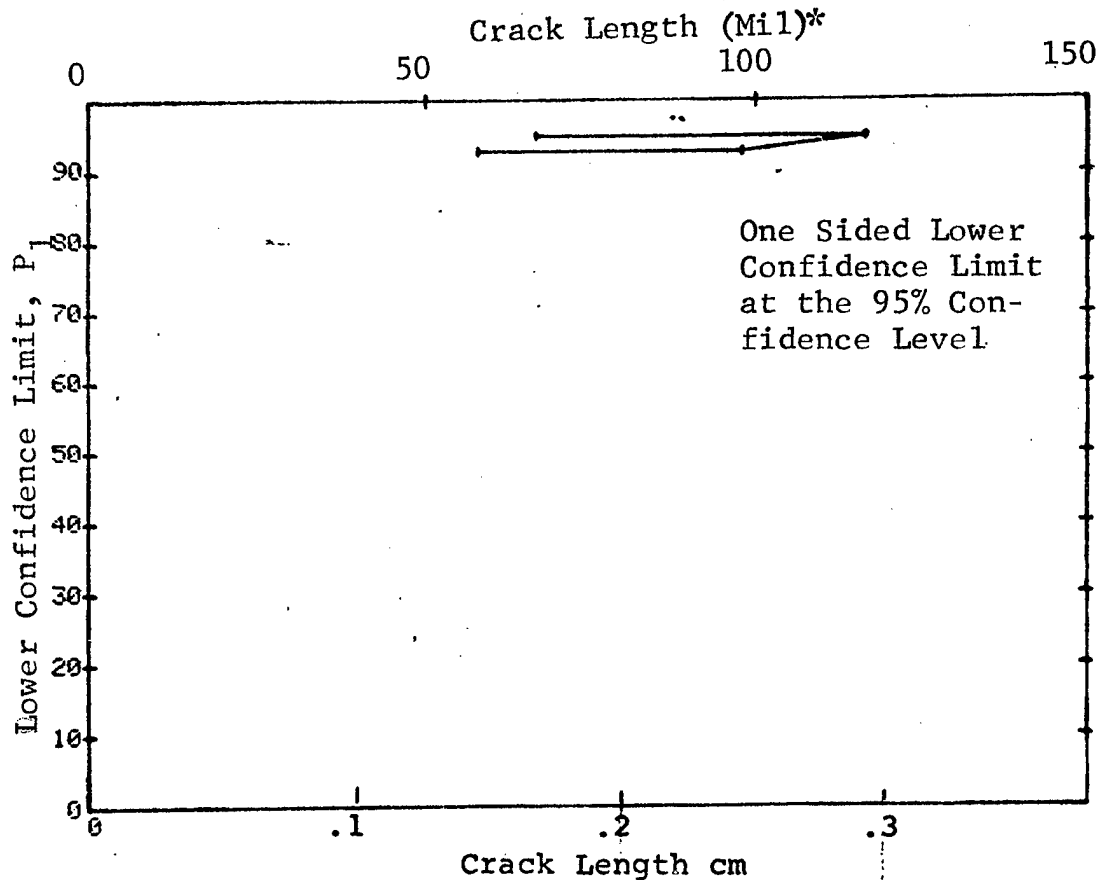


Figure D-46 (Concluded)

(a) Range Interval Method of Data Cumulation

09-OCT-75		MAGNETIC PARTICLE		TEST 1		(47)		
RANGE	MIN LN	* MAX LN *	N	DET	50%	95%	0 MISS	1 MISS
1	32	32	3	2	50	13	0	0
2	41	143	11	11	93	76	18	35
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	65	65	3	3	79	36	0	0
7	70	72	14	13	98	70	0	0
8	77	80	4	4	84	47	0	0
9	0	0	0	0	0	0	0	0
10	88	91	16	16	95	82	13	30
11	93	95	7	7	90	65	0	0
12	100	100	4	4	84	47	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	117	118	11	11	93	76	18	35
16	0	0	0	0	0	0	0	0
17	132	132	5	5	87	54	0	0
18	0	0	0	0	0	0	0	0
19	141	143	9	9	92	71	0	0
20	147	149	13	13	94	79	16	33
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	170	170	6	6	89	60	0	0
24	0	0	0	0	0	0	0	0
25	181	181	6	6	89	60	0	0
26	184	184	9	9	92	71	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	226	226	5	5	87	54	0	0

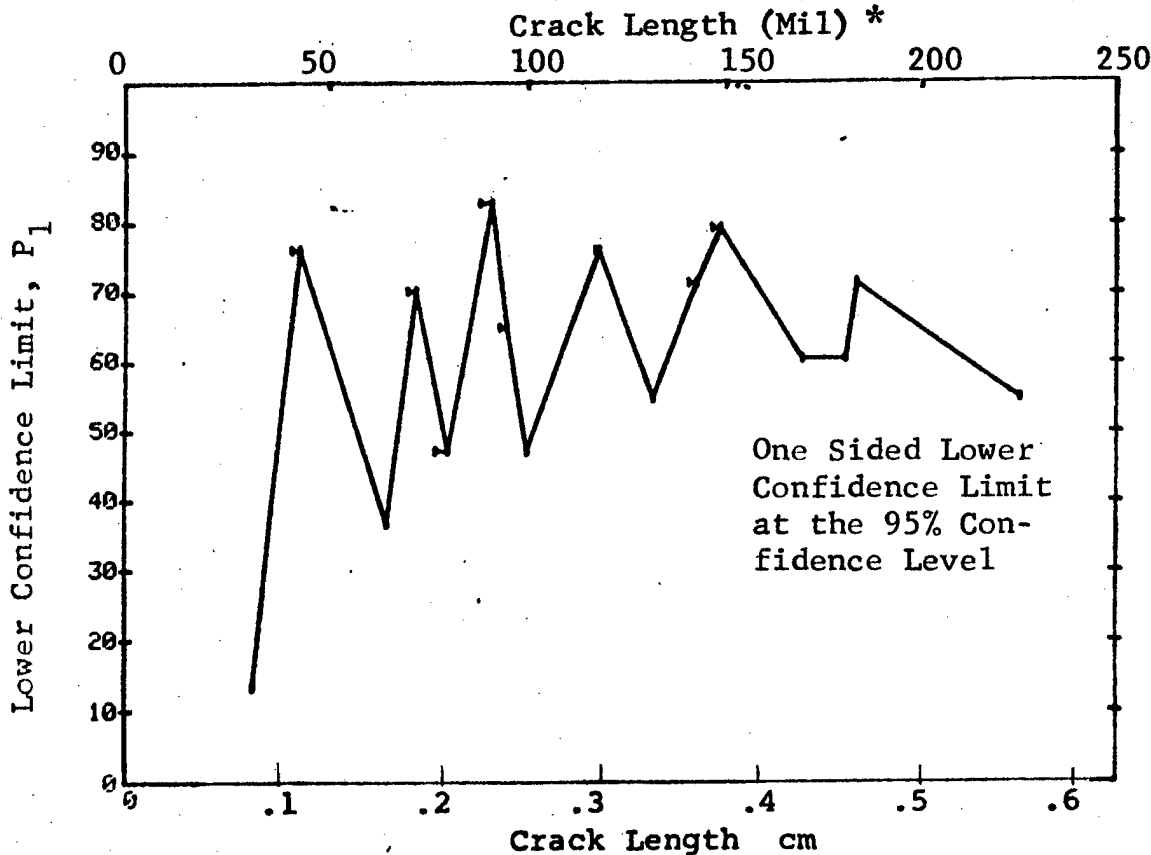


Figure D-47 Probability of Detection for PH17-4 Steel Using Ultrasonic Shear Wave. Fatigue Cracks in Flat Plates. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

09-OCT-75				MAGNETIC PARTICLE		TEST 2		(47)	
RANGE	MIN	LN	MAX LN	*	N	DET	50%	95%	0 MISS
1	32	32	32	*	3	2	0	13	0
2	41	41	43		11	11	0	76	0
3	0	0	0		0	0	0	0	0
4	0	0	0		0	0	0	0	0
5	0	0	0		0	0	0	0	0
6	41	65	14		14	14	0	80	15
7	41	72	28		27	27	0	84	18
8	41	80	32		31	31	0	86	14
9	0	0	0		0	0	0	0	0
10	41	91	48		47	47	0	90	0
11	41	95	55		54	54	0	91	6
12	41	100	59		58	58	0	92	2
13	0	0	0		0	0	0	0	0
14	0	0	0		0	0	0	0	0
15	41	118	70		69	69	0	93	0
16	0	0	0		0	0	0	0	0
17	77	132	47		47	47	0	93	0
18	0	0	0		0	0	0	0	0
19	77	143	56		56	56	0	94	0
20	77	149	69		69	69	0	95	0
21	0	0	0		0	0	0	0	0
22	0	0	0		0	0	0	0	0
23	77	170	75		75	75	0	96	0
24	0	0	0		0	0	0	0	0
25	77	181	81		81	81	0	96	0
26	77	184	90		90	90	0	96	0
27	0	0	0		0	0	0	0	0
28	0	0	0		0	0	0	0	0
29	0	0	0		0	0	0	0	0
30	0	0	0		0	0	0	0	0
31	0	0	0		0	0	0	0	0
32	77	226	95		95	95	0	96	0

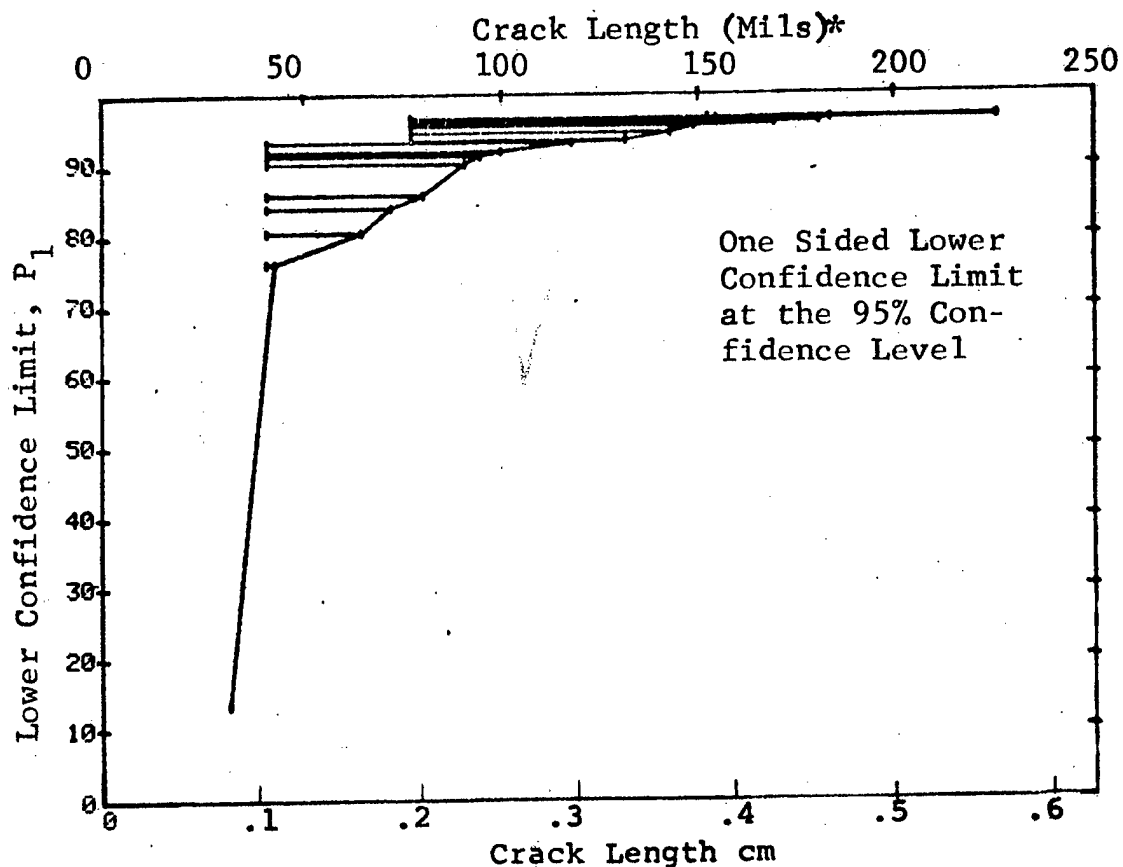


Figure D-47 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

09-OCT-75 MAGNETIC PARTICLE				TEST 3		(47)			
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0*	0*	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	32	88	36	34	92	93	20	40	
30	41	117	60	59	97	93	0	1	
31	88	149	60	60	98	95	0	0	
32	117	226	60	60	98	95	0	0	

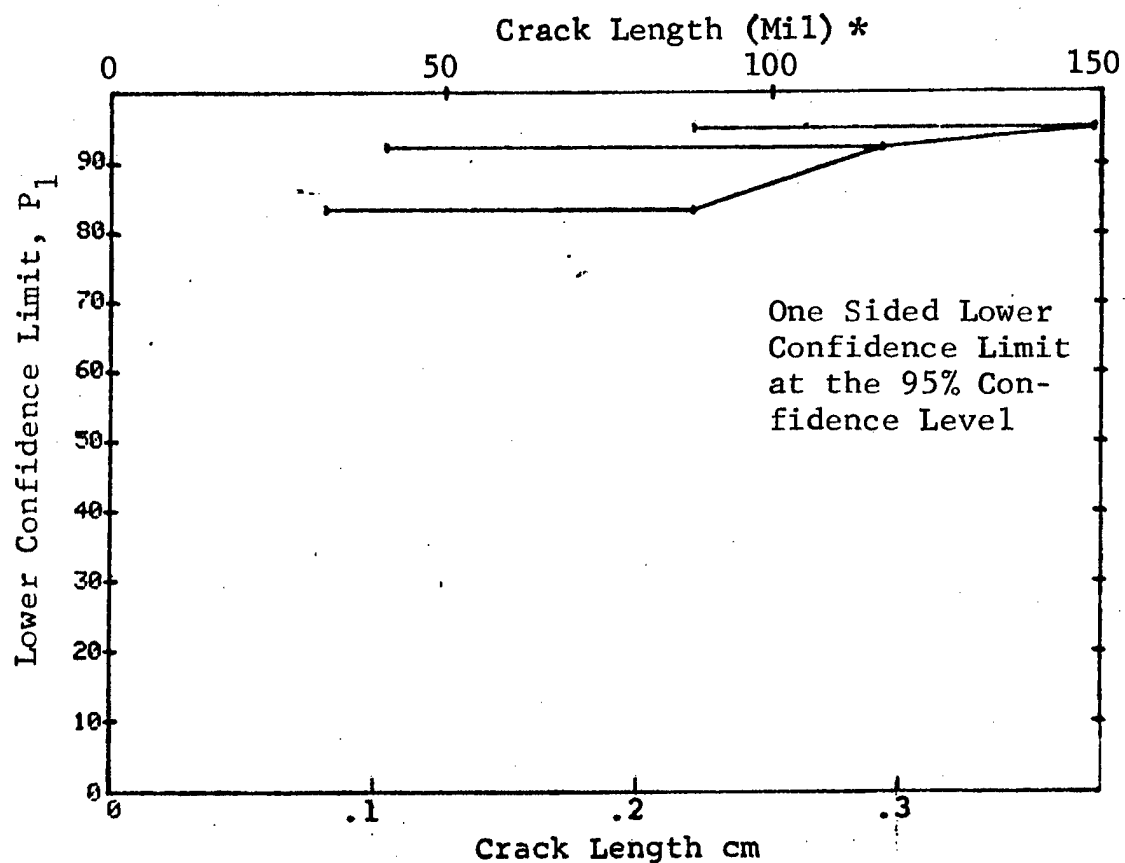


Figure D-47 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75 PENETRANT				TEST 1 (MERGE ALL ALUMINUM) (48)			
RANGE	MIN LN	MAX LN	N	DET	90%	95%	MISS
1	7 *	38 *	336	88	38	33	0
2	40	68	441	42	77	74	0
3	70	100	637	554	88	86	0
4	101	131	281	360	92	89	0
5	132	162	231	203	87	83	0
6	164	190	47	45	94	87	14
7	194	197	9	7	71	45	0
8	241	253	70	63	97	93	0
9	256	283	119	119	99	97	0
10	287	317	112	109	96	93	0
11	318	347	175	165	93	90	0
12	352	372	70	63	89	82	59
13	381	408	28	27	94	84	18
14	426	426	7	7	90	65	0
15	442	472	70	67	94	89	6
16	474	503	154	149	96	93	0
17	504	534	182	180	98	96	0
18	535	559	49	47	94	87	12
19	568	568	7	7	90	65	0
20	610	610	7	7	90	65	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	710	710	7	7	90	65	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0
32	979	979	7	7	90	65	0

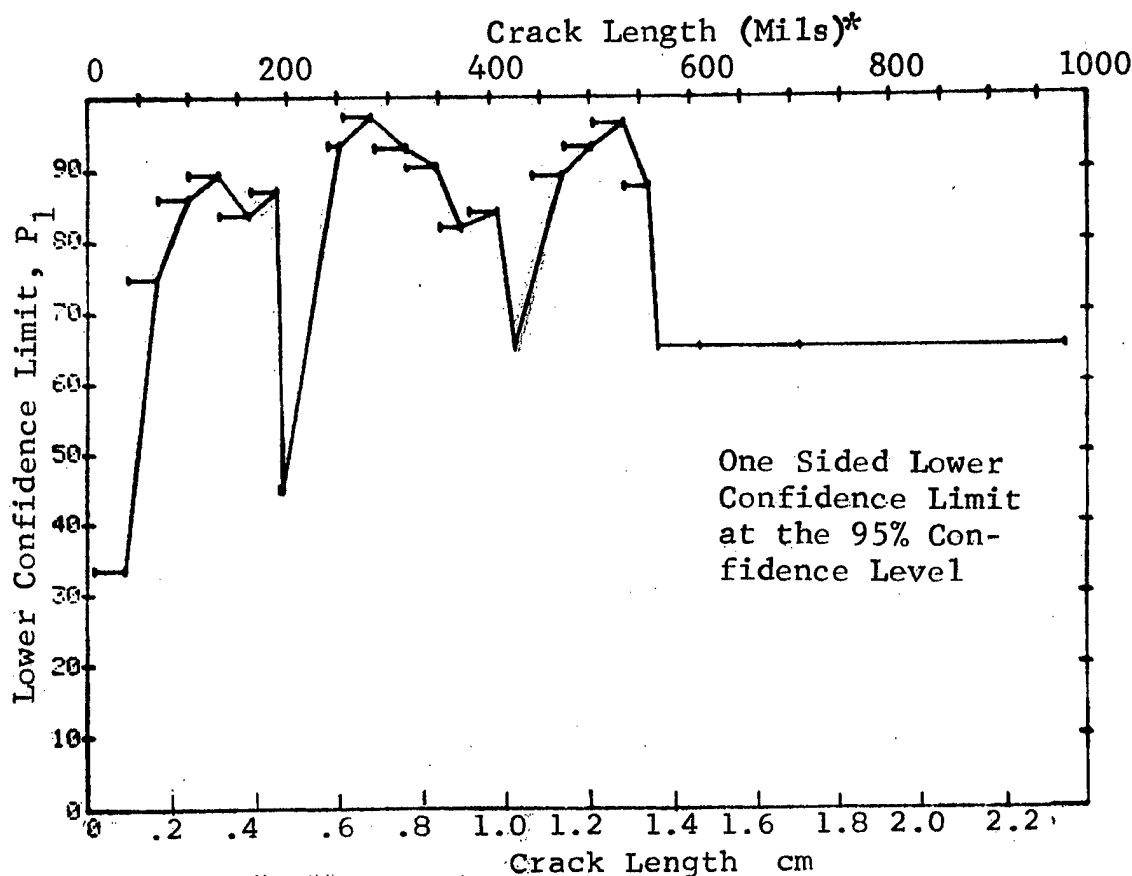


Figure D-48 Probability of Detection for Aluminum Using Liquid Penetrant Fatigue Cracks in Flat Plates.

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		PENETRANT		N	TEST 2 (MERGE ALL ALUMINUM) (48)				
RANGE	MIN LN	MAX LN	*		DET	50%	95%	0 MISS	1 MISS
1	7	38	*	226	89	0	33	0	0
2	40	89		441	498	0	74	0	0
3	70	100		627	554	0	86	0	0
4	101	131		281	260	0	82	0	0
5	101	162		512	463	0	88	0	0
6	101	190		559	508	0	88	0	0
7	101	197		568	515	0	88	0	0
8	241	253		70	69	0	93	0	0
9	256	283		119	119	0	97	0	0
10	241	317		301	297	0	96	0	0
11	241	347		476	462	0	95	0	0
12	241	372		546	535	0	94	0	0
13	241	408		574	552	0	94	0	0
14	241	426		581	559	0	94	0	0
15	241	472		651	626	0	94	0	0
16	241	503		805	775	0	94	0	0
17	504	534		182	180	0	96	0	0
18	504	559		231	227	0	96	0	0
19	504	568		238	234	0	96	0	0
20	504	610		245	241	0	96	0	0
21	0	0		0	0	0	0	0	0
22	0	0		0	0	0	0	0	0
23	504	710		252	248	0	96	0	0
24	0	0		0	0	0	0	0	0
25	0	0		0	0	0	0	0	0
26	0	0		0	0	0	0	0	0
27	0	0		0	0	0	0	0	0
28	0	0		0	0	0	0	0	0
29	0	0		0	0	0	0	0	0
30	0	0		0	0	0	0	0	0
31	0	0		0	0	0	0	0	0
32	504	979		259	255	0	96	0	0

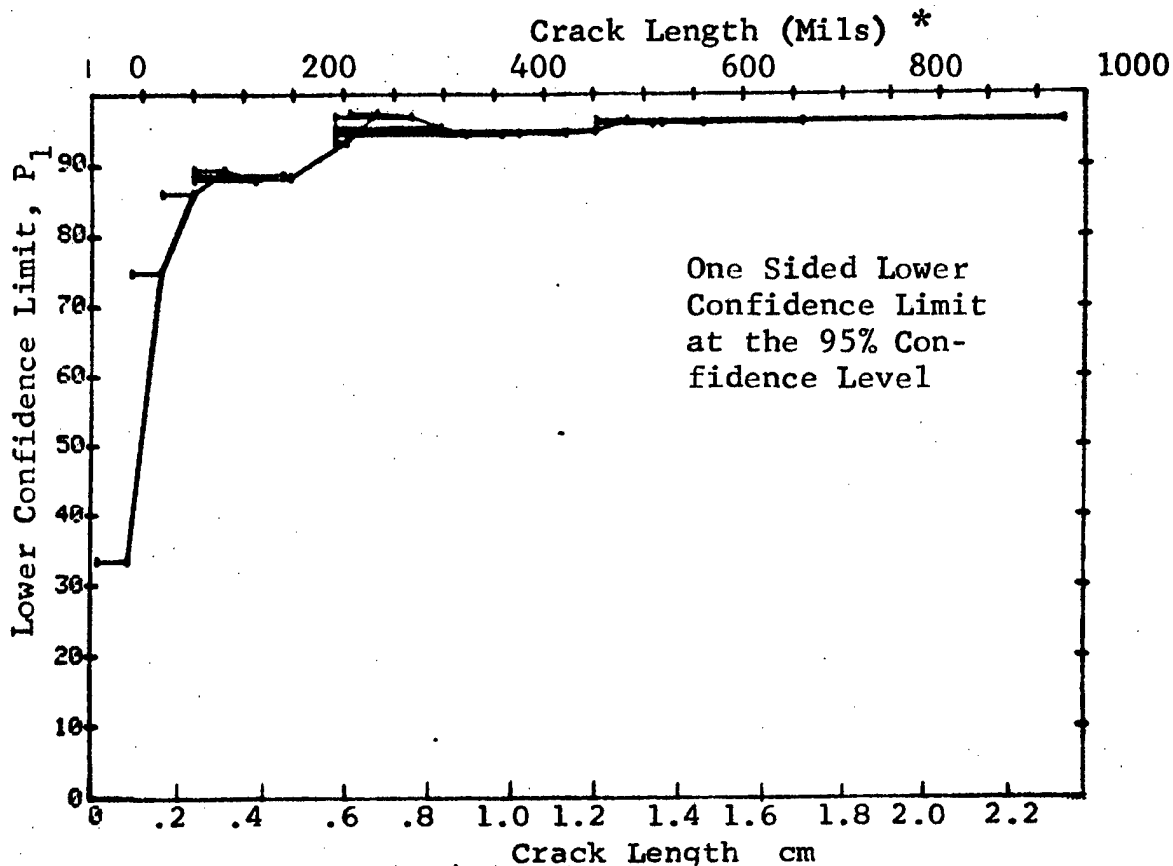


Figure D-48 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

15-OCT-75		PENETRANT		N	1001 (MERGE ALL ALUMINUM) (48)				
RANGE	MIN LN	* MIN LN	* MAX LN		LET	50%	25%	0.1%	0.01%
1	143	*	149	60	52	85	77	82	94
2	144		153	60	52	85	77	82	94
3	149		158	60	51	83	75	84	100
4	153		182	60	57	93	87	16	25
5	158		190	60	58	95	89	1	16
6	182		247	60	55	90	83	43	58
7	190		249	60	57	93	87	16	29
8	247		257	60	60	98	95	0	0
9	249		258	60	60	98	95	0	0
10	257		261	60	60	98	95	0	0
11	258		275	60	60	98	95	0	0
12	261		288	60	60	98	95	0	0
13	279		296	60	60	98	95	0	0
14	288		306	60	59	97	92	0	1
15	296		313	60	58	95	89	1	16
16	306		321	60	58	95	89	1	16
17	313		326	60	57	93	87	16	29
18	321		330	60	58	95	89	1	16
19	326		336	60	59	97	92	0	1
20	331		340	60	54	88	81	56	69
21	336		345	60	53	87	79	52	82
22	340		362	60	57	93	87	16	29
23	345		370	60	57	93	87	16	29
24	362		384	60	54	88	81	56	69
25	370		442	60	54	88	81	56	69
26	384		460	60	58	95	89	1	16
27	444		472	60	59	97	92	0	1
28	460		478	60	57	93	87	16	29
29	472		484	60	58	95	89	1	16
30	478		492	60	59	97	92	0	1
31	484		496	60	59	97	92	0	1
32	492		500	60	57	93	87	16	29

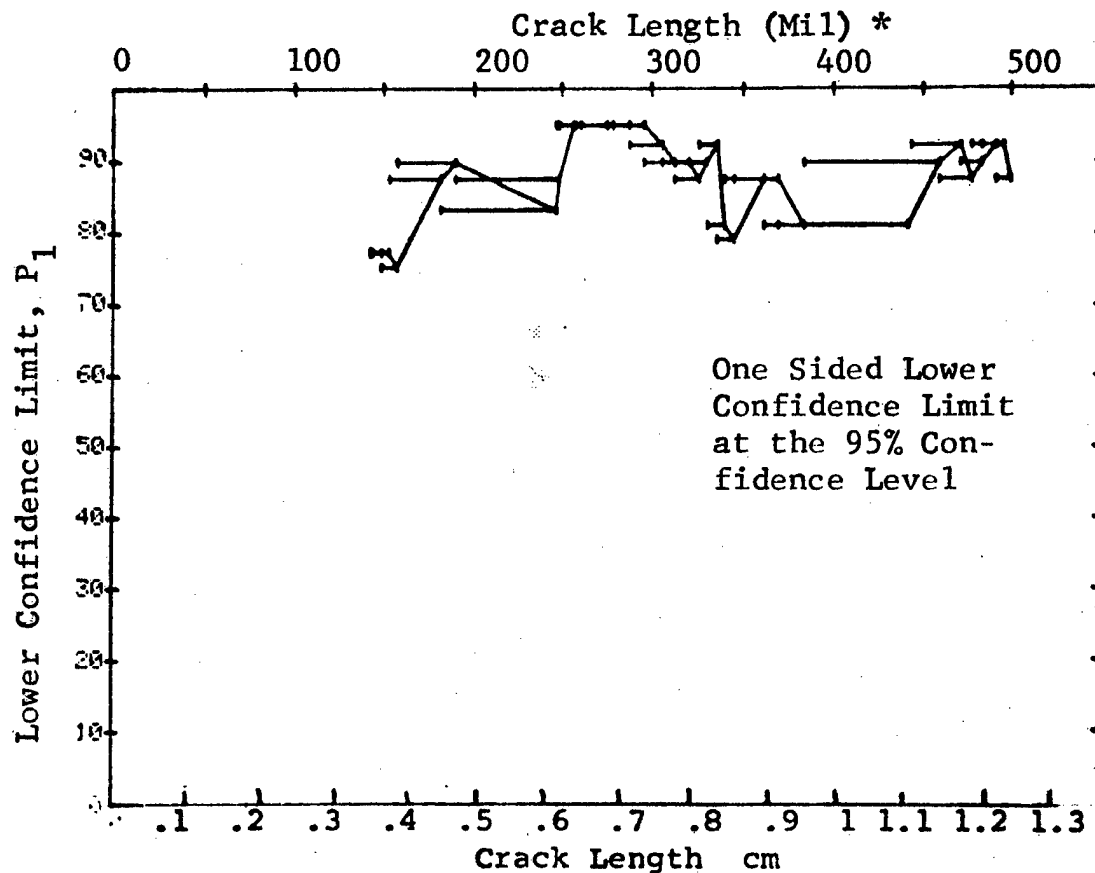


Figure D-48 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

15-OCT-75		PENETRANT		N	TEST 2 (MERGE ALL ALUMINUM) (48)				
RANGE	MIN	LN	MAX		HIT	50%	95%	0 MISS	1 MISS
1	76	79	80	60	54	88	81	56	69
2	77	80	81	60	54	88	81	56	69
3	79	80	81	60	54	88	81	56	69
4	80	82	83	60	47	77	67	0	0
5	80	83	85	60	49	80	71	0	0
6	82	85	85	60	47	77	67	0	0
7	83	85	85	60	47	77	67	0	0
8	85	86	88	60	55	90	83	43	56
9	85	88	90	60	55	90	83	43	56
10	86	90	92	60	55	90	83	43	56
11	88	92	95	60	57	93	87	16	29
12	90	95	96	60	59	97	92	0	1
13	92	96	97	60	59	97	92	0	1
14	95	97	99	60	57	93	87	16	29
15	96	99	103	60	57	93	87	16	29
16	97	103	105	60	60	98	95	0	0
17	99	105	108	60	56	92	85	29	43
18	103	108	115	60	56	92	85	29	43
19	105	115	118	60	59	97	92	0	1
20	108	118	122	60	55	90	83	43	56
21	115	122	124	60	52	85	77	82	94
22	118	124	125	60	51	83	75	94	100
23	122	129	134	60	53	87	79	69	82
24	124	134	135	60	57	93	87	16	29
25	126	135	138	60	57	93	87	16	29
26	129	143	145	60	54	88	81	56	69
27	134	145	150	60	54	88	81	56	69
28	135	145	153	60	51	83	75	94	100
29	138	150	153	60	51	83	75	94	100
30	143	153	158	60	52	85	77	82	94
31	145	158		60	53	87	79	69	82
32	150			60					

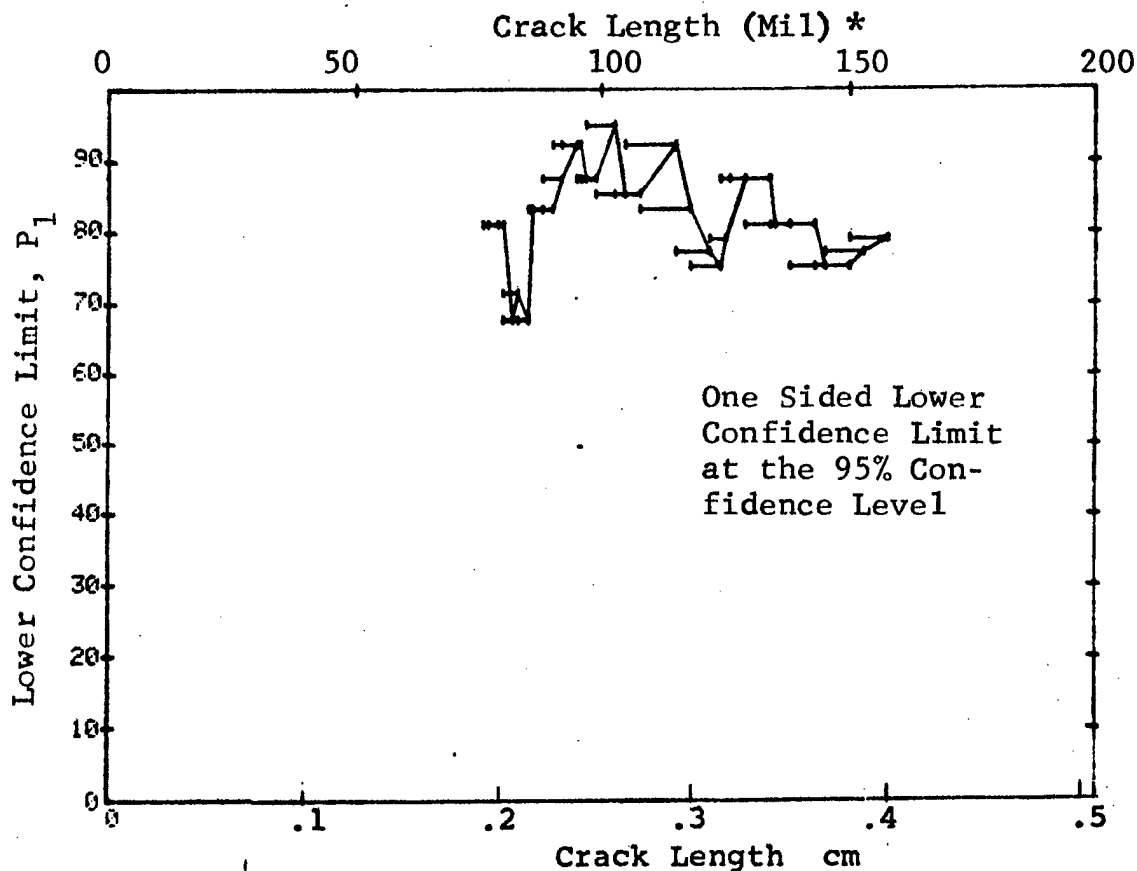


Figure D-48 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

15-OCT-75		PENETRANT		N	TEST C (MERGE ALL ALUMINUM) (48)				
RANGE	MIN	LN	MAX LN		DEF	50%	95%	0 MILS	MISS
1	30	*	35	60	24	39	29	0	0
2	32		40	60	34	55	45	0	0
3	35		41	60	45	74	64	0	0
4	40		44	60	43	70	60	0	0
5	41		45	60	47	77	67	0	0
6	44		47	60	52	85	77	82	24
7	45		49	60	46	75	65	0	0
8	47		51	60	43	70	60	0	0
9	49		54	60	50	82	73	0	0
10	51		56	60	45	74	64	0	0
11	54		58	60	41	67	57	0	0
12	56		60	60	42	69	58	0	0
13	58		61	60	49	80	71	0	0
14	60		62	60	51	83	75	94	100
15	61		63	60	47	77	67	0	0
16	62		64	60	50	82	73	0	0
17	63		65	60	48	79	69	0	0
18	64		66	60	44	72	62	0	0
19	65		67	60	41	67	57	0	0
20	66		68	60	48	79	69	0	0
21	67		68	60	57	93	87	16	20
22	68		69	60	53	87	79	69	80
23	68		69	60	43	70	60	0	0
24	69		71	60	37	60	50	0	0
25	69		73	60	43	70	60	0	0
26	71		74	60	52	85	77	82	24
27	73		75	60	53	87	79	69	80
28	74		76	60	53	87	79	69	80
29	76		78	60	55	90	83	43	25
30	76		79	60	55	90	83	43	25
31	78		80	60	54	88	81	35	27
32	79		80	60	54	88	81	35	27

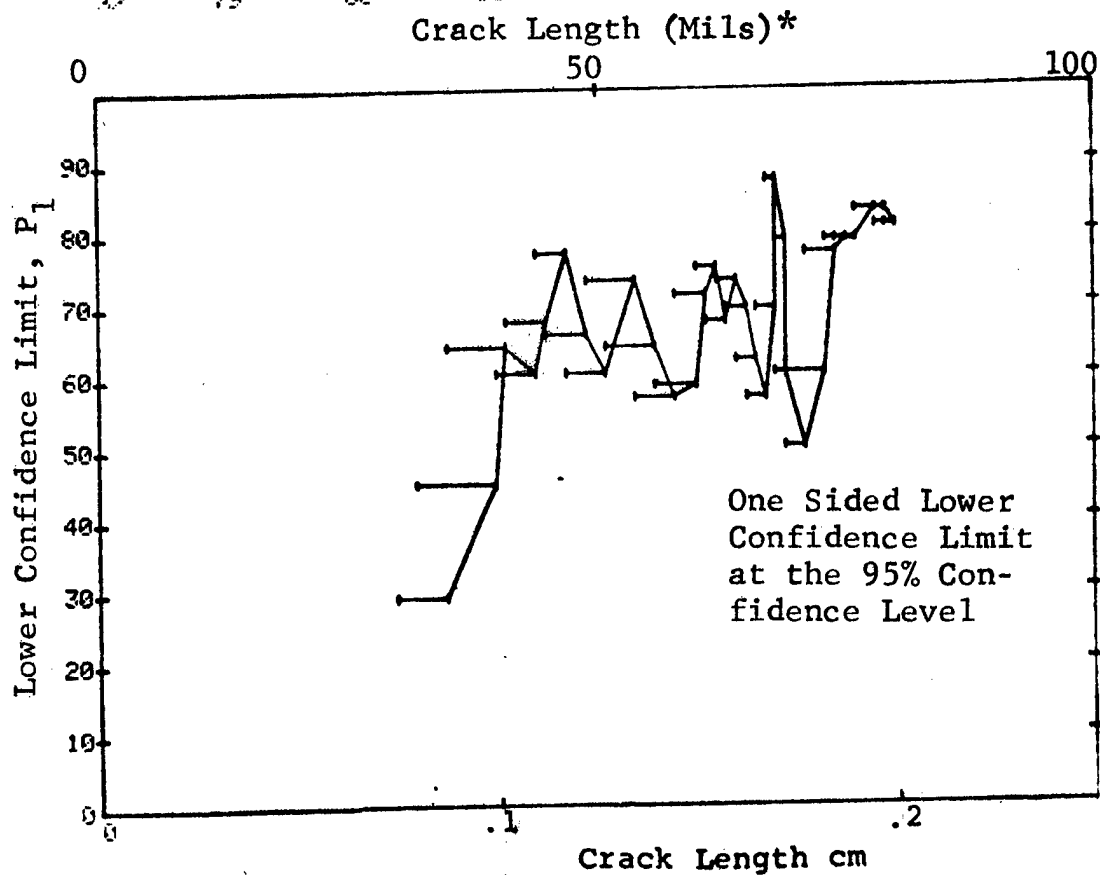


Figure D-48 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75	PENETRANT		TEST 1 (49)		95%	0 MISS	1 MISS
RANGE	MIN LN	MAX LN	DET	50%			
1	70 *	70 *	0	0	0	0	0
2	0	0	0	0	0	0	0
3	100	105	2	38	0	0	0
4	120	120	2	0	0	0	0
5	130	140	11	41	19	0	0
6	150	150	0	0	0	0	0
7	157	158	2	31	7	0	0
8	170	170	1	0	0	0	0
9	184	190	3	20	1	0	0
10	200	200	0	0	0	0	0
11	212	215	2	29	2	0	0
12	236	236	7	63	34	0	0
13	0	0	0	0	0	0	0
14	262	264	4	61	24	0	0
15	0	0	0	0	0	0	0
16	288	292	5	68	34	0	0
17	0	0	0	0	0	0	0
18	314	315	3	79	36	0	0
19	0	0	0	0	0	0	0
20	337	344	5	31	7	0	0
21	0	0	0	0	0	0	0
22	368	368	1	50	5	0	0
23	0	0	0	0	0	0	0
24	394	394	2	70	22	0	0
25	420	420	1	50	0	0	0
26	0	0	0	0	0	0	0
27	446	446	1	50	0	0	0
28	0	0	0	0	0	0	0
29	472	473	2	70	1	0	0
30	0	0	0	0	0	0	0
31	499	499	1	50	0	0	0
32	526	526	1	50	0	0	0

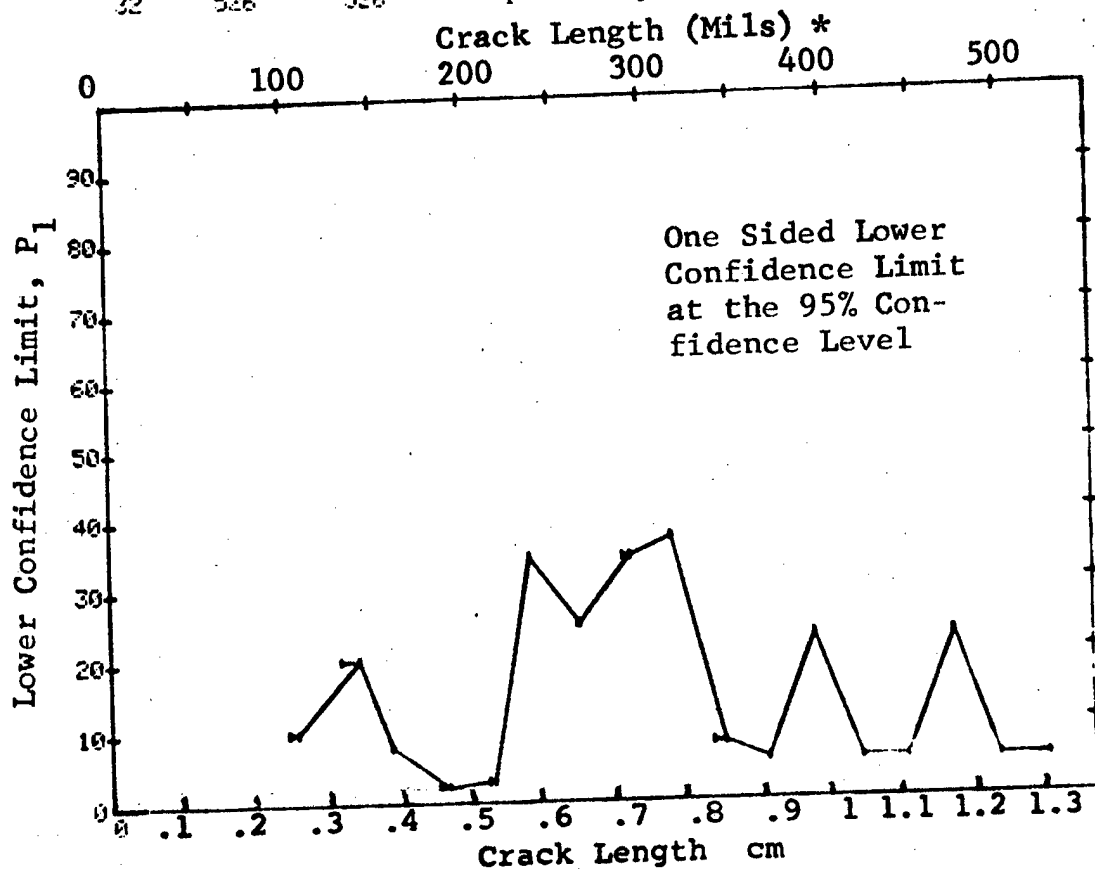


Figure D-49 Probability of Detection for 4330V Steel Using Liquid Penetrant. Fatigue Cracks in Cylindrical Shell Specimens. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		PENETRATION		TEST 2 (49)					
RANGE	MIN LN	MAX LN		DET	50%	95%	0 MISS	1 MISS	
1	70 *	70 *	1	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	100	105	4	2	0	0	0	0	
4	100	120	6	3	0	0	0	0	
5	100	140	17	7	0	21	0	0	
6	100	150	19	7	0	18	0	0	
7	100	158	24	9	0	21	0	0	
8	100	170	25	9	0	20	0	0	
9	100	190	28	10	0	20	0	0	
10	100	200	30	10	0	19	0	0	
11	100	215	32	11	0	20	0	0	
12	212	236	9	6	0	34	0	0	
13	0	0	0	0	0	0	0	0	
14	236	264	11	8	0	43	0	0	
15	0	0	0	0	0	0	0	0	
16	236	292	16	12	0	51	0	0	
17	0	0	0	0	0	0	0	0	
18	236	315	19	15	0	58	0	0	
19	0	0	0	0	0	0	0	0	
20	236	344	24	17	0	52	0	0	
21	0	0	0	0	0	0	0	0	
22	236	368	25	18	0	53	0	0	
23	0	0	0	0	0	0	0	0	
24	236	394	27	20	0	56	0	0	
25	236	420	28	21	0	58	0	0	
26	0	0	0	0	0	0	0	0	
27	236	446	29	22	0	59	0	0	
28	0	0	0	0	0	0	0	0	
29	368	473	7	7	0	65	0	0	
30	0	0	0	0	0	0	0	0	
31	368	499	8	8	0	68	0	0	
32	368	526	9	9	0	71	0	0	

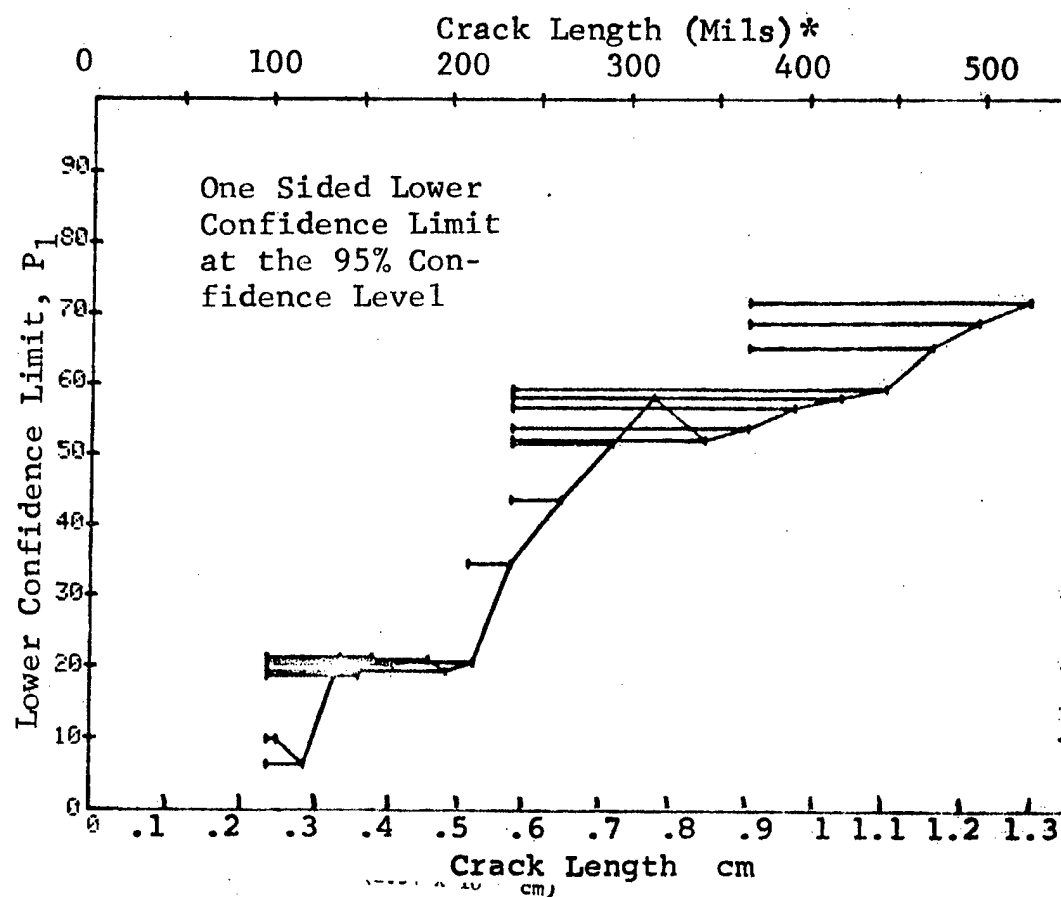


Figure D-49 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

10-OCT-75	PENETRANT		TEST 7 (49)		50%	95%	0 MISS	1 MISS
RANGE	MIN LN	MAX LN	N	DET				
1	0*	0*	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	70	236	35	12	33	21	0	0
32	120	499	60	34	55	45	0	0

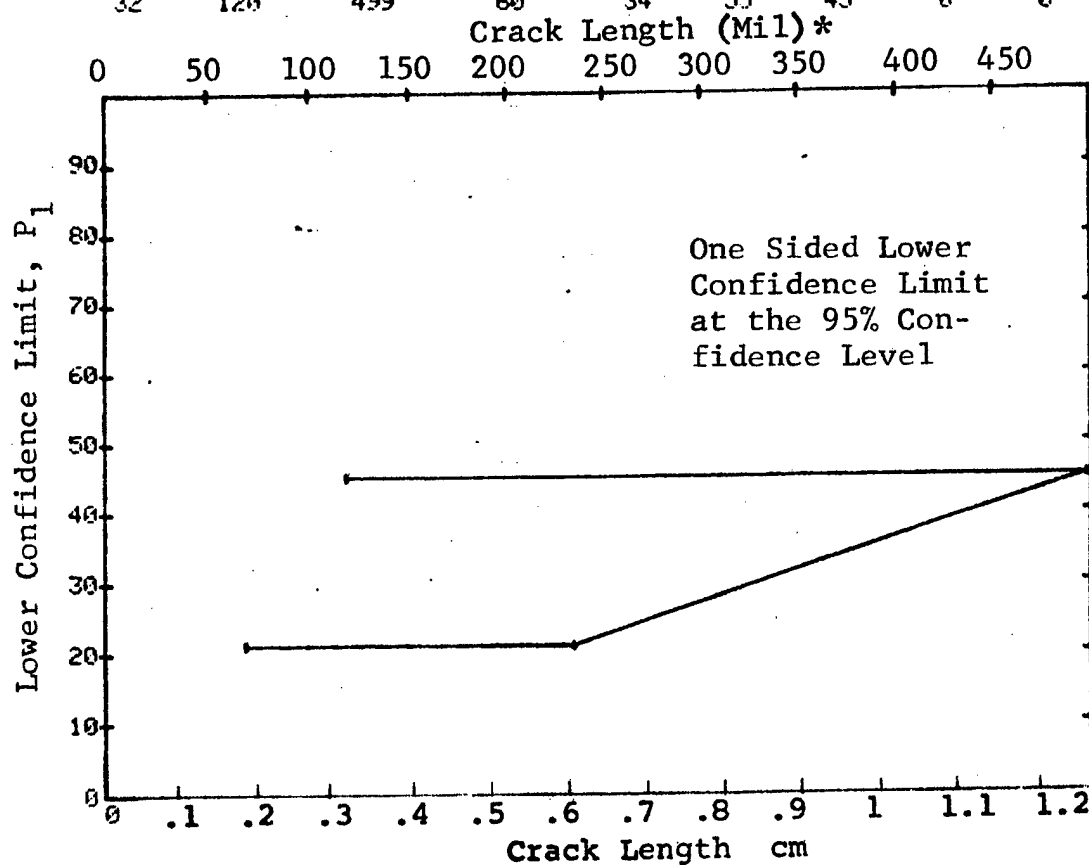


Figure D-49 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75		PENETRANT		N	TEST 1 (50)				
RANGE	MIN LN	MAX LN	70*		DET	50%	95%	0 MISS	1 MISS
1	70	105	70*	1	1	50	5	0	0
2	0	105	70*	0	0	0	0	0	0
3	100	120	105	4	0	0	0	0	0
4	120	140	120	2	0	0	0	0	0
5	130	150	140	11	1	6	0	0	0
6	150	150	150	2	0	0	0	0	0
7	157	158	158	5	1	12	1	0	0
8	170	170	170	1	1	50	5	0	0
9	184	190	190	3	0	0	0	0	0
10	200	200	200	2	0	0	0	0	0
11	212	215	215	2	0	0	0	0	0
12	236	236	236	7	1	9	0	0	0
13	0	0	0	0	0	0	0	0	0
14	262	264	264	4	1	15	1	0	0
15	0	0	0	0	0	0	0	0	0
16	288	292	292	5	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	314	315	315	3	1	20	1	0	0
19	0	0	0	0	0	0	0	0	0
20	337	344	344	5	1	12	1	0	0
21	0	0	0	0	0	0	0	0	0
22	368	368	368	1	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	394	394	394	2	1	29	2	0	0
25	420	420	420	1	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	446	446	446	1	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	472	473	473	2	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	499	499	499	1	1	50	5	0	0
32	526	526	526	1	0	0	0	0	0

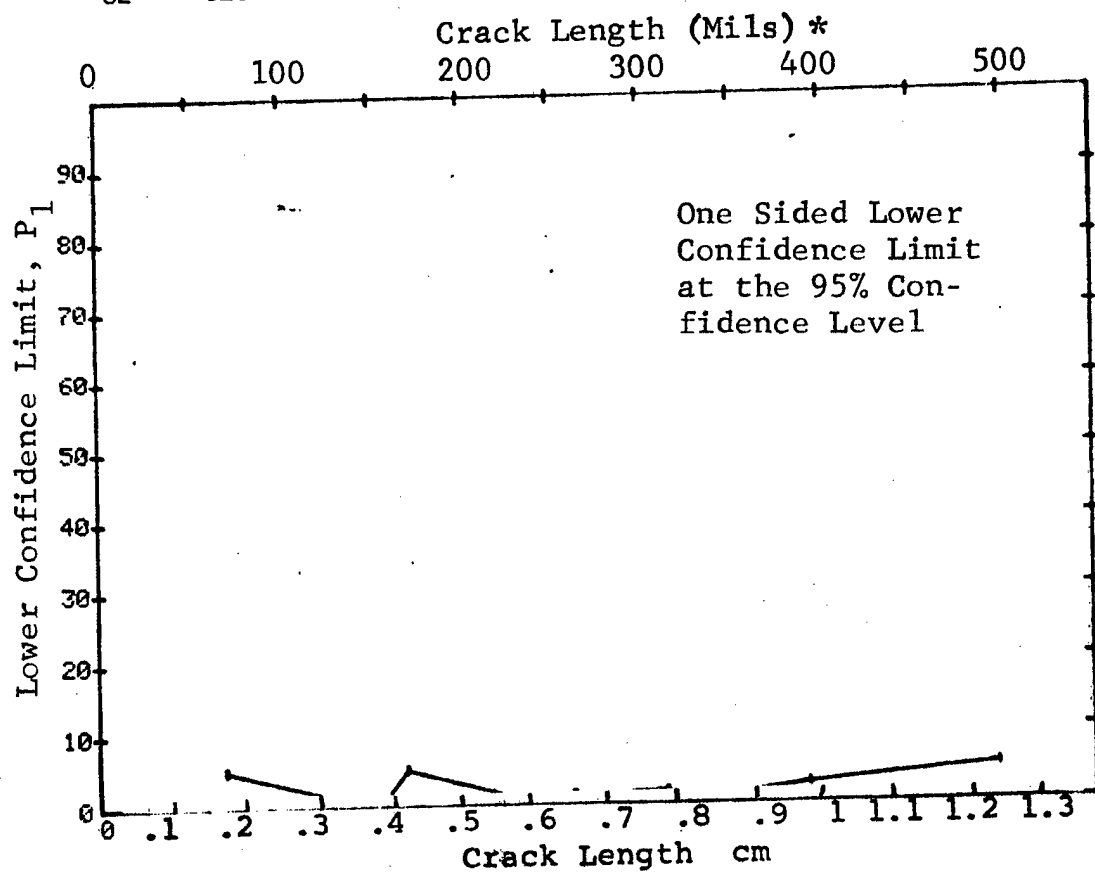


Figure D-50 Probability of Detection for 4330V Steel Using Magniflux ZL-2. Fatigue Cracks in Cylindrical Shell Specimens. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		PENETRANT		N	TEST 2 (50				
RANGE	MIN	LN	MAX LN		DET	50%	95%	0 MISS	1 MISS
1	70	*	70 *	1	1	0	5	0	0
2	0			0	0	0	0	0	0
3	70		105	5	1	0	1	0	0
4	70		120	7	1	0	0	0	0
5	70		140	18	2	0	2	0	0
6	70		150	20	2	0	1	0	0
7	70		158	25	3	0	3	0	0
8	157		170	6	2	0	6	0	0
9	70		190	29	4	0	4	0	0
10	70		200	31	4	0	4	0	0
11	70		215	33	4	0	4	0	0
12	70		236	40	5	0	5	0	0
13	0		0	0	0	0	0	0	0
14	70		264	44	6	0	6	0	0
15	0		0	0	0	0	0	0	0
16	70		292	49	6	0	5	0	0
17	0		0	0	0	0	0	0	0
18	70		315	52	7	0	6	0	0
19	0		0	0	0	0	0	0	0
20	157		344	37	6	0	7	0	0
21	0		0	0	0	0	0	0	0
22	157		368	38	6	0	7	0	0
23	0		0	0	0	0	0	0	0
24	157		394	40	7	0	8	0	0
25	157		420	41	7	0	8	0	0
26	0		0	0	0	0	0	0	0
27	157		446	42	7	0	8	0	0
28	0		0	0	0	0	0	0	0
29	157		473	44	7	0	11	0	0
30	0		0	0	0	0	0	0	0
31	157		499	45	8	0	9	0	0
32	157		526	46	8	0	8	0	0

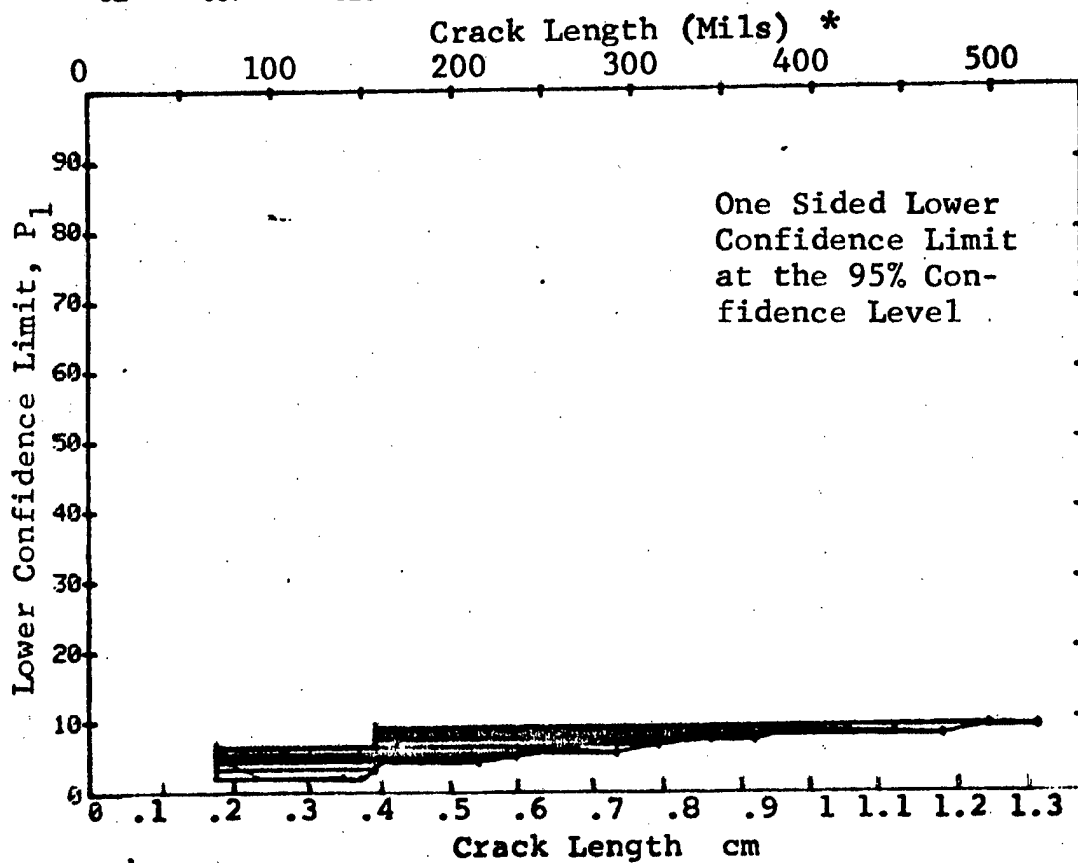


Figure D-50 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

10-OCT-75		PENETRANT		TEST 3 (50)					
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	70	236	35	4	10	4	0	0	
32	120	499	60	9	14	8	0	0	

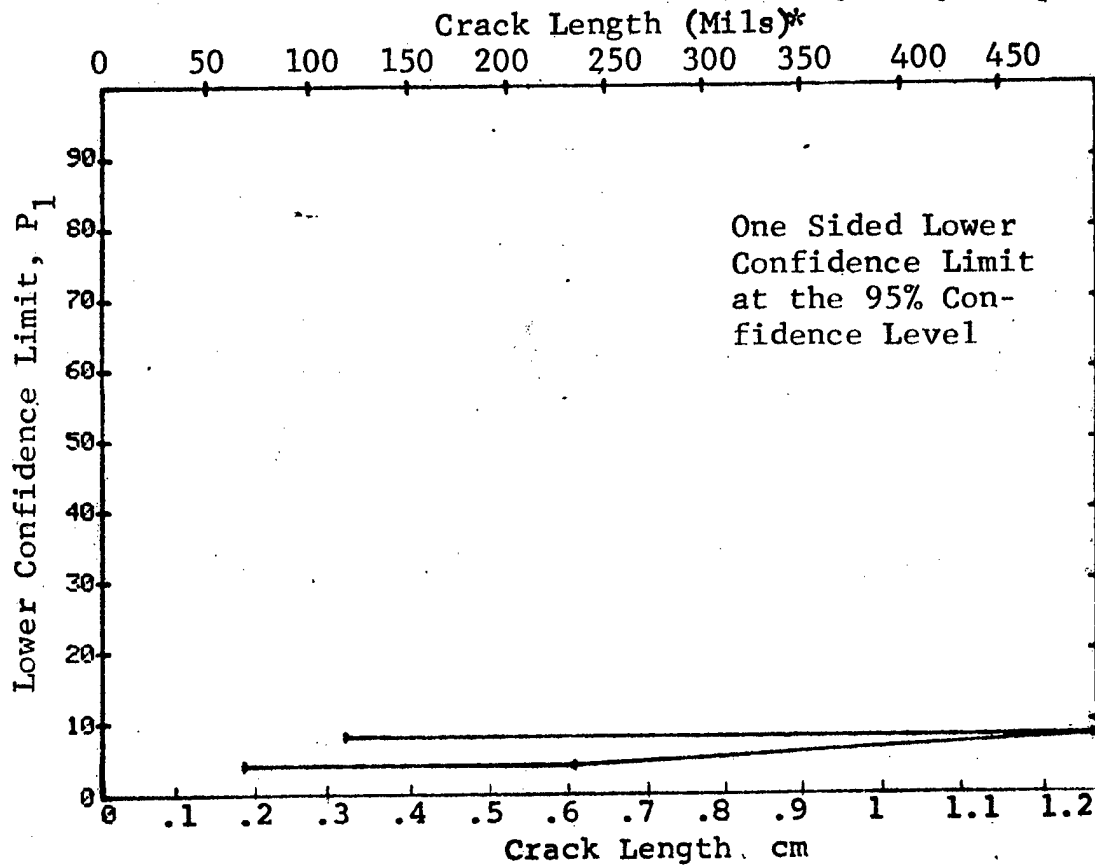


Figure D-50 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75	PENETRANT		N	TEST 1		(51)	0 MISS	1 MISS
RANGE	MIN LN	MAX LN		DET	50%	95%		
1	52*	53*	4	0	0	0	0	0
2	70	81	5	1	10	0	0	0
3	91	92	3	1	20	1	0	0
4	105	109	4	3	28	9	0	0
5	130	137	15	4	23	9	0	0
6	0	0	0	0	0	0	0	0
7	157	162	12	2	13	3	0	0
8	183	188	6	3	42	15	0	0
9	190	196	3	2	50	13	0	0
10	210	212	2	2	70	22	0	0
11	236	239	2	1	29	2	0	0
12	242	248	3	3	79	36	0	0
13	262	267	2	2	70	22	0	0
14	289	290	2	2	70	22	0	0
15	0	0	0	0	0	0	0	0
16	314	321	3	3	79	36	0	0
17	327	341	3	3	79	36	0	0
18	344	358	3	3	79	36	0	0
19	362	362	1	1	50	5	0	0
20	382	389	2	2	70	22	0	0
21	0	0	0	0	0	0	0	0
22	422	423	2	2	70	22	0	0
23	428	431	2	2	70	22	0	0
24	0	0	0	0	0	0	0	0
25	461	461	1	1	50	5	0	0
26	0	0	0	0	0	0	0	0
27	498	498	1	1	50	5	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	576	577	2	2	70	22	0	0
32	604	604	1	1	50	5	0	0

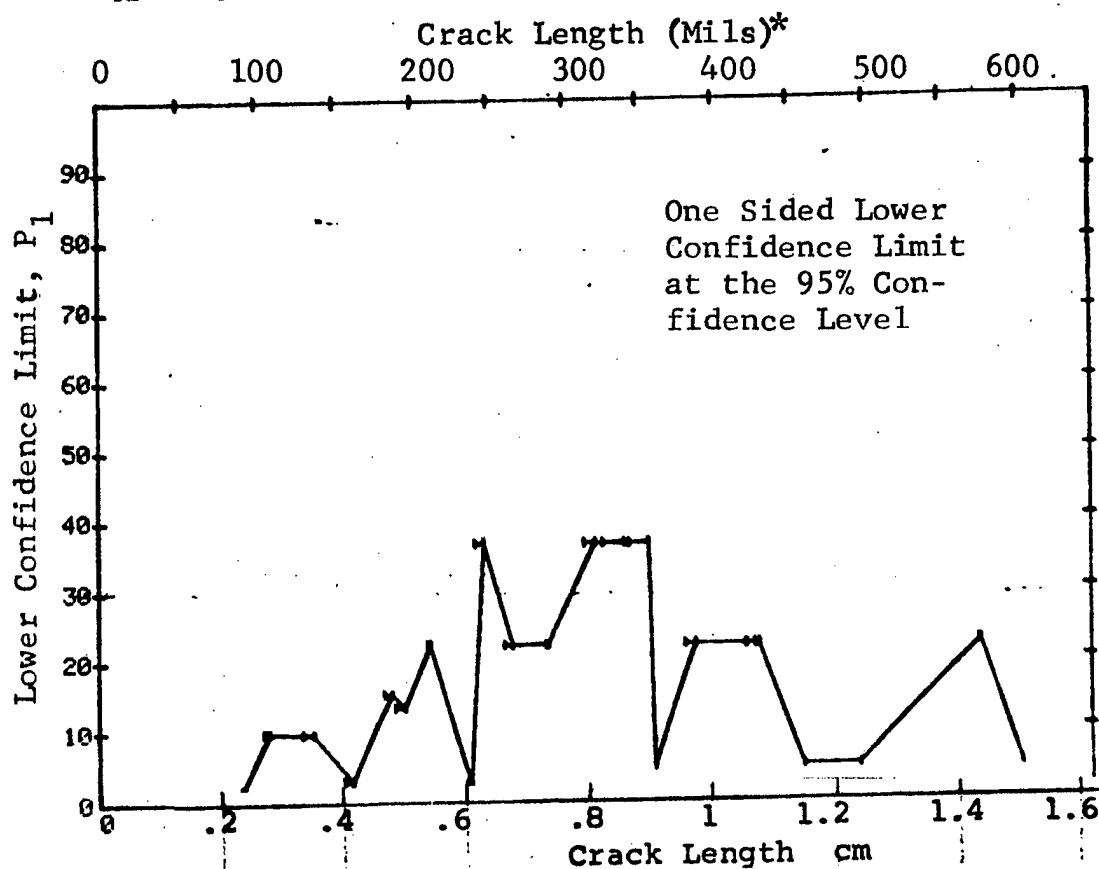


Figure D-51 Probability of Detection for 7075-T6511 Al Using Magniflux ZL-2. Fatigue Cracks in Cylindrical Shell Specimens. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		PENETRANT		N	TEST 2 (51)			0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DET	50%	95%		
1	52*	53*		4	0	0	0	0	0
2	70	70		6	1	0	0	0	0
3	70	92		9	2	0	4	0	0
4	91	109		12	4	0	12	0	0
5	91	137		27	8	0	15	0	0
6	0	0		0	0	0	0	0	0
7	91	162		39	10	0	14	0	0
8	91	188		45	13	0	18	0	0
9	183	196		9	5	0	25	0	0
10	183	212		11	7	0	34	0	0
11	183	239		13	8	0	35	0	0
12	190	248		10	8	0	49	0	0
13	210	267		9	8	0	57	0	0
14	242	290		7	7	0	65	0	0
15	0	0		0	0	0	0	0	0
16	242	321		10	10	0	74	0	0
17	242	341		13	13	0	79	0	0
18	242	358		16	16	0	82	13	30
19	242	362		17	17	0	83	12	29
20	242	389		19	19	0	85	10	27
21	0	0		0	0	0	0	0	0
22	242	423		21	21	0	86	8	25
23	242	431		23	23	0	87	6	23
24	0	0		0	0	0	0	0	0
25	242	461		24	24	0	88	5	22
26	0	0		0	0	0	0	0	0
27	242	498		25	25	0	88	4	21
28	0	0		0	0	0	0	0	0
29	0	0		0	0	0	0	0	0
30	0	0		0	0	0	0	0	0
31	242	577		27	27	0	89	2	19
32	242	604		28	28	0	89	1	18

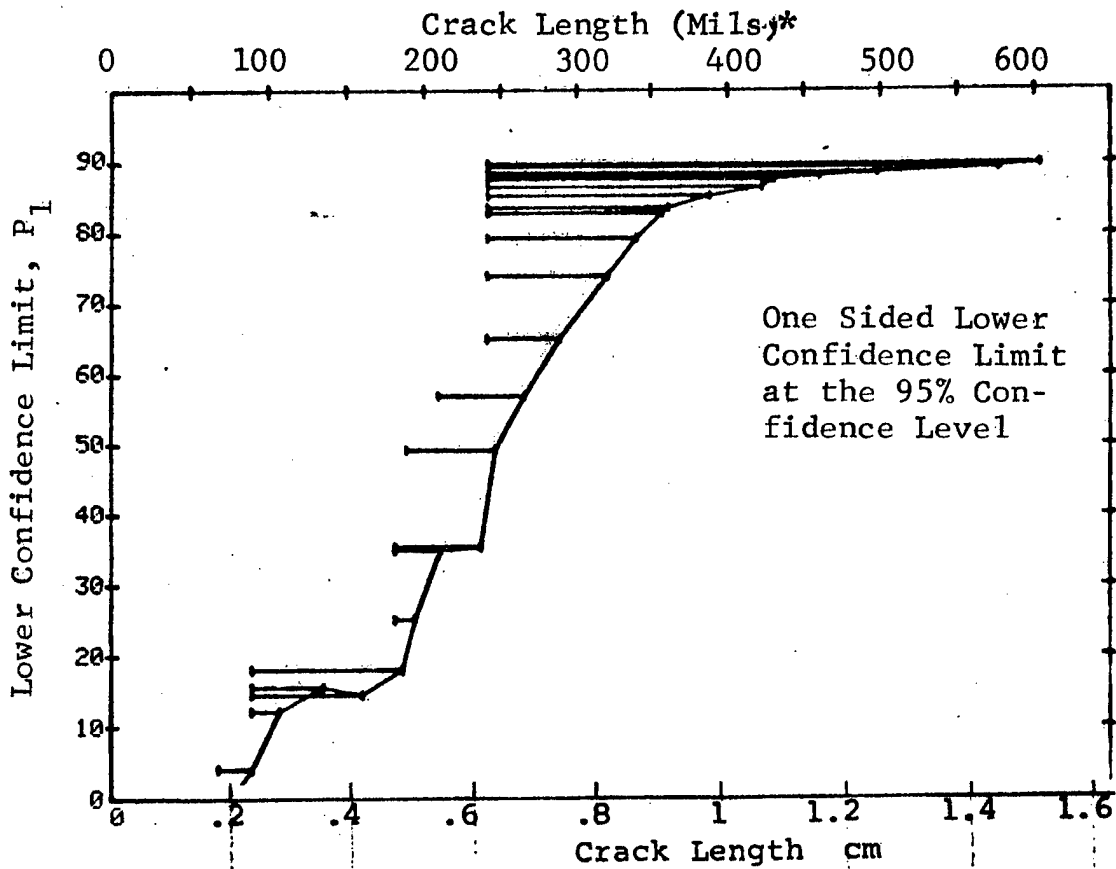


Figure D-51 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

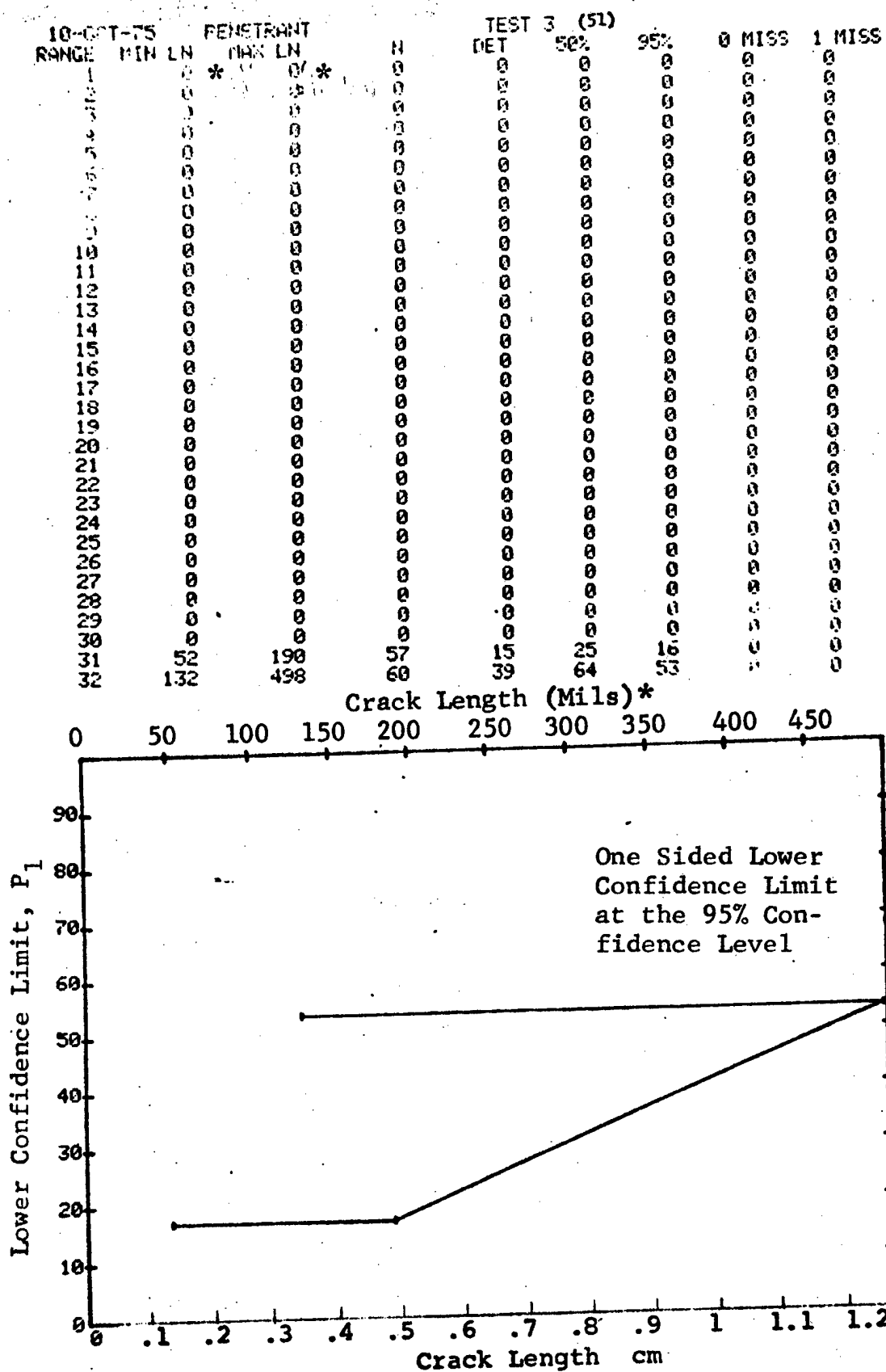


Figure D-51 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75		MAGNETIC PARTICLE			TEST 1 (52)					
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS
1		70	*	70	*	1	0	0	0	0
2		0		0	0	0	0	0	0	0
3		100		105	3	2	50	13	0	0
4		120		120	2	2	70	22	0	0
5		130		131	5	2	31	7	0	0
6		0		0	0	0	0	0	0	0
7		150		157	3	1	20	1	0	0
8		170		170	1	1	50	5	0	0
9		184		184	1	1	50	5	0	0
10		200		200	2	0	0	0	0	0
11		0		0	0	0	0	0	0	0
12		0		0	0	0	0	0	0	0
13		236		237	4	3	61	24	0	0
14		0		0	0	0	0	0	0	0
15		262		264	3	3	79	36	0	0
16		0		0	0	0	0	0	0	0
17		288		288	1	1	50	5	0	0
18		292		292	1	1	50	5	0	0
19		314		314	1	1	50	5	0	0
20		0		0	0	0	0	0	0	0
21		0		0	0	0	0	0	0	0
22		0		0	0	0	0	0	0	0
23		0		0	0	0	0	0	0	0
24		0		0	0	0	0	0	0	0
25		394		394	1	1	50	5	0	0
26		0		0	0	0	0	0	0	0
27		0		0	0	0	0	0	0	0
28		0		0	0	0	0	0	0	0
29		0		0	0	0	0	0	0	0
30		0		0	0	0	0	0	0	0
31		0		0	0	0	0	0	0	0
32		499		499	1	1	50	5	0	0

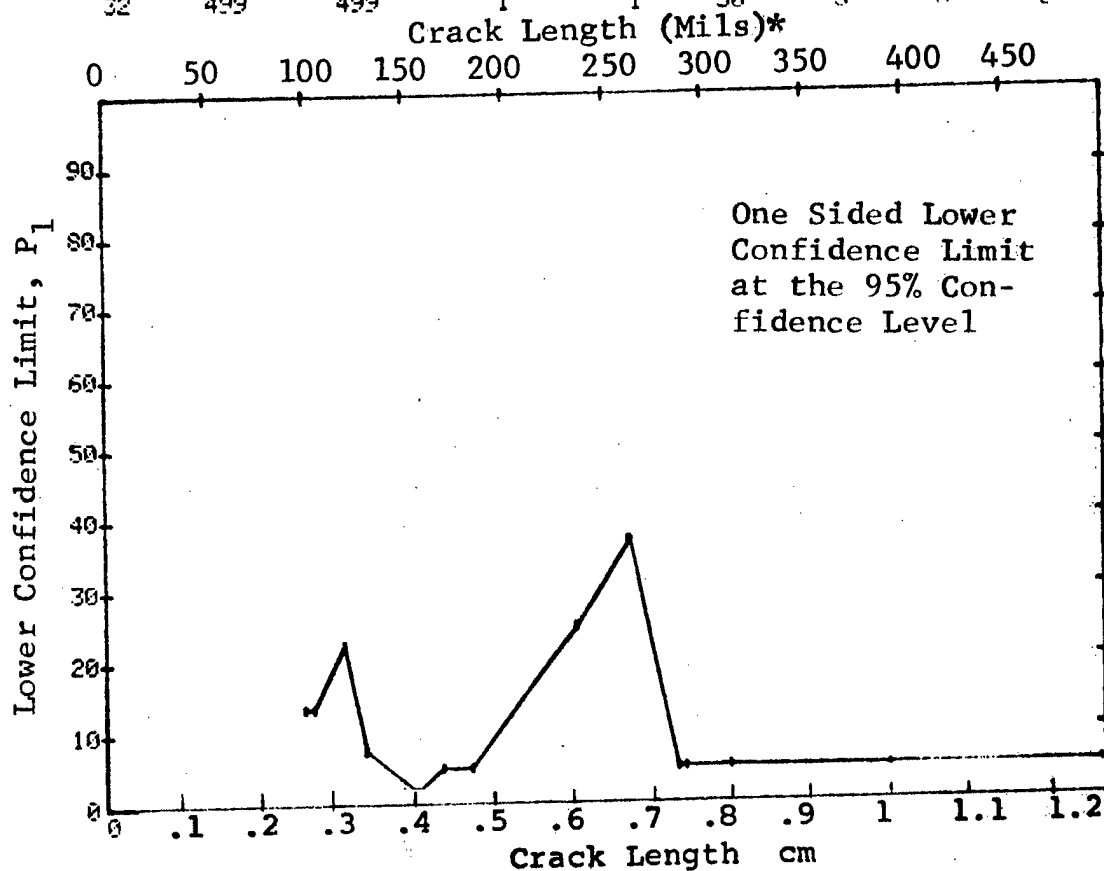


Figure D-52 Probability of Detection for 4330V Steel Using Magnetical Particle. Fatigue Cracks in Cylindrical Shell Specimens. Lab. Env.

(b) Overlapping Sixty Point Method of Data Cumulation

10-OCT-75 MAGNETIC PARTICLE				TEST 2 (52)				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	70*	70*	1	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	100	105	3	2	0	13	0	0
4	100	120	5	4	0	34	0	0
5	100	131	10	6	0	30	0	0
6	0	0	0	0	0	0	0	0
7	100	157	13	7	0	28	0	0
8	100	170	14	8	0	32	0	0
9	100	184	15	9	0	35	0	0
10	100	200	17	9	0	31	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	100	237	21	12	0	37	0	0
14	0	0	0	0	0	0	0	0
15	236	264	7	6	0	47	0	0
16	0	0	0	0	0	0	0	0
17	236	298	8	7	0	52	0	0
18	236	292	9	8	0	57	0	0
19	262	314	6	6	0	60	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	262	394	7	7	0	65	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	262	499	8	8	0	68	0	0

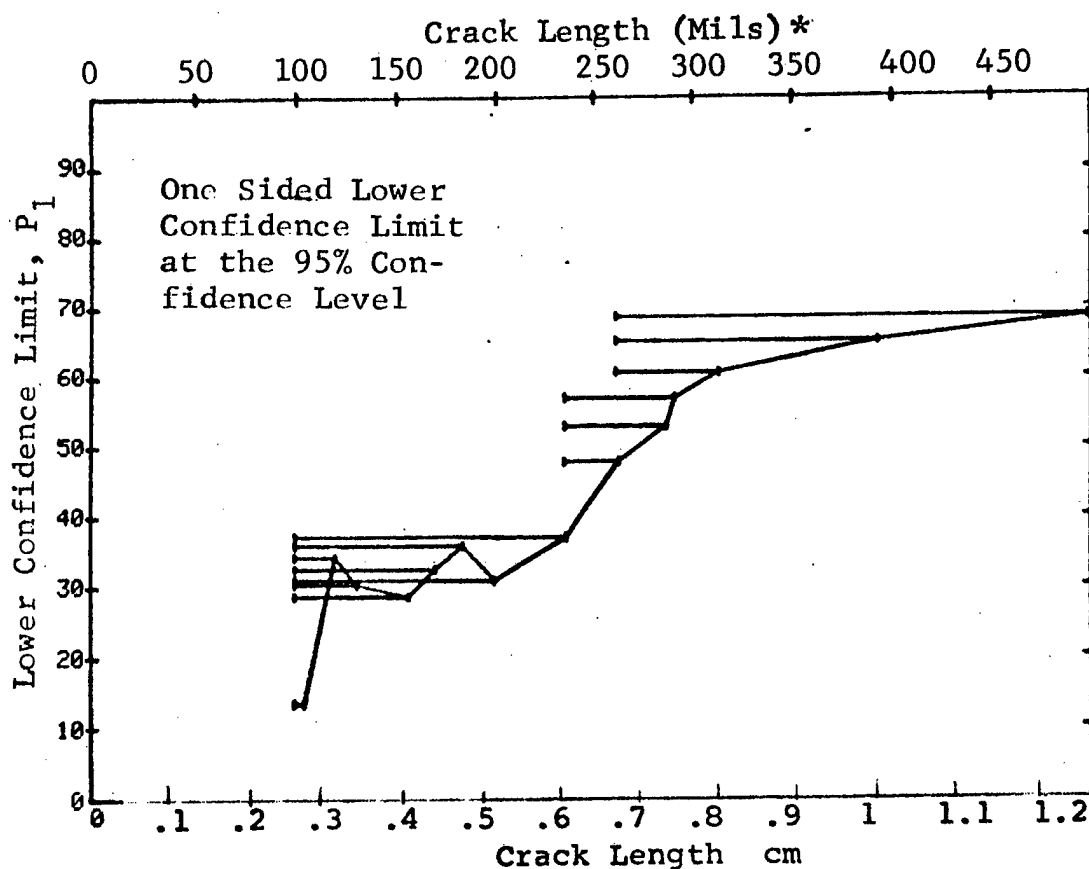


Figure D-52 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

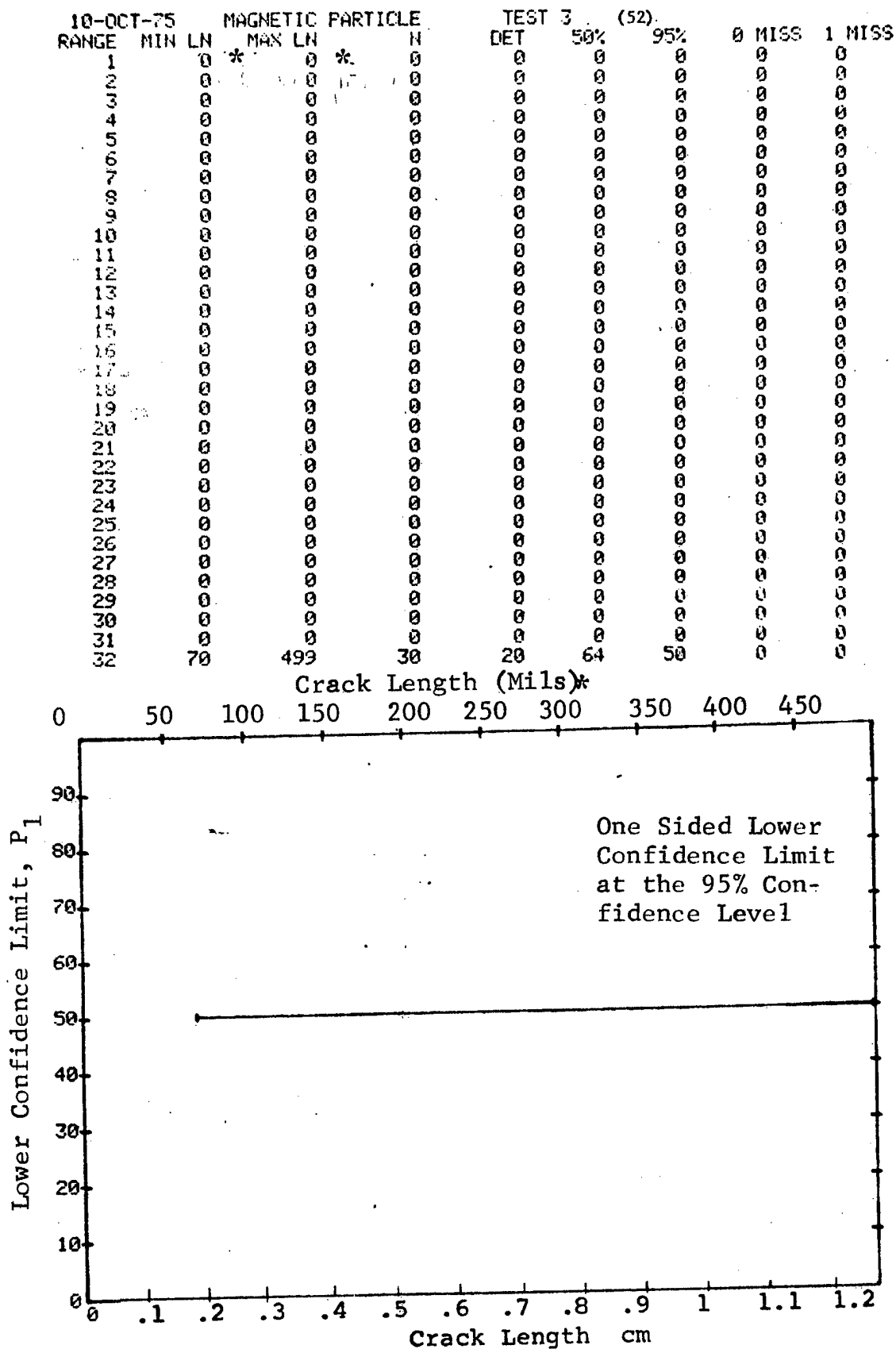


Figure D-52 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75		ULTRASONIC		N	TEST 1 (53)		95%	0 MISS	1 MISS
RANGE	MIN LN	MAX LN			DET	50%			
1	70*	70*	1	1	50	5	0	0	0
2	0	0	0	0	0	0	0	0	0
3	100	105	4	2	38	9	0	0	0
4	120	120	2	1	29	2	0	0	0
5	130	140	10	3	74	49	0	0	0
6	150	150	2	2	70	22	0	0	0
7	157	158	5	5	87	54	0	0	0
8	170	170	1	1	50	5	0	0	0
9	184	190	3	3	79	36	0	0	0
10	200	200	2	1	29	2	0	0	0
11	212	215	2	2	70	22	0	0	0
12	236	236	7	7	90	65	0	0	0
13	0	0	0	0	0	0	0	0	0
14	262	264	4	4	84	47	0	0	0
15	0	0	0	0	0	0	0	0	0
16	288	292	5	5	87	54	0	0	0
17	0	0	0	0	0	0	0	0	0
18	314	315	3	3	79	36	0	0	0
19	0	0	0	0	0	0	0	0	0
20	337	344	5	4	68	34	0	0	0
21	0	0	0	0	0	0	0	0	0
22	368	368	1	1	50	5	0	0	0
23	0	0	0	0	0	0	0	0	0
24	394	394	2	2	70	22	0	0	0
25	420	420	1	1	50	5	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	460	460	1	1	50	5	0	0	0
29	472	473	2	2	70	22	0	0	0
30	0	0	0	0	0	0	0	0	0
31	499	499	1	1	50	5	0	0	0
32	526	526	1	1	50	5	0	0	0

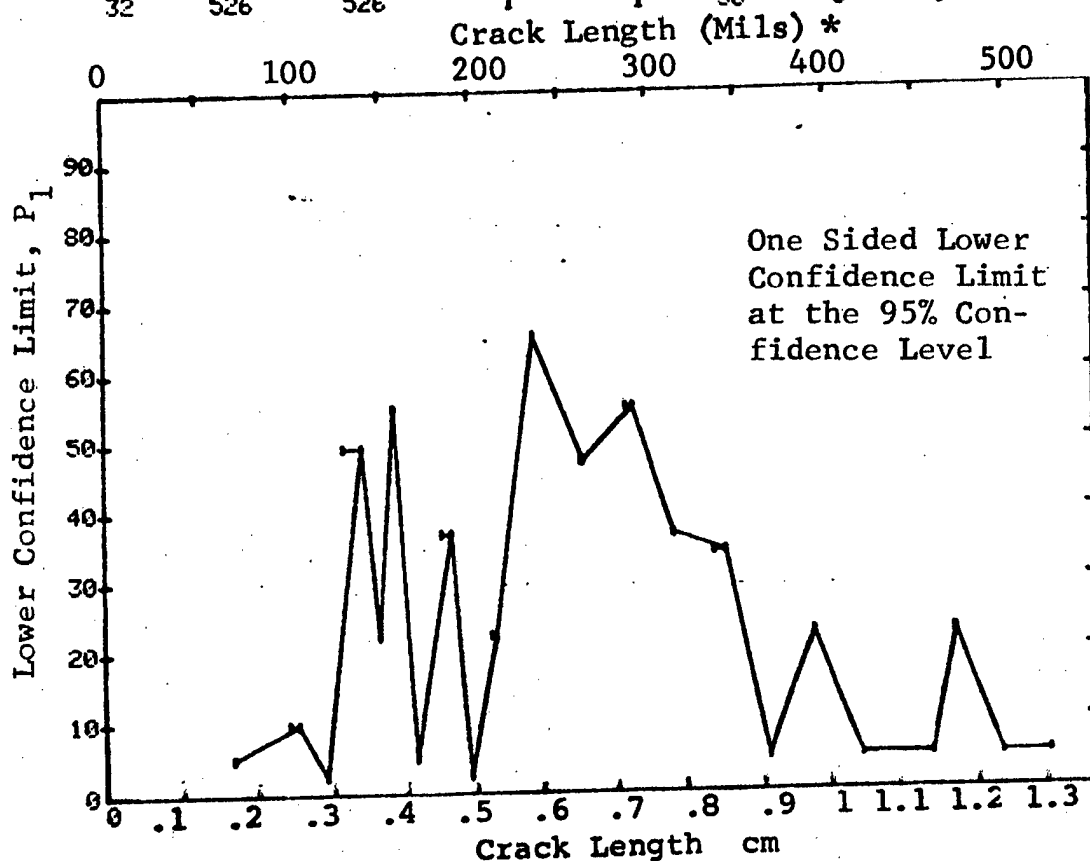


Figure D-53 Probability of Detection for 4330V Steel Using Ultrasonic Shear Wave. Fatigue Cracks in Cylindrical Shell Specimens. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		ULTRASONIC		N	TEST 2 (53)		95%	0 MISS	1 MISS
RANGE	MIN LN	* MAX LN	*		DET	50%			
1	70	70	*	1	1	0	5	0	0
2	0	0		0	0	0	0	0	0
3	70	105		5	3	0	18	0	0
4	70	120		7	4	0	22	0	0
5	130	140		10	6	0	49	0	0
6	130	150		12	10	0	56	0	0
7	130	158		17	15	0	67	0	0
8	130	170		18	16	0	68	0	0
9	150	190		11	11	0	76	0	0
10	130	200		23	20	0	69	0	0
11	150	215		15	14	0	72	0	0
12	150	236		22	21	0	80	24	39
13	0	0		0	0	0	0	0	0
14	150	264		26	25	0	83	20	35
15	0	0		0	0	0	0	0	0
16	150	292		31	30	0	85	15	30
17	0	0		0	0	0	0	0	0
18	150	315		34	33	0	86	12	27
19	0	0		0	0	0	0	0	0
20	150	344		39	37	0	84	22	37
21	0	0		0	0	0	0	0	0
22	150	368		40	38	0	85	21	36
23	0	0		0	0	0	0	0	0
24	150	394		42	40	0	85	19	34
25	150	420		43	41	0	86	18	33
26	0	0		0	0	0	0	0	0
27	0	0		0	0	0	0	0	0
28	150	460		44	42	0	86	17	32
29	150	473		46	44	0	86	15	30
30	0	0		0	0	0	0	0	0
31	150	499		47	45	0	87	14	29
32	150	526		48	46	0	87	13	28

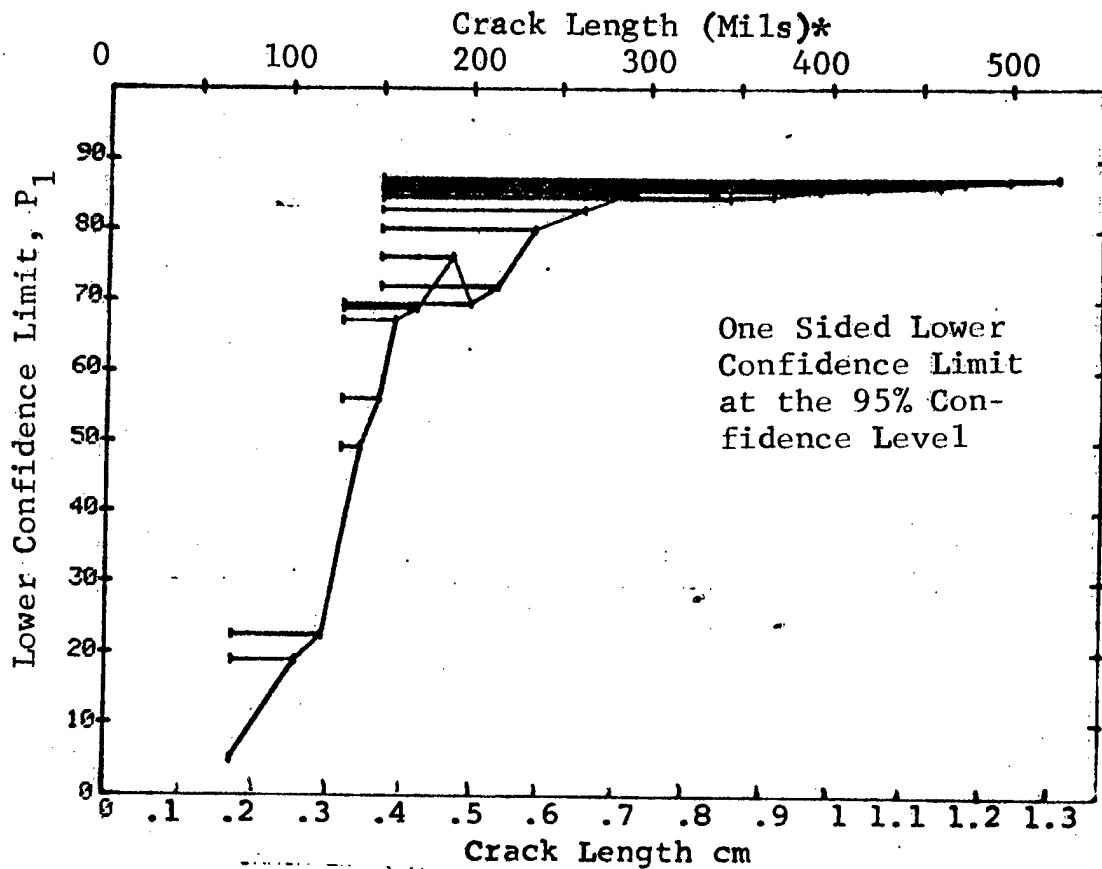


Figure D-53 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

10-OCT-75		ULTRASONIC		N	TEST 3 (53)			0 MISS	1 MISS
RANGE	MIN LN	MAX LN	DET		50%	95%			
1		0*	0*	0	0	0	0	0	0
2		0	0	0	0	0	0	0	0
3		0	0	0	0	0	0	0	0
4		0	0	0	0	0	0	0	0
5		0	0	0	0	0	0	0	0
6		0	0	0	0	0	0	0	0
7		0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0
31	70		236	34	28	80	68	43	56
32	105		499	60	55	90	83		

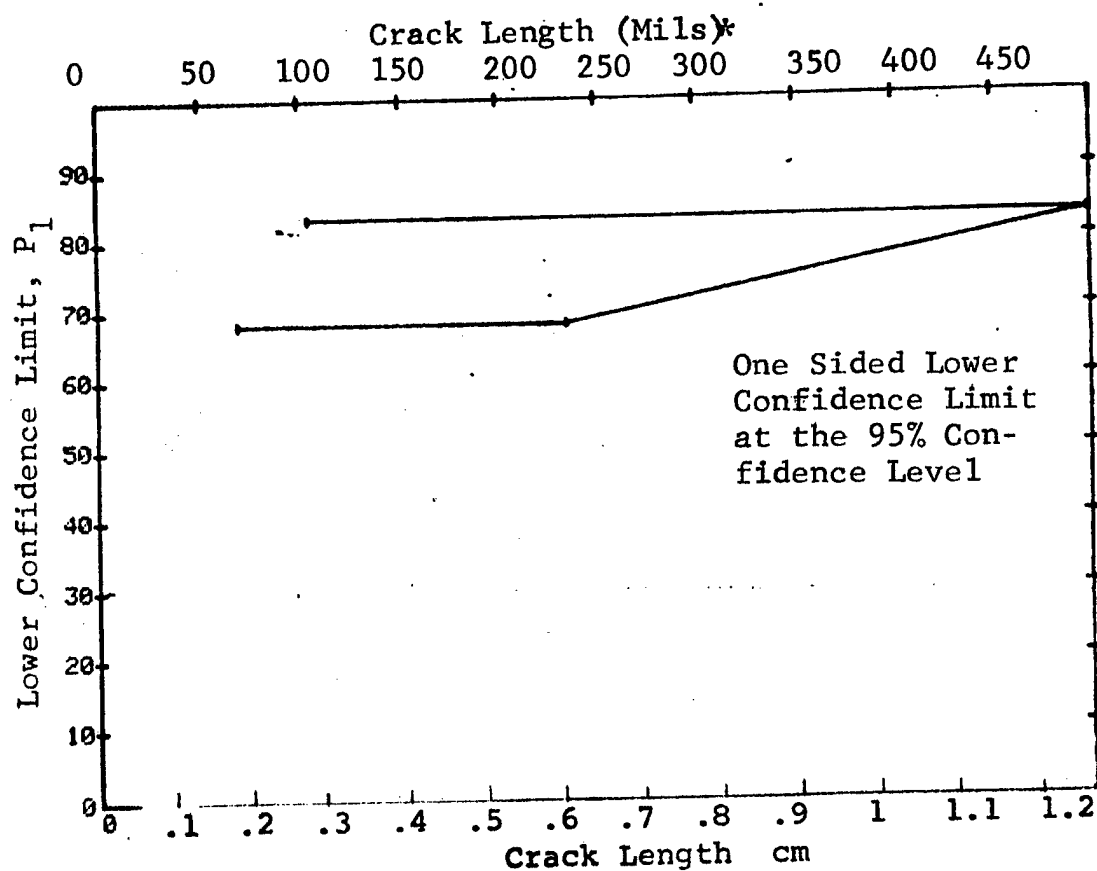


Figure D-53 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75		ULTRASONIC		N	TEST 1 (54)		0 MISS	1 MISS
RANGE	MIN LN	MAX LN	LN	DET	50%	95%		
1	52*	53*	4	1	15	1	0	0
2	70	81	6	2	26	6	0	0
3	91	92	3	3	79	36	0	0
4	105	109	9	6	60	34	0	0
5	130	137	15	9	56	35	0	0
6	0	0	0	0	0	0	0	0
7	157	162	12	6	45	24	0	0
8	183	188	6	4	57	27	0	0
9	190	196	3	1	20	1	0	0
10	210	212	2	2	70	22	0	0
11	234	236	2	2	70	22	0	0
12	242	248	3	3	79	36	0	0
13	262	267	2	2	70	22	0	0
14	290	290	2	2	70	22	0	0
15	0	0	0	0	0	0	0	0
16	314	322	3	3	79	36	0	0
17	327	330	2	2	70	22	0	0
18	342	358	4	3	61	24	0	0
19	362	362	1	0	0	0	0	0
20	382	389	2	2	70	22	0	0
21	0	0	0	0	0	0	0	0
22	422	423	2	2	70	22	0	0
23	428	431	2	2	70	22	0	0
24	0	0	0	0	0	0	0	0
25	461	461	1	1	50	5	0	0
26	0	0	0	0	0	0	0	0
27	498	498	1	1	50	5	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	576	577	2	2	70	22	0	0
32	604	604	1	1	50	5	0	0

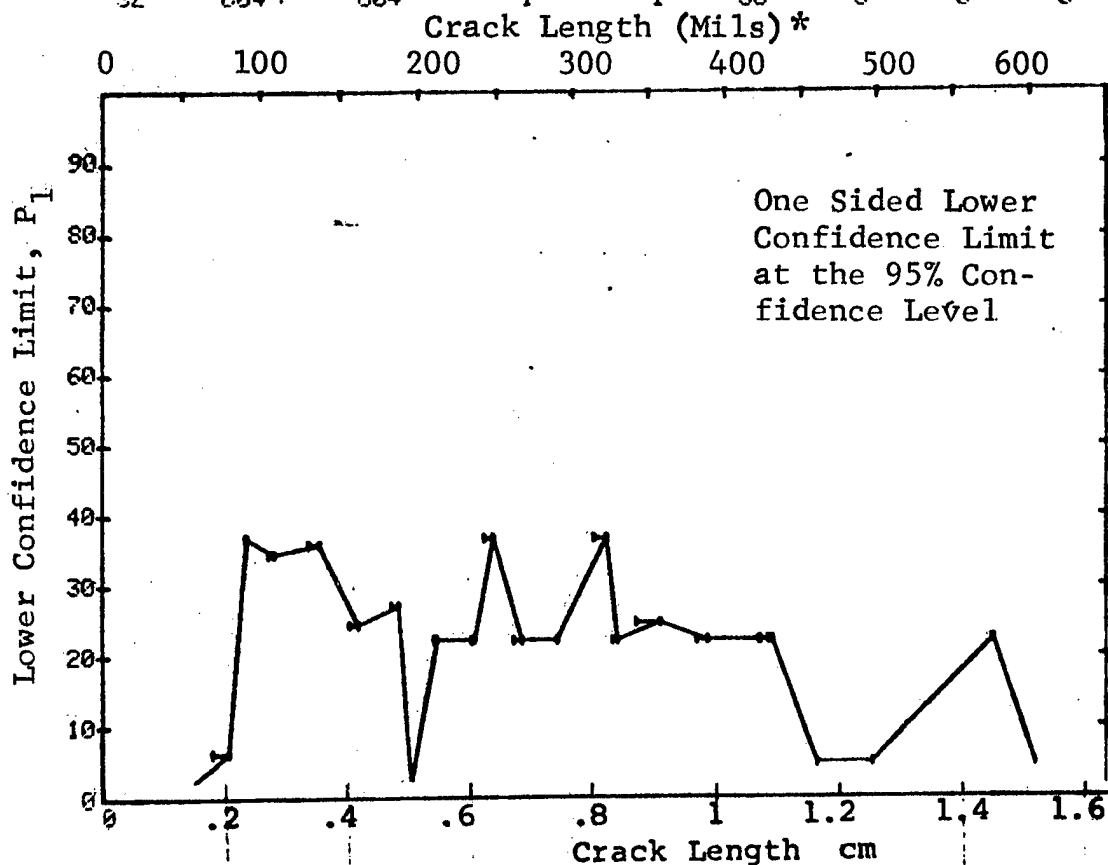


Figure D-54 Probability of Detection for 7075-T6511 Al Using Ultrasonic Shear Wave. Fatigue Cracks in Cylindrical Shell Specimens. Lab. Env..

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		ULTRASONIC		N	TEST 2 (54)		95%	0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DEF	50%			
1		52	* 53*	4	1	0	1	0	0
2		57	81	10	3	0	8	0	0
3		91	92	3	3	0	36	0	0
4		91	109	12	9	0	47	0	0
5		91	137	27	18	0	49	0	0
6		0	0	0	0	0	0	0	0
7		91	162	39	24	0	47	0	0
8		91	188	45	28	0	48	0	0
9		91	196	48	29	0	47	0	0
10		91	212	50	31	0	49	0	0
11		91	236	52	33	0	51	0	0
12		210	248	7	7	0	65	0	0
13		210	267	9	9	0	71	0	0
14		210	290	11	11	0	76	0	0
15		0	0	0	0	0	0	15	32
16		210	322	14	14	0	80	13	30
17		210	330	16	16	0	82	0	0
18		210	358	20	19	0	78	0	0
19		210	362	21	19	0	72	0	0
20		210	389	23	21	0	75	0	0
21		0	0	0	0	0	0	0	0
22		210	423	25	23	0	76	0	0
23		210	431	27	25	0	78	0	0
24		0	0	0	0	0	0	0	0
25		210	461	28	26	0	79	0	0
26		0	0	0	0	0	0	0	0
27		210	498	29	27	0	79	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0
31		210	577	31	29	0	81	30	45
32		210	604	32	30	0	81	30	44

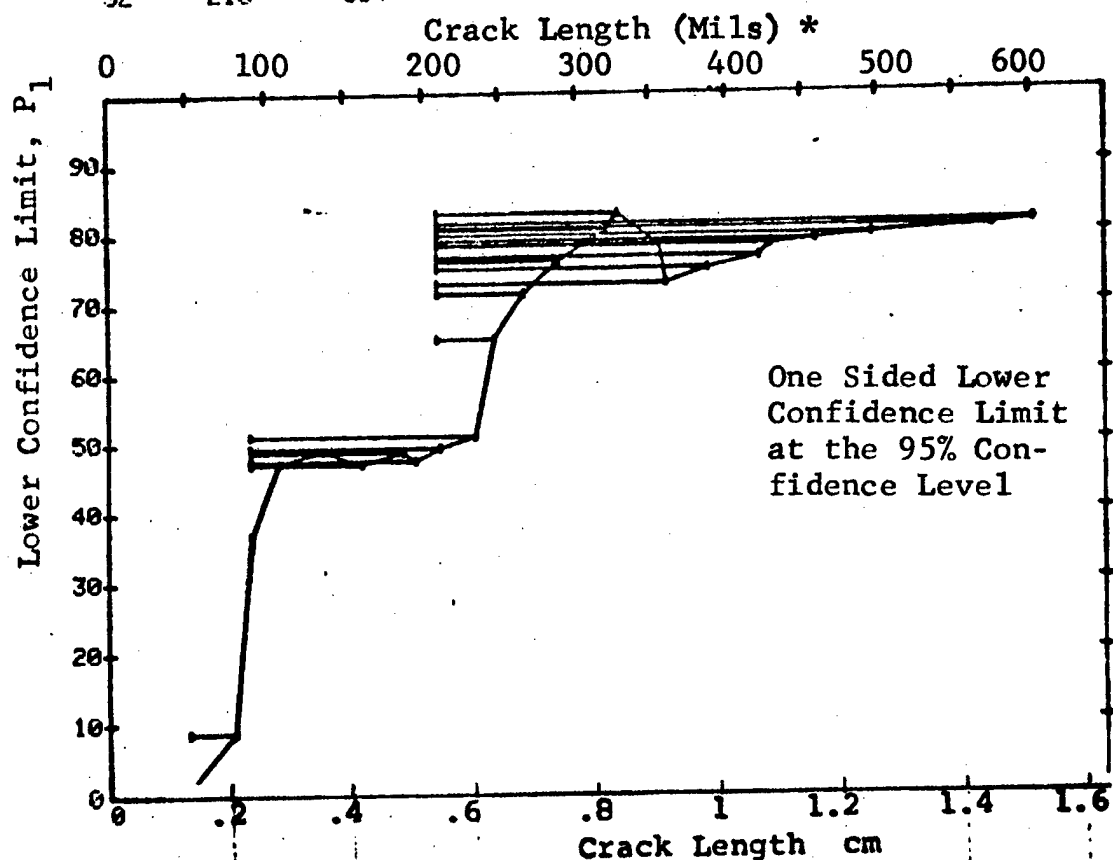


Figure D-54 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

10-OCT-75			ULTRASONIC			TEST 3 (154)				0 MISS	1 MISS
RANGE	MIN	LN	* MAX	LN	*	N	DET	50%	95%		
1		0		0		0	0	0	0	0	0
2		0		0		0	0	0	0	0	0
3		0		0		0	0	0	0	0	0
4		0		0		0	0	0	0	0	0
5		0		0		0	0	0	0	0	0
6		0		0		0	0	0	0	0	0
7		0		0		0	0	0	0	0	0
8		0		0		0	0	0	0	0	0
9		0		0		0	0	0	0	0	0
10		0		0		0	0	0	0	0	0
11		0		0		0	0	0	0	0	0
12		0		0		0	0	0	0	0	0
13		0		0		0	0	0	0	0	0
14		0		0		0	0	0	0	0	0
15		0		0		0	0	0	0	0	0
16		0		0		0	0	0	0	0	0
17		0		0		0	0	0	0	0	0
18		0		0		0	0	0	0	0	0
19		0		0		0	0	0	0	0	0
20		0		0		0	0	0	0	0	0
21		0		0		0	0	0	0	0	0
22		0		0		0	0	0	0	0	0
23		0		0		0	0	0	0	0	0
24		0		0		0	0	0	0	0	0
25		0		0		0	0	0	0	0	0
26		0		0		0	0	0	0	0	0
27		0		0		0	0	0	0	0	0
28		0		0		0	0	0	0	0	0
29		0		0		0	0	0	0	0	0
30		0		0		0	0	0	0	0	0
31	52		190			57	32	55	44	0	0
32	132		498			60	44	72	62	0	0

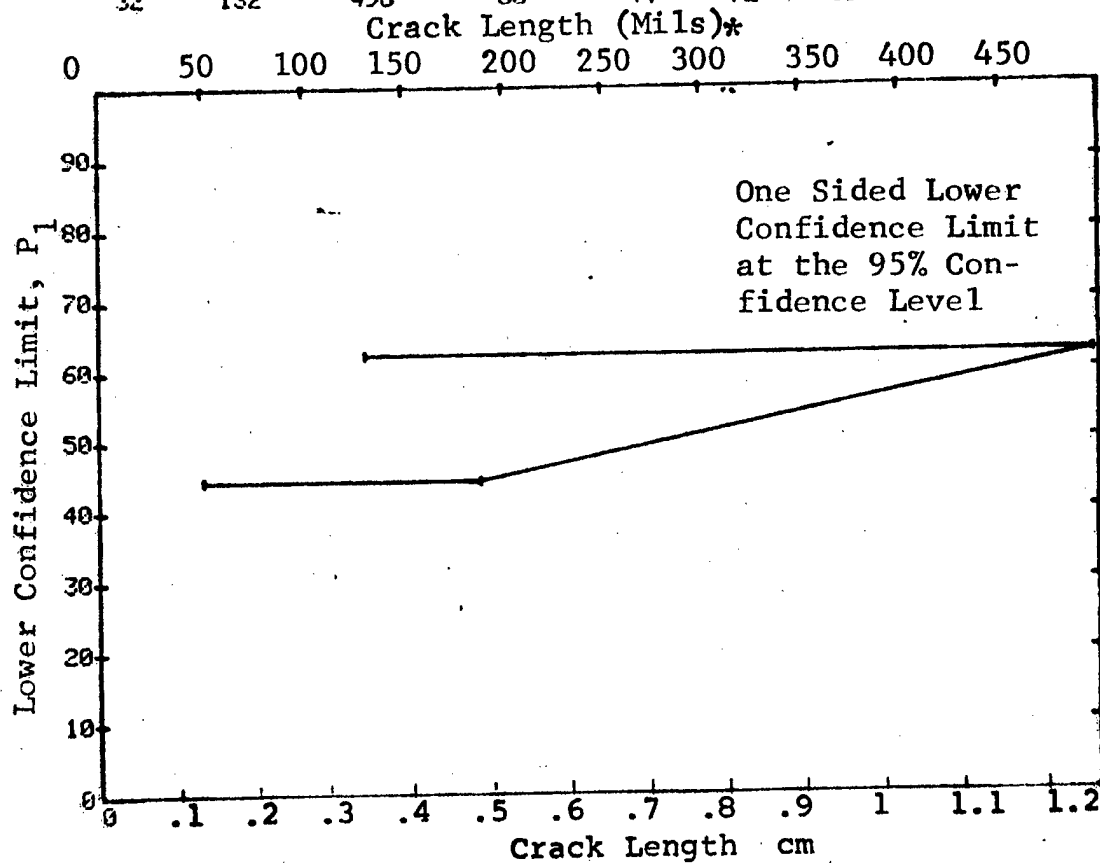


Figure D-54 (Concluded)

(a) Range Interval Method of Data Cumulation

10-OCT-75 RADIOGRAPHY				TEST 1		(55)			
RANGE	MIN	LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1		52*	53*	4	0	0	0	0	0
2		70	81	6	1	10	0	0	0
3		91	92	3	0	0	0	0	0
4		105	109	9	0	0	0	0	0
5		130	137	15	0	0	0	0	0
6		0	0	0	0	0	0	0	0
7		157	162	12	0	0	0	0	0
8		183	188	6	0	0	0	0	0
9		190	196	3	0	0	0	0	0
10		210	212	2	0	0	0	0	0
11		236	236	1	0	0	0	0	0
12		240	248	4	0	0	0	0	0
13		262	267	2	0	0	0	0	0
14		290	290	2	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		314	322	3	0	0	0	0	0
17		327	330	2	0	0	0	0	0
18		342	358	4	2	38	9	0	0
19		362	362	1	0	0	0	0	0
20		382	389	2	2	70	22	0	0
21		0	0	0	0	0	0	0	0
22		422	423	2	0	0	0	0	0
23		428	431	2	1	29	2	0	0
24		0	0	0	0	0	0	0	0
25		461	461	1	1	50	5	0	0
26		0	0	0	0	0	0	0	0
27		498	498	1	1	50	5	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0
31		576	577	2	2	70	22	0	0
32		604	604	1	0	0	0	0	0

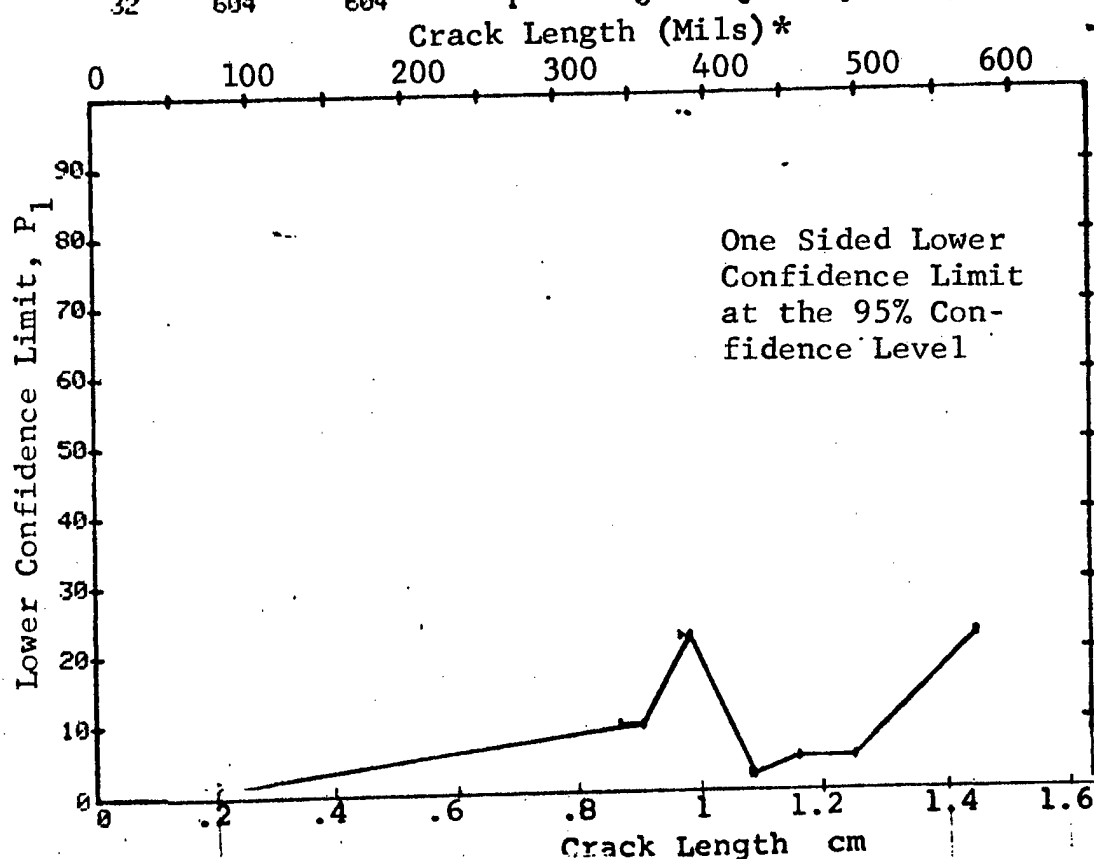


Figure D-55 Probability of Detection for 7075-T6511 Al Using X-ray. Fatigue Cracks in Cylindrical Shell. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		RADIOGRAPHY		N	TEST 2		(55)		
RANGE	MIN	LN	* MAX LN		DET	50%	95%	0 MISS	1 MISS
1		52	53*	4	0	0	0	0	0
2		70	81	6	1	0	0	0	0
3		70	92	9	1	0	0	0	0
4		70	109	18	1	0	0	0	0
5		70	137	33	1	0	0	0	0
6		0	0	0	0	0	0	0	0
7		70	162	45	1	0	0	0	0
8		70	188	51	1	0	0	0	0
9		70	196	54	1	0	0	0	0
10		70	212	56	1	0	0	0	0
11		70	236	57	1	0	0	0	0
12		70	248	61	1	0	0	0	0
13		70	267	63	1	0	0	0	0
14		70	290	65	1	0	0	0	0
15		0	0	0	0	0	0	0	0
16		70	322	68	1	0	0	0	0
17		70	330	70	1	0	0	0	0
18	342		358	4	2	0	9	0	0
19	342		362	5	2	0	7	0	0
20	342		389	7	4	0	22	0	0
21	0		0	0	0	0	0	0	0
22	342		423	9	4	0	16	0	0
23	342		431	11	5	0	19	0	0
24	0		0	0	0	0	0	0	0
25	342		461	12	6	0	24	0	0
26	0		0	0	0	0	0	0	0
27	382		498	8	5	0	28	0	0
28	0		0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0
31	461		577	4	4	0	47	0	0
32	382		604	11	7	0	34	0	0

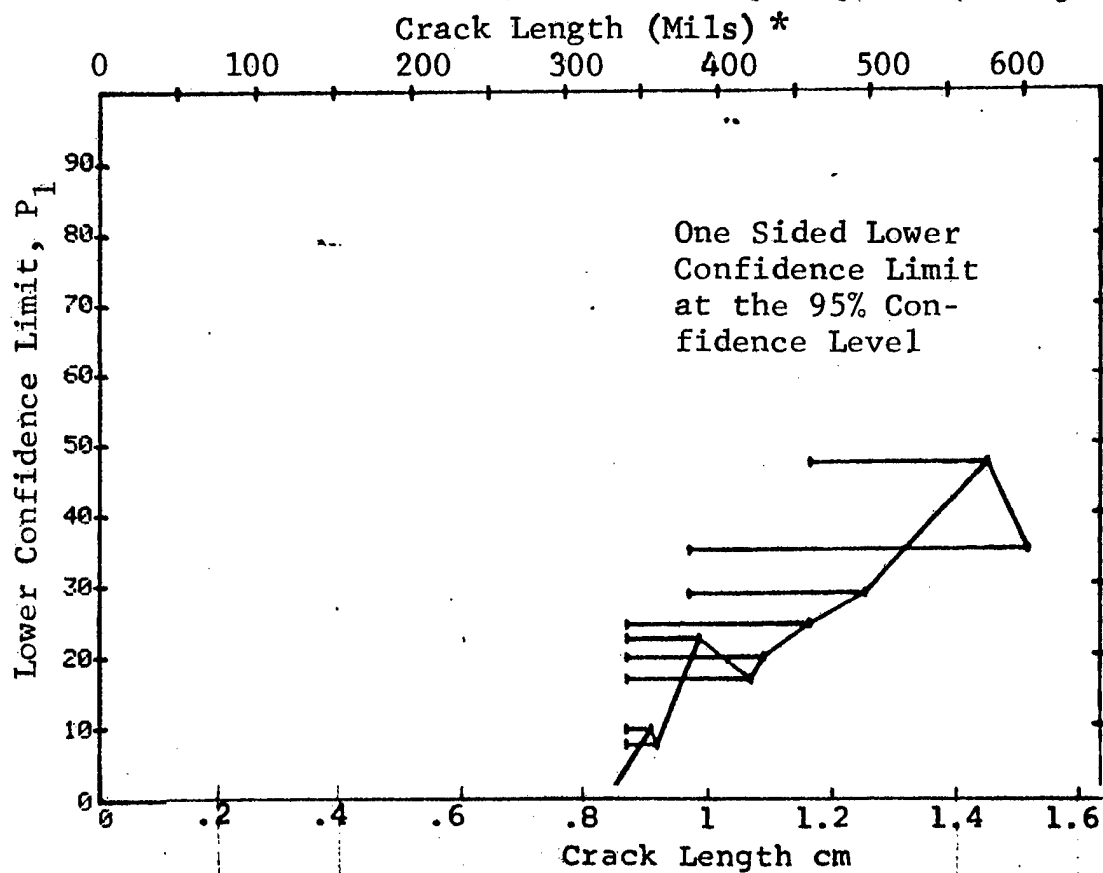


Figure D-55 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

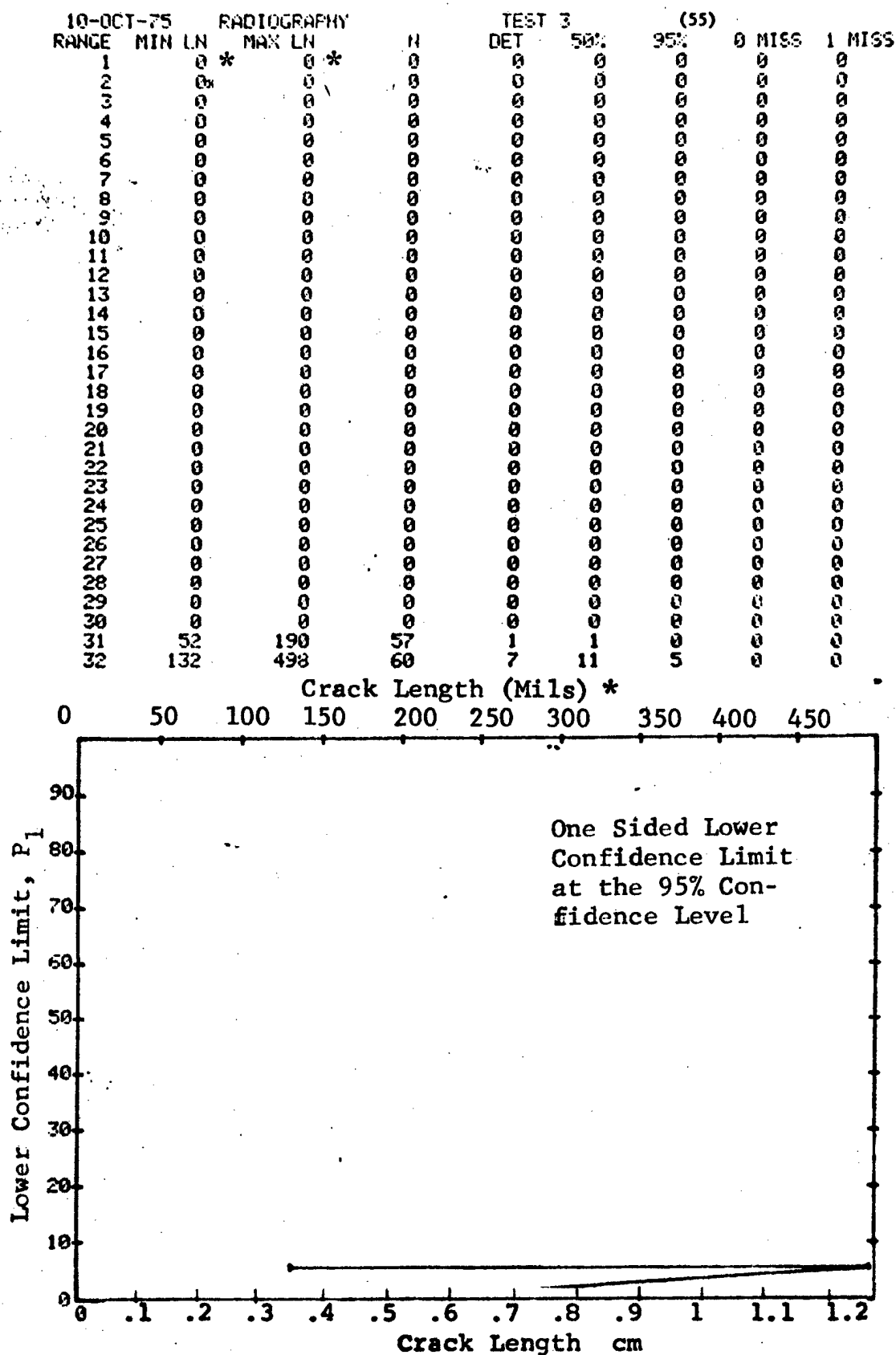


Figure D-55 (Concluded)

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

(a) Range Interval Method of Data Cumulation

10-OCT-75		RADIOGRAPHY		N	TEST 1		(56)		0 MISS	1 MISS
RANGE	MIN LN	* MAX LN	*		DET	50%	95%			
1	70	70	*	1	0	0	0	0	0	0
2	0	0		0	0	0	0	0	0	0
3	100	105		4	0	0	0	0	0	0
4	120	120		2	0	0	0	0	0	0
5	130	140		11	0	0	0	0	0	0
6	150	150		2	0	0	0	0	0	0
7	157	158		5	0	0	0	0	0	0
8	170	170		1	0	0	0	0	0	0
9	184	190		3	0	0	0	0	0	0
10	200	200		2	0	0	0	0	0	0
11	212	215		2	0	0	0	0	0	0
12	236	236		7	0	0	0	0	0	0
13	0	0		0	0	0	0	0	0	0
14	262	264		4	1	15	1	0	0	0
15	0	0		0	0	0	0	0	0	0
16	288	292		5	0	0	0	0	0	0
17	0	0		0	0	0	0	0	0	0
18	314	315		3	0	0	0	0	0	0
19	0	0		0	0	0	0	0	0	0
20	337	344		5	1	12	1	0	0	0
21	0	0		0	0	0	0	0	0	0
22	368	368		1	0	0	0	0	0	0
23	0	0		0	0	0	0	0	0	0
24	394	394		2	0	0	0	0	0	0
25	420	420		1	0	0	0	0	0	0
26	0	0		0	0	0	0	0	0	0
27	446	446		1	0	0	0	0	0	0
28	0	0		0	0	0	0	0	0	0
29	472	473		2	1	29	2	0	0	0
30	0	0		0	0	0	0	0	0	0
31	499	499		1	1	50	5	0	0	0
32	526	526		1	1	50	5	0	0	0

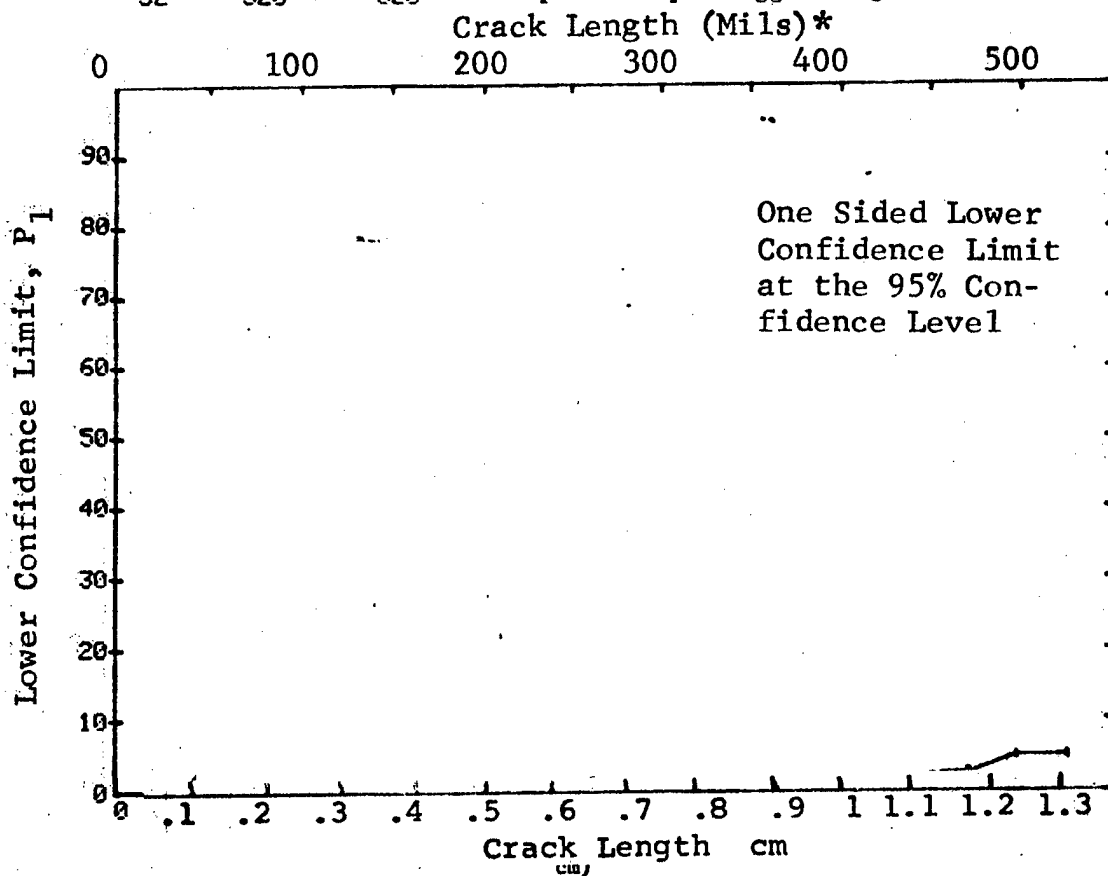


Figure D-56 Probability of Detection for 4330V Steel Using X-ray. Fatigue Cracks in Cylindrical Shell. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

10-OCT-75		RADIOGRAPHY		N	TEST 2		(56)		
RANGE	MIN LN	*MAX LN*			DET	50%	95%	0 MISS	1 MISS
1	70	70	1	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	100	105	4	0	0	0	0	0	0
4	120	120	2	0	0	0	0	0	0
5	130	140	11	0	0	0	0	0	0
6	150	150	2	0	0	0	0	0	0
7	157	158	5	0	0	0	0	0	0
8	170	170	1	0	0	0	0	0	0
9	184	190	3	0	0	0	0	0	0
10	200	200	2	0	0	0	0	0	0
11	212	215	2	0	0	0	0	0	0
12	236	236	7	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	262	264	4	1	0	1	0	0	0
15	0	0	0	0	0	0	0	0	0
16	262	292	9	1	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	262	315	12	1	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	262	344	17	2	0	2	0	0	0
21	0	0	0	0	0	0	0	0	0
22	262	368	18	2	0	2	0	0	0
23	0	0	0	0	0	0	0	0	0
24	262	394	20	2	0	1	0	0	0
25	262	420	21	2	0	1	0	0	0
26	0	0	0	0	0	0	0	0	0
27	262	446	22	2	0	1	0	0	0
28	0	0	0	0	0	0	0	0	0
29	262	473	24	3	0	3	0	0	0
30	0	0	0	0	0	0	0	0	0
31	472	499	3	2	0	13	0	0	0
32	472	526	4	3	0	24	0	0	0

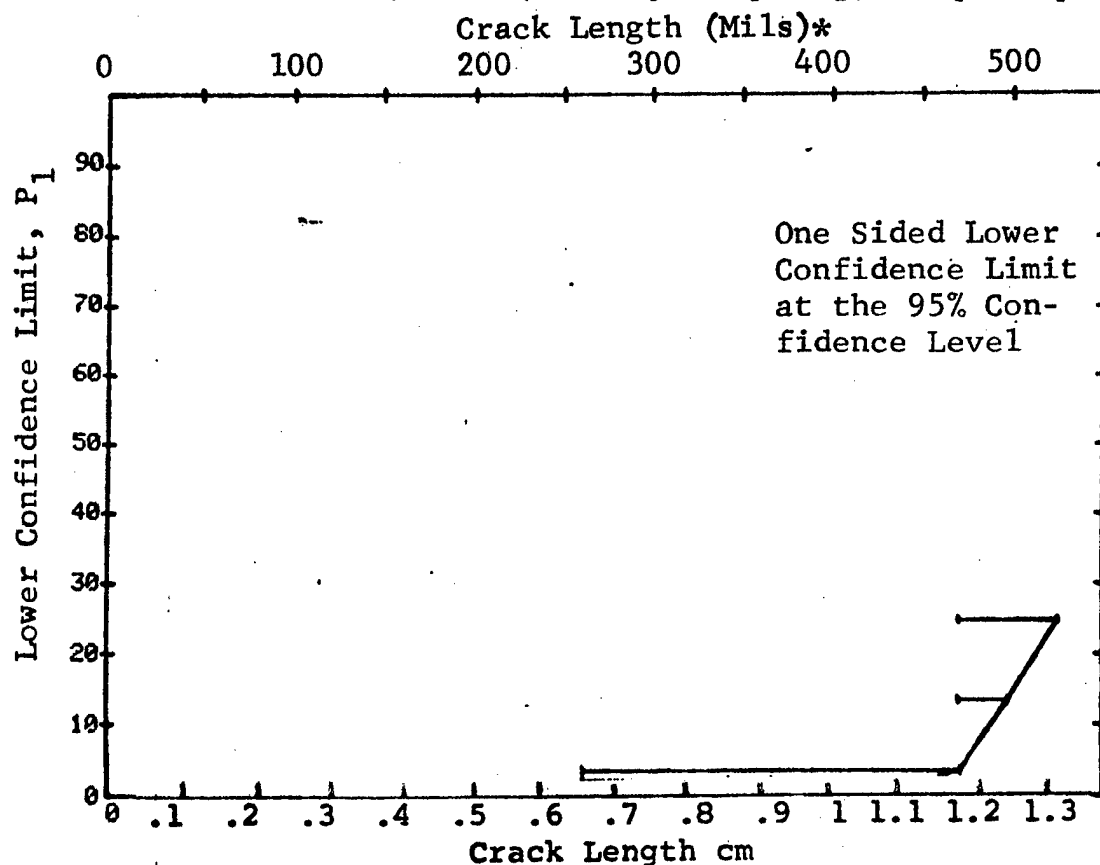


Figure D-56 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

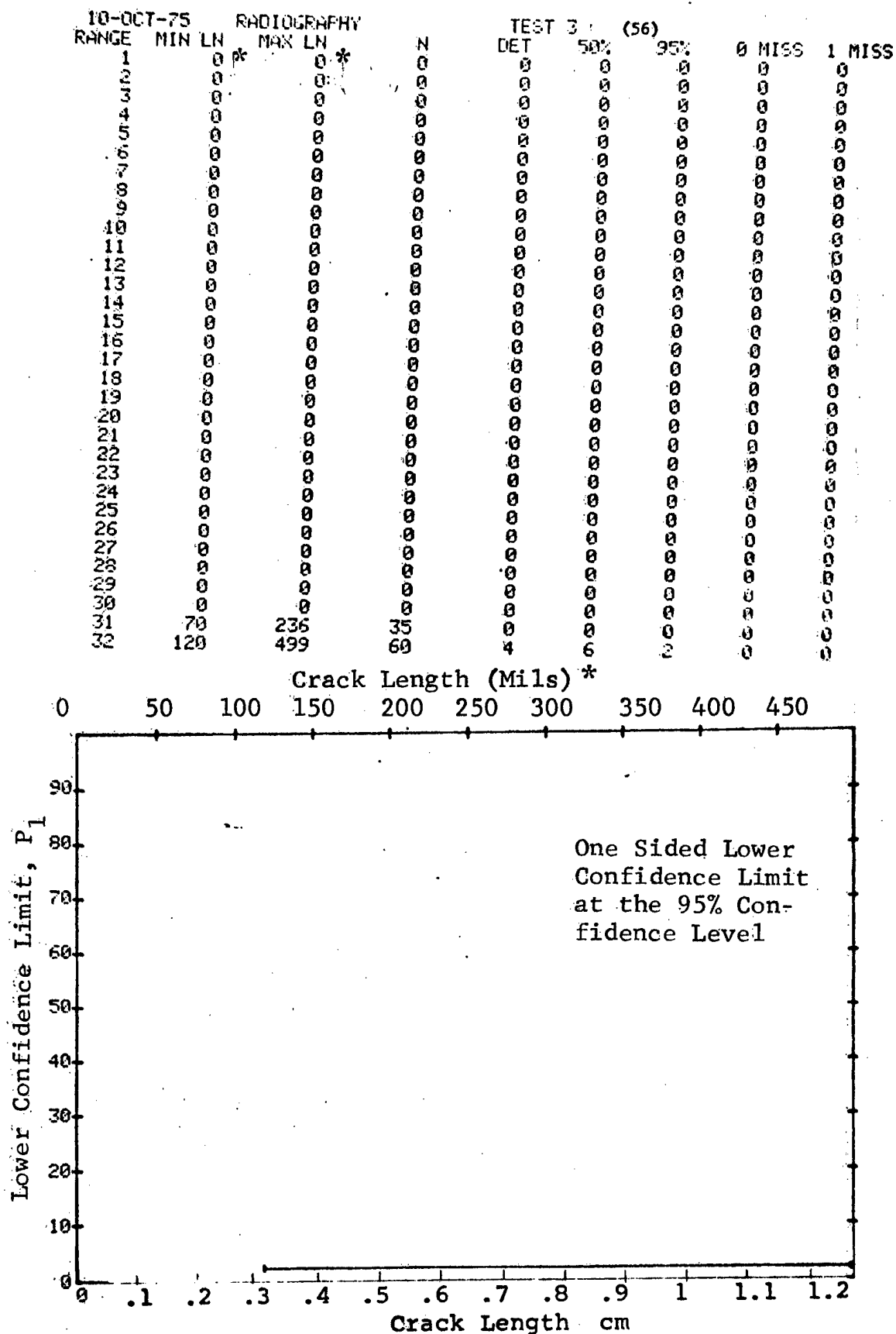


Figure D-56 (Concluded)

(a) Range Interval Method of Data Cumulation

17-OCT-75			TEST 1			(57)		
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	5	20	154	19	12	8	0	0
2	30	51	87	22	34	17	0	0
3	54	74	25	14	53	37	0	0
4	78	100	19	7	34	18	0	0
5	105	125	10	9	83	60	0	0
6	127	142	8	7	79	52	0	0
7	150	168	10	6	54	30	0	0
8	179	194	4	4	84	47	0	0
9	200	220	7	6	77	47	0	0
10	230	243	3	3	79	36	0	0
11	252	265	4	4	84	47	0	0
12	271	271	1	0	0	0	0	0
13	296	307	2	1	29	2	0	0
14	320	339	2	2	70	22	0	0
15	346	353	2	2	70	22	0	0
16	0	0	0	0	0	0	0	0
17	392	408	2	1	29	2	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	533	533	1	1	50	5	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	687	687	1	1	50	5	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	774	774	1	1	50	5	0	0

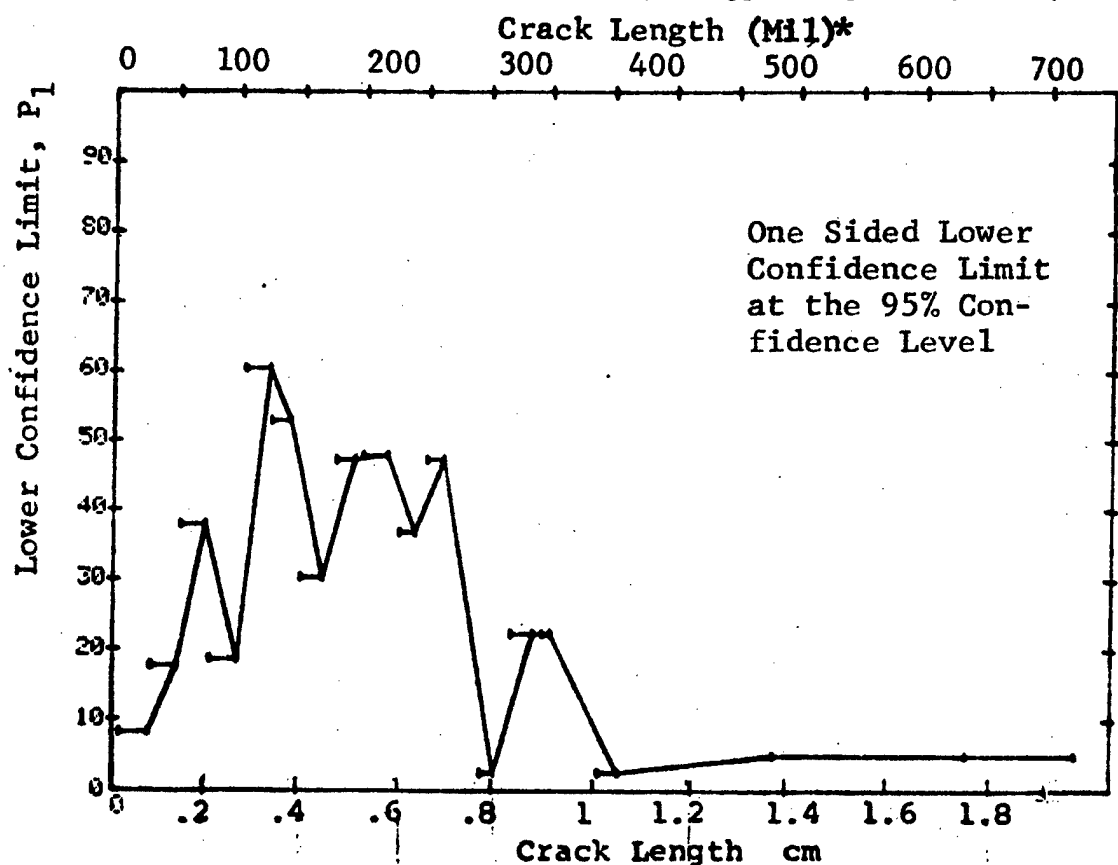


Figure D-57 Probability of Detection for 7178-T651 Al Using Eddy Current. Fatigue Cracks in Fastener Holes Measured by Team 2. Field Env.

(b) Optimum Probability Method of Data Cumulation

17-OCT-75				TEST 2				(57)	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	5	29	154	17	0	8	0	0	
2	30	51	87	32	0	17	0	0	
3	54	74	25	14	0	37	0	0	
4	54	100	44	21	0	34	0	0	
5	105	125	10	9	0	60	0	0	
6	105	142	18	16	0	68	0	0	
7	105	168	28	22	0	62	0	0	
8	105	194	32	26	0	66	0	0	
9	105	220	39	32	0	68	0	0	
10	105	243	42	35	0	70	0	0	
11	179	265	18	17	0	76	0	0	
12	105	271	47	39	0	71	0	0	
13	105	307	49	40	0	70	0	0	
14	105	339	51	42	0	71	0	0	
15	105	353	53	44	0	72	0	0	
16	0	0	0	0	0	0	0	0	
17	105	408	55	45	0	71	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	105	533	56	46	0	71	0	0	
23	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	105	687	57	47	0	71	0	0	
30	0	0	0	0	0	0	0	0	
31	0	0	0	0	0	0	0	0	
32	105	774	58	48	0	72	0	0	

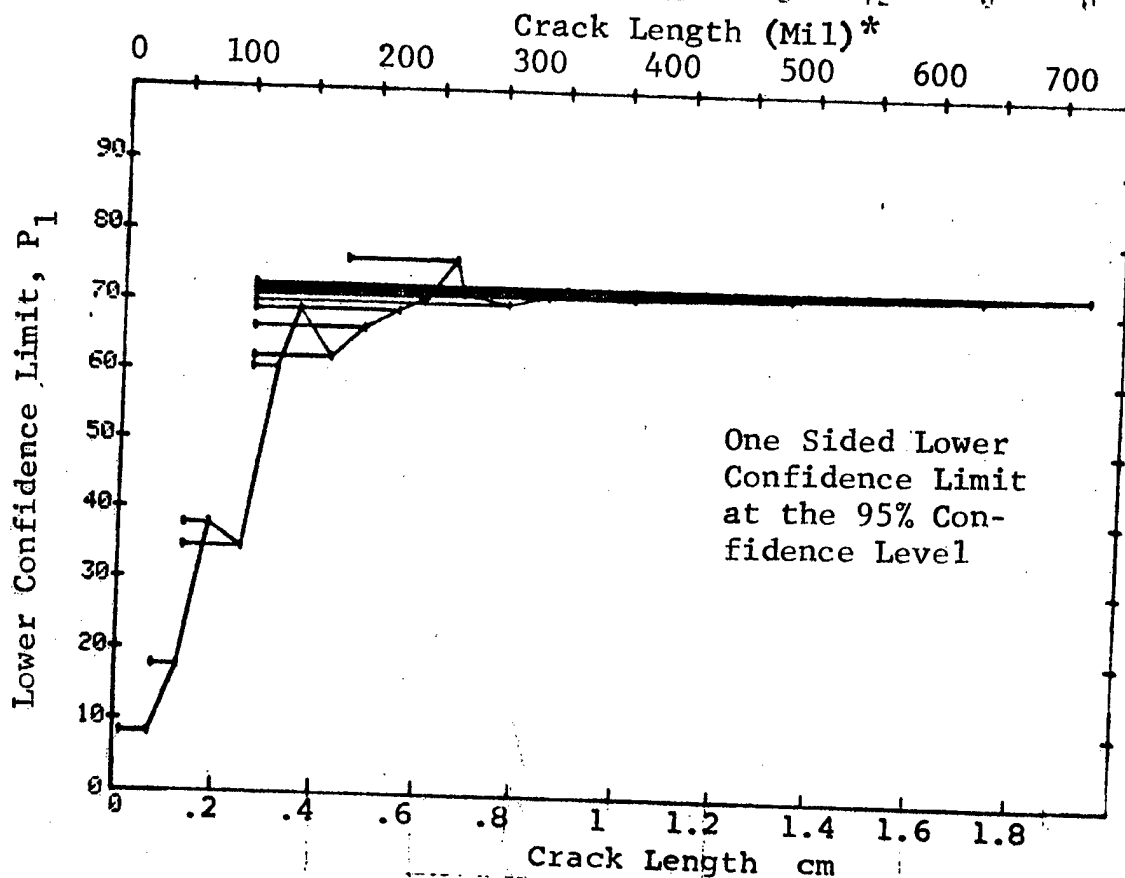


Figure D-57 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

17-OCT-75					TEST 3					(57)	
RANGE	MIN LN	* LN	MAX LN	* LN	N	DET	50%	95%	0 MISS	1 MISS	
1	0	*	0	*	0	0	0	0	0	0	
2	0		0		0	0	0	0	0	0	
3	0		0		0	0	0	0	0	0	
4	0		0		0	0	0	0	0	0	
5	0		0		0	0	0	0	0	0	
6	0		0		0	0	0	0	0	0	
7	0		0		0	0	0	0	0	0	
8	0		0		0	0	0	0	0	0	
9	0		0		0	0	0	0	0	0	
10	0		0		0	0	0	0	0	0	
11	0		0		0	0	0	0	0	0	
12	0		0		0	0	0	0	0	0	
13	0		0		0	0	0	0	0	0	
14	0		0		0	0	0	0	0	0	
15	0		0		0	0	0	0	0	0	
16	0		0		0	0	0	0	0	0	
17	0		0		0	0	0	0	0	0	
18	0		0		0	0	0	0	0	0	
19	0		0		0	0	0	0	0	0	
20	0		0		0	0	0	0	0	0	
21	0		0		0	0	0	0	0	0	
22	5		10		40	4	9	3	0	0	
23	10		20		60	3	4	1	0	0	
24	10		20		60	6	9	4	0	0	
25	20		20		60	10	16	9	0	0	
26	20		30		60	10	16	9	0	0	
27	20		36		60	12	19	11	0	0	
28	30		45		60	14	22	14	0	0	
29	30		60		60	18	29	20	0	0	
30	45		95		60	26	42	32	0	0	
31	60		161		60	38	60	45	0	0	
32	96		402		60	47	77	57	0	0	

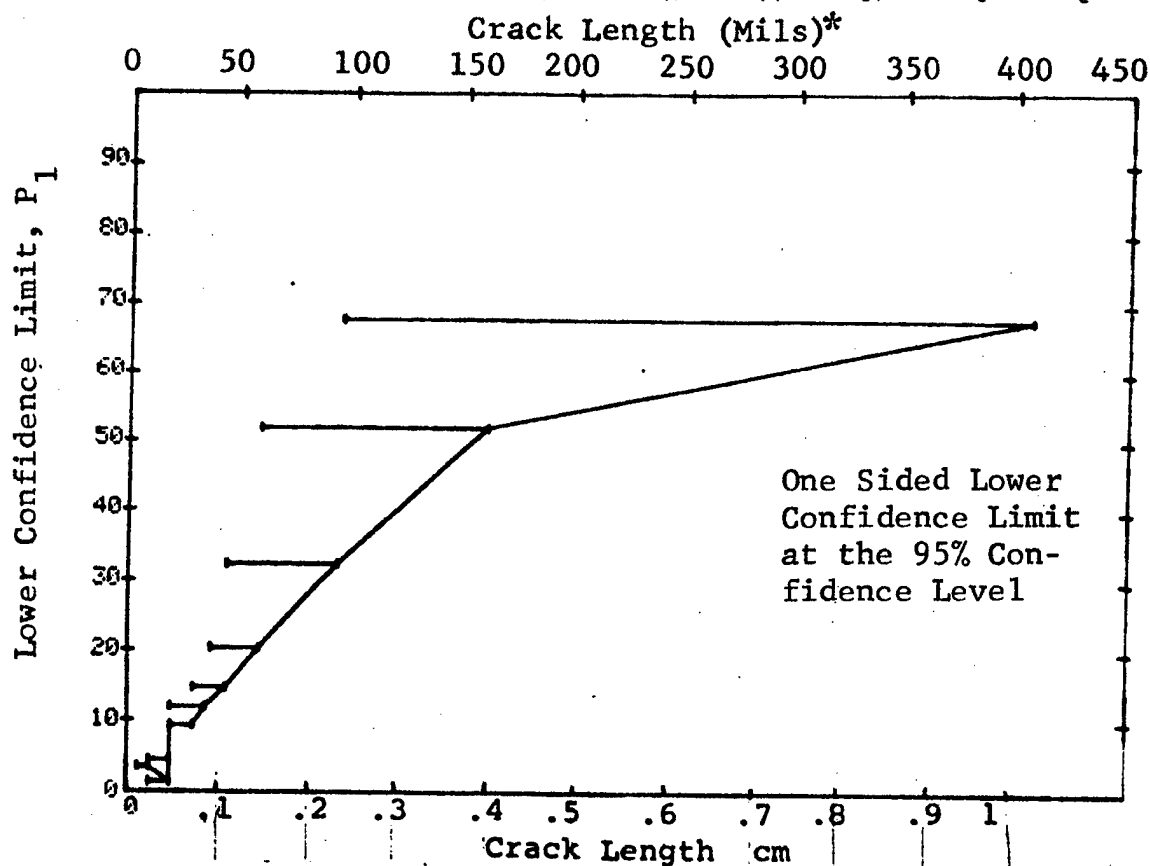


Figure D-57 (Concluded)

(a) Range Interval Method of Data Cumulation

17-OCT-75				17-OCT-75			
RANGE	MIN LN	MAX LN	N	RANGE	MIN LN	MAX LN	N
1	5	22	150	1	5	22	150
2	30	51	90	2	30	51	90
3	54	74	33	3	54	74	33
4	78	100	26	4	78	100	26
5	105	125	10	5	105	125	10
6	127	142	7	6	127	142	7
7	150	169	9	7	150	169	9
8	179	194	9	8	179	194	9
9	208	220	5	9	208	220	5
10	230	243	4	10	230	243	4
11	252	265	4	11	252	265	4
12	271	280	4	12	271	280	4
13	296	307	6	13	296	307	6
14	320	339	6	14	320	339	6
15	346	353	6	15	346	353	6
16	0	0	0	16	0	0	0
17	392	408	2	17	392	408	2
18	0	0	0	18	0	0	0
19	0	0	0	19	0	0	0
20	0	0	0	20	0	0	0
21	0	0	0	21	0	0	0
22	533	533	1	22	533	533	1
23	0	0	0	23	0	0	0
24	0	0	0	24	0	0	0
25	0	0	0	25	0	0	0
26	0	0	0	26	0	0	0
27	0	0	0	27	0	0	0
28	0	0	0	28	0	0	0
29	687	687	1	29	687	687	1
30	0	0	0	30	0	0	0
31	0	0	0	31	0	0	0
32	774	774	1	32	774	774	1

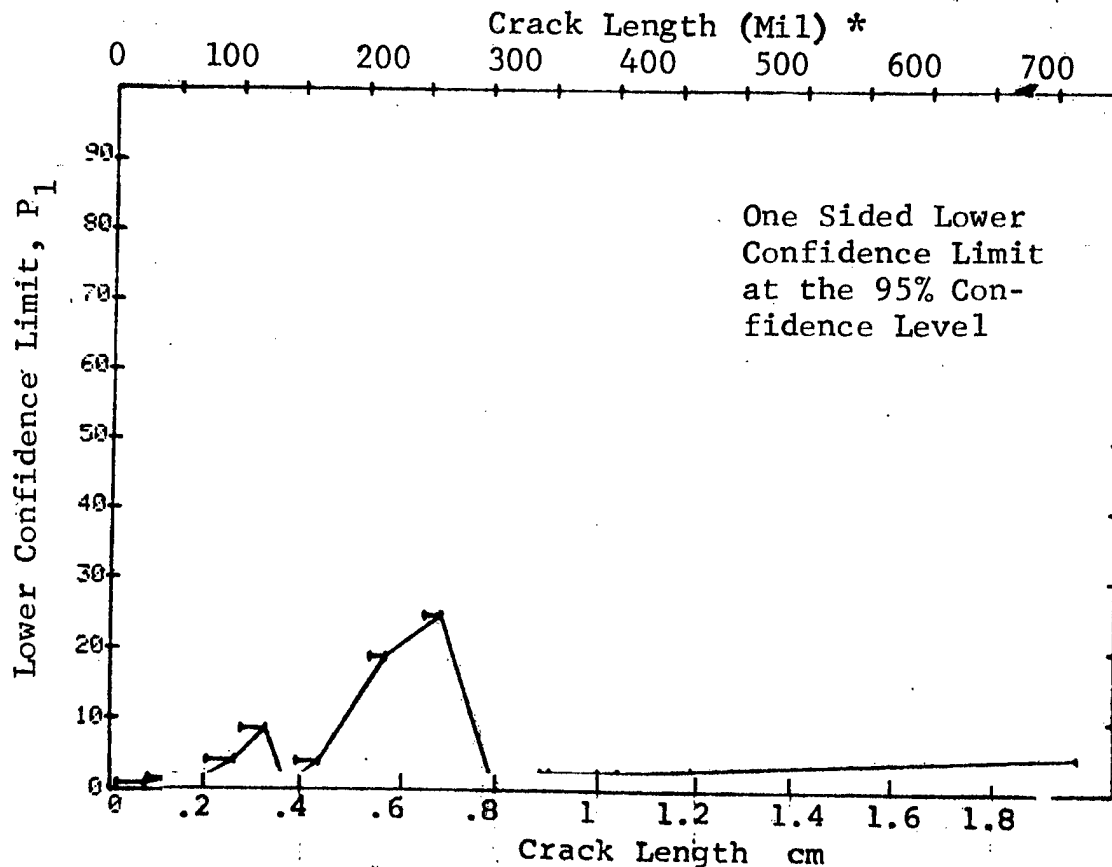


Figure D-58 Probability of Detection for 7178-T651 Al Using Eddy Current. Fatigue Cracks in Fastener Holes Measured by Team 4. Field Env.

(b) Optimum Probability Method of Data Cumulation

17-OCT-75				17-OCT-75				(58)
RANGE	MIN	IN	MIL IN	RANGE	MIN	IN	MIL IN	
1	5*		150	1	0	0	0	
2	5	0	140	2	0	1	0	
3	30	0	109	3	0	2	0	
4	54	0	43	4	0	4	0	
5	78	0	30	5	0	6	0	
6	78	0	37	6	0	9	0	
7	78	0	46	7	0	10	0	
8	78	0	51	8	0	9	0	
9	208	0	5	9	0	12	0	
10	105	0	40	10	0	12	0	
11	252	0	4	11	0	24	0	
12	208	0	15	12	0	19	0	
13	208	0	18	13	0	12	0	
14	208	0	20	14	0	17	0	
15	208	0	22	15	0	12	0	
16	0	0	0	16	0	0	0	
17	208	0	24	17	0	21	0	
18	0	0	0	18	0	0	0	
19	0	0	0	19	0	0	0	
20	0	0	0	20	0	0	0	
21	0	0	0	21	0	0	0	
22	208	0	25	22	0	20	0	
23	0	0	0	23	0	0	0	
24	0	0	0	24	0	0	0	
25	0	0	0	25	0	0	0	
26	0	0	0	26	0	0	0	
27	0	0	0	27	0	0	0	
28	0	0	0	28	0	0	0	
29	208	0	26	29	0	12	0	
30	0	0	0	30	0	0	0	
31	0	0	0	31	0	0	0	
32	208	0	27	32	0	0	0	

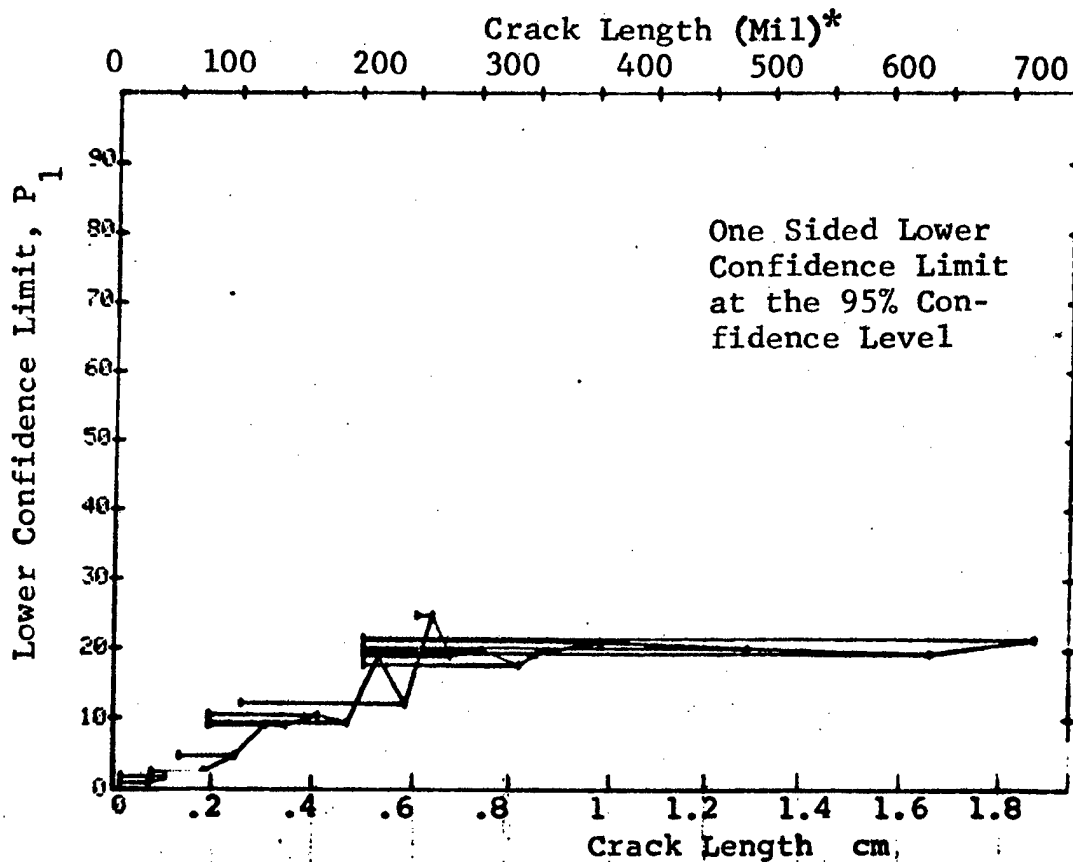


Figure D-58 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

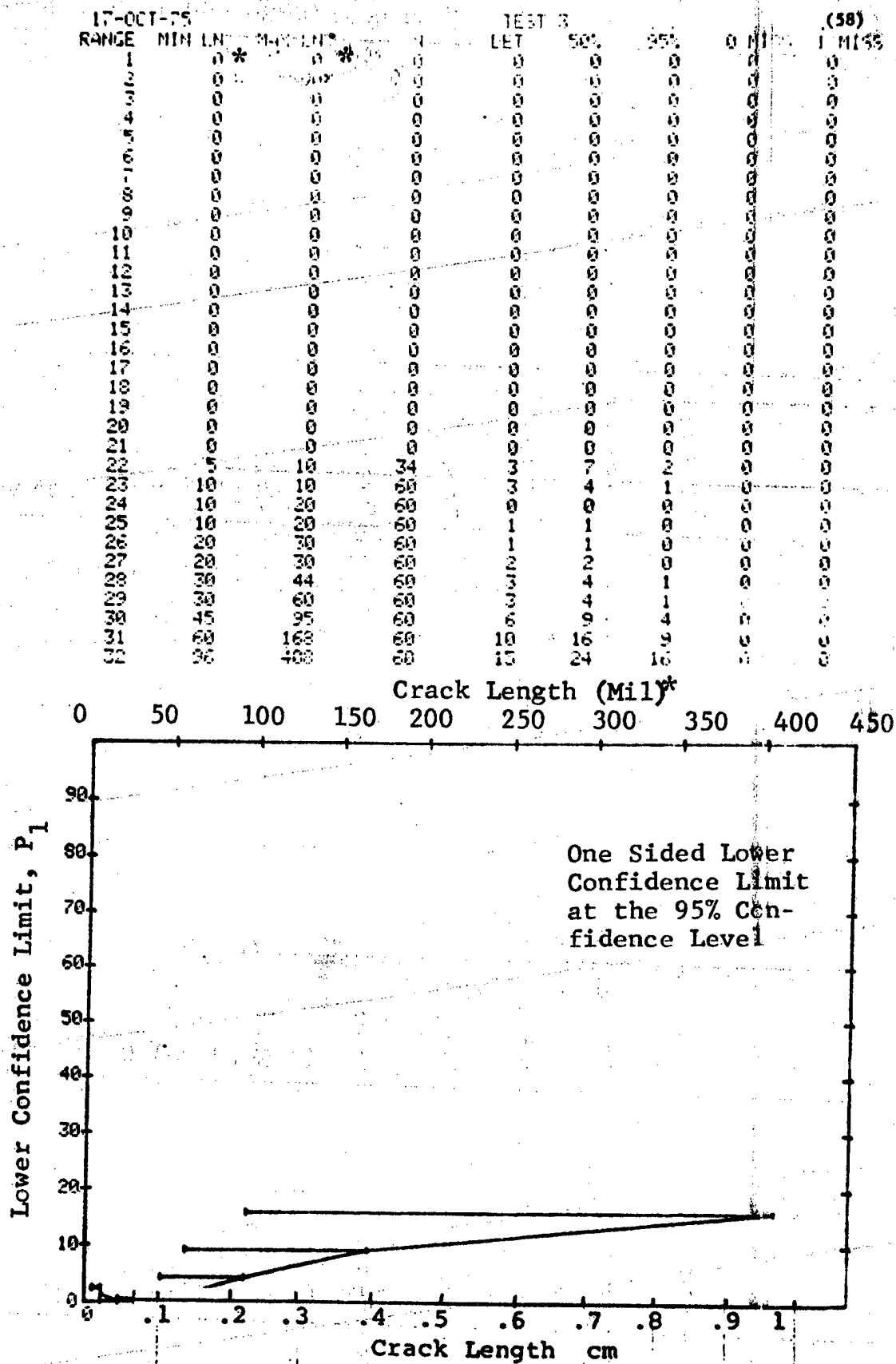


Figure D-58 (Concluded)

(a) Range Interval Method of Data Cumulation

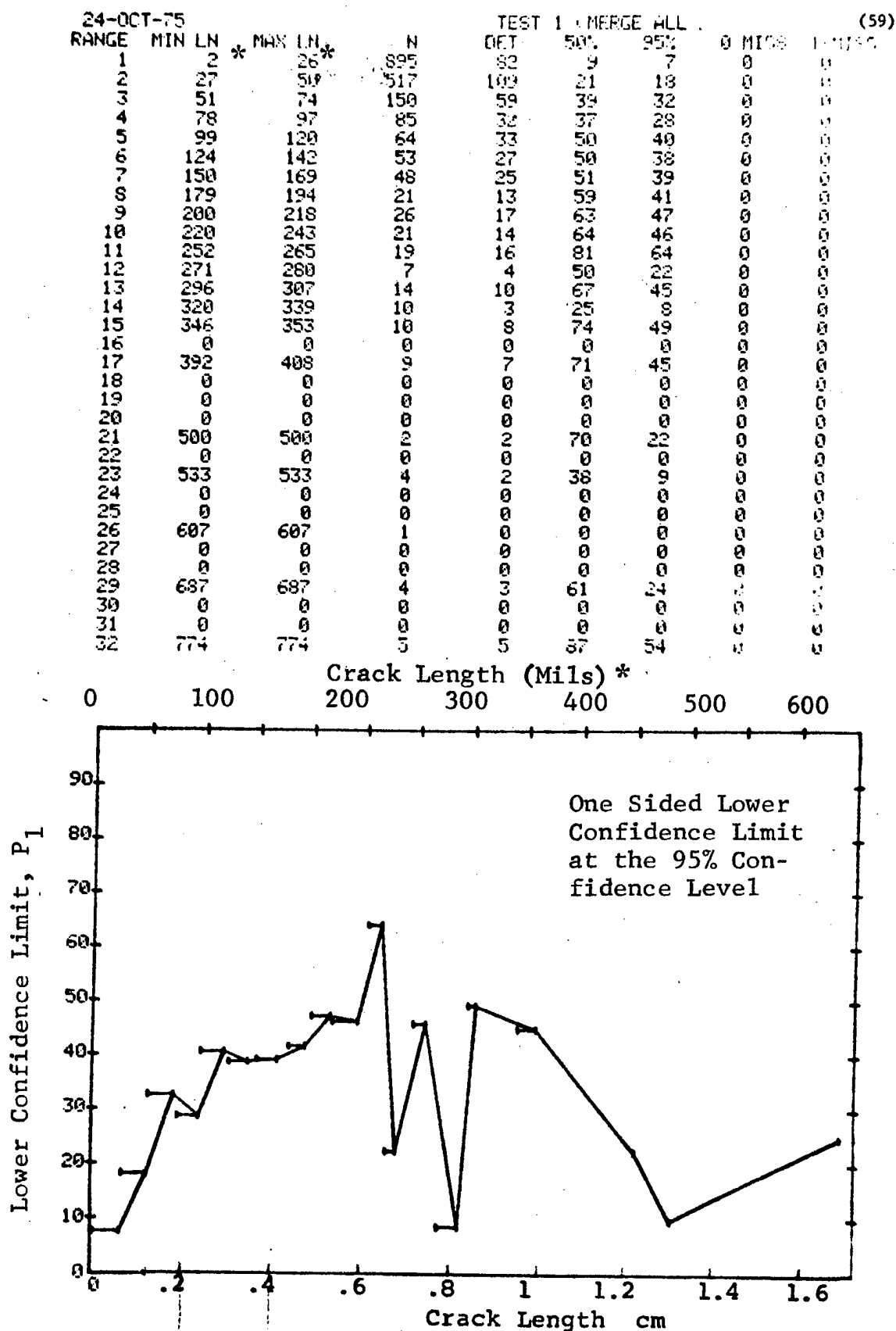


Figure D-59 Probability of Detection for 7178-T651 Al Using Eddy Current. Fatigue Cracks in Fastener Holes Measured by 5 Merged Teams. Field Env.

(b) Optimum Probability Method of Data Cumulation

24-OCT-75				TEST 2 (MERGE)				(59)	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	MISS	MISS
1	2	26	895	82	0	7	0	0	0
2	27	50	517	109	0	18	0	0	0
3	51	74	150	59	0	32	0	0	0
4	51	97	235	91	0	33	0	0	0
5	99	120	64	33	0	40	0	0	0
6	124	142	53	27	0	38	0	0	0
7	124	169	101	52	0	42	0	0	0
8	124	194	122	65	0	45	0	0	0
9	179	218	47	30	0	50	0	0	0
10	179	243	68	44	0	54	0	0	0
11	252	265	19	16	0	64	0	0	0
12	200	280	73	51	0	59	0	0	0
13	252	307	40	30	0	61	0	0	0
14	179	339	118	77	0	57	0	0	0
15	200	353	107	72	0	59	0	0	0
16	0	0	0	0	0	0	0	0	0
17	200	408	116	79	0	60	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	346	500	21	17	0	61	0	0	0
22	0	0	0	0	0	0	0	0	0
23	200	533	122	83	0	60	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	200	607	123	83	0	59	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	200	687	127	86	0	60	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	346	774	35	27	0	62	0	0	0

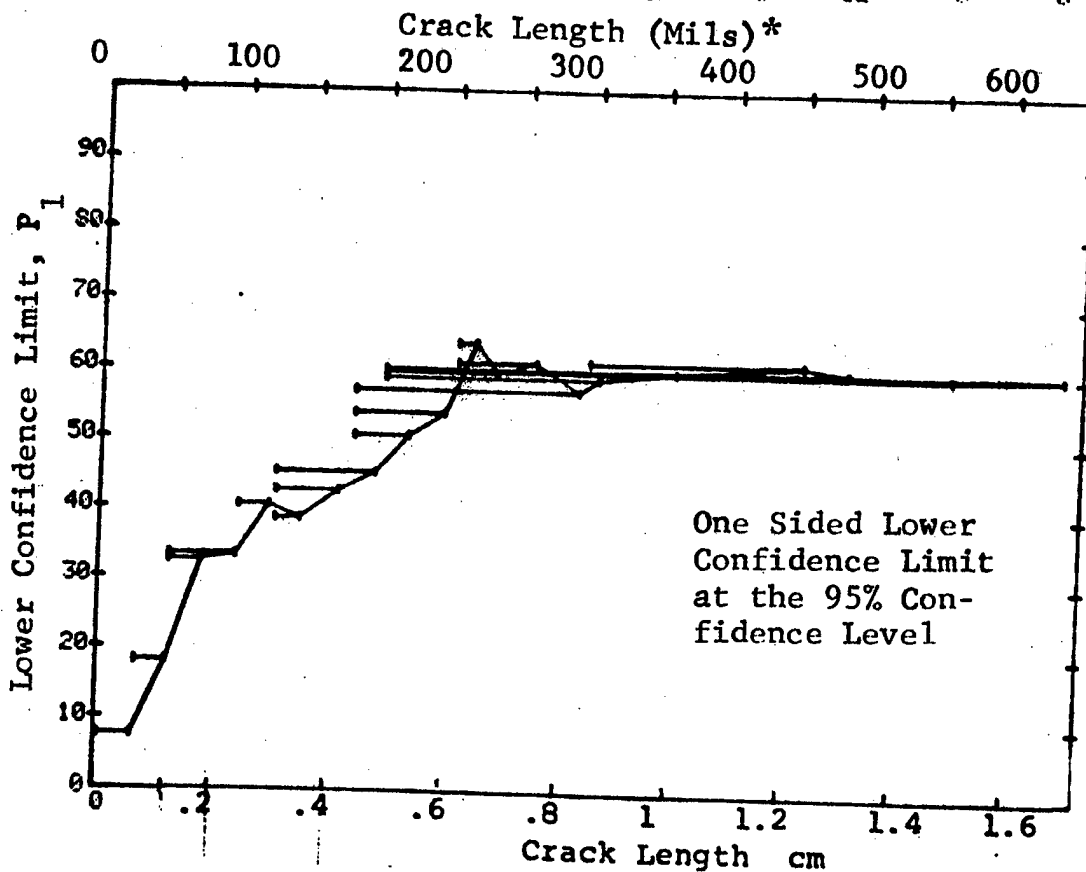


Figure D-59 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

24-OCT-75					TEST 3 (MEFGE			(59)	
RANGE	NIN	LN	* MAX LN	* N	DET	50%	95%	0 MISS	1 MISS
1		30	* 30	* 60	9	14	8	0	0
2		30	30	60	9	14	8	0	0
3		30	30	60	8	12	6	0	0
4		30	30	60	12	19	11	0	0
5		30	40	60	12	19	11	0	0
6		30	40	60	12	19	11	0	0
7		40	40	60	16	25	17	0	0
8		40	40	60	21	34	24	0	0
9		40	42	60	15	24	16	0	0
10		40	45	60	12	19	11	0	0
11		42	50	60	14	22	14	0	0
12		45	50	60	10	16	9	0	0
13		50	50	60	8	12	6	0	0
14		50	50	60	14	22	14	0	0
15		50	60	60	22	35	26	0	0
16		50	60	60	23	37	27	0	0
17		60	64	60	24	39	29	0	0
18		60	70	60	27	44	33	0	0
19		64	74	60	24	39	29	0	0
20		70	80	60	26	42	32	0	0
21		74	90	60	22	35	26	0	0
22		80	99	60	17	27	18	0	0
23		90	108	60	30	49	38	0	0
24		99	120	60	32	52	41	0	0
25	108		132	60	28	45	35	0	0
26	124		150	60	32	52	41	0	0
27	132		166	60	32	52	41	0	0
28	150		194	60	31	50	40	0	0
29	166		220	60	36	59	48	0	0
30	194		264	60	42	69	58	0	0
31	220		320	60	43	70	60	0	0
32	264		500	60	41	67	57	0	0

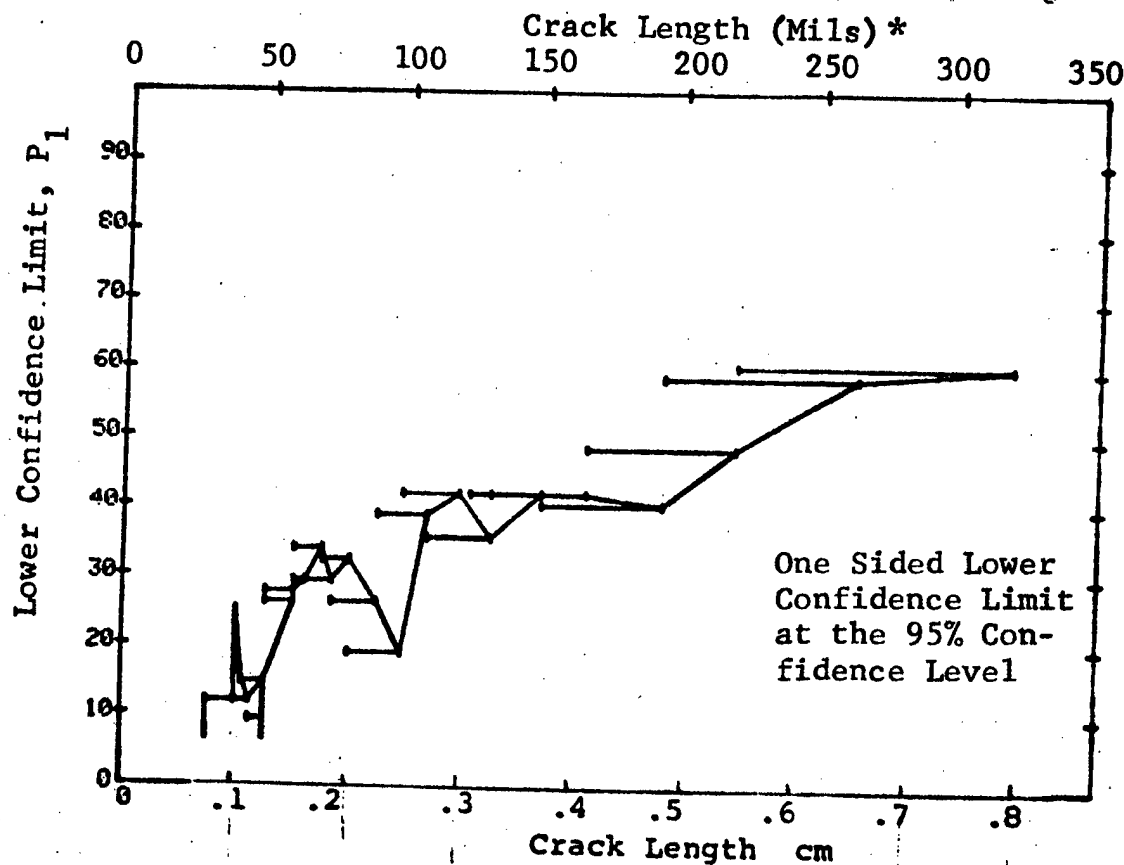


Figure D-59 (Concluded)

(a) Range Interval Method of Data Cumulation

24-OCT-75		PENETRANT		TEST 1			(60)	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	10	10	2	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	30	30	5	1	12	1	0	0
4	0	0	0	0	0	0	0	0
5	40	40	10	7	64	39	0	0
6	50	50	14	8	53	32	0	0
7	0	0	0	0	0	0	0	0
8	60	60	6	4	57	27	0	0
9	70	70	4	4	84	47	0	0
10	0	0	0	0	0	0	0	0
11	80	80	8	8	91	68	0	0
12	90	90	8	7	79	52	0	0
13	0	0	0	0	0	0	0	0
14	100	100	13	9	64	42	0	0
15	110	110	18	17	90	76	28	43
16	120	120	3	3	79	36	0	0
17	0	0	0	0	0	0	0	0
18	130	130	8	2	20	4	0	0
19	140	140	9	8	82	57	0	0
20	0	0	0	0	0	0	0	0
21	150	150	11	10	85	63	0	0
22	160	160	6	6	89	60	0	0
23	0	0	0	0	0	0	0	0
24	170	170	7	4	50	22	0	0
25	180	180	15	15	95	81	14	31
26	0	0	0	0	0	0	0	0
27	190	190	7	7	90	65	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	210	210	2	1	29	2	0	0
31	220	220	3	1	20	1	0	0
32	230	230	11	11	93	76	18	35

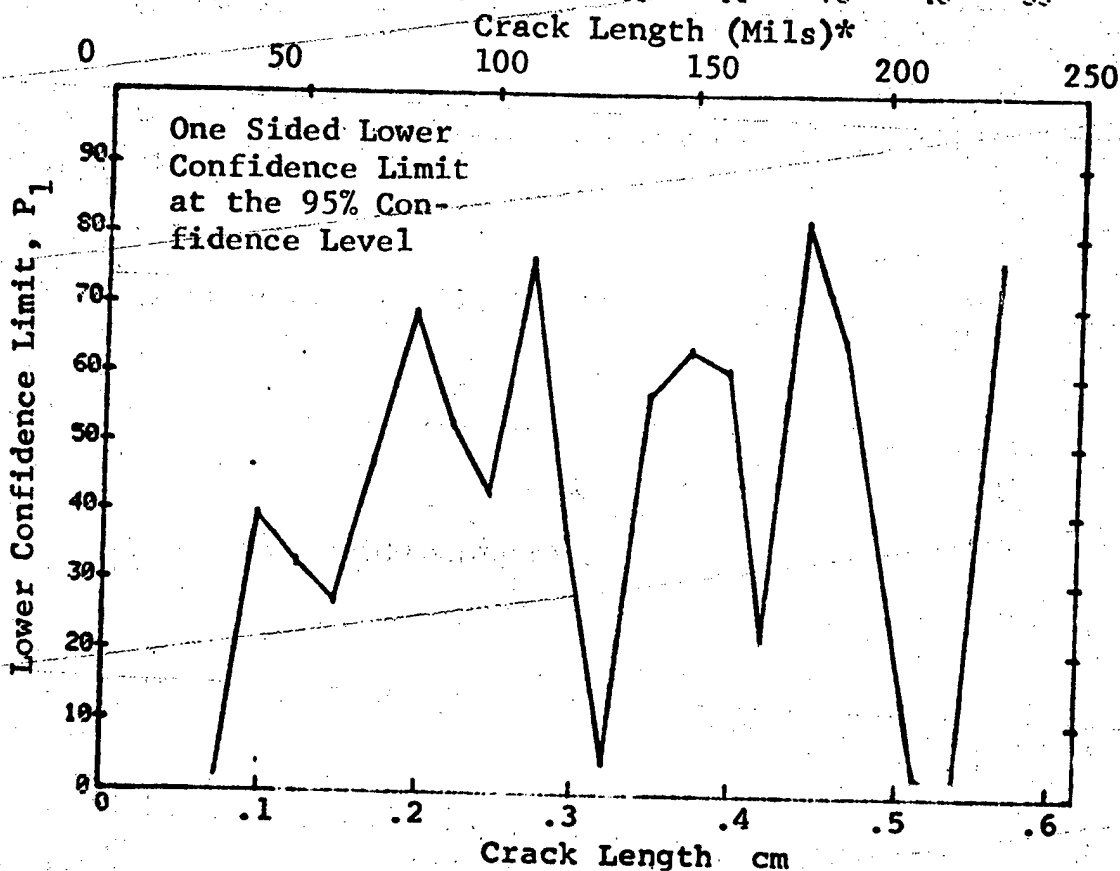


Figure D-60 Probability of Detection for 2024-T6 Al Using Liquid Penetrant. Compressed Notch Flaws in Tandem T Sections. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

24-OCT-75		PENETRANT		TEST 2		(60)			
RANGE	MIN	LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	10	*	10	2	0	0	0	0	0
2	0		0	0	0	0	0	0	0
3	30		30	5	0	0	0	0	0
4	0		0	0	0	0	0	0	0
5	40		40	10	7	0	39	0	0
6	40		50	24	15	0	43	0	0
7	0		0	0	0	0	0	0	0
8	40		60	30	19	0	46	0	0
9	40		70	34	23	0	52	0	0
10	0		0	0	0	0	0	0	0
11	70		80	12	12	0	77	0	0
12	70		90	20	19	0	78	0	0
13	0		0	0	0	0	0	0	0
14	70		100	33	28	0	70	0	0
15	70		110	51	45	0	78	0	0
16	110		120	21	20	0	79	0	0
17	0		0	0	0	0	0	0	0
18	70		130	62	50	0	70	0	0
19	70		140	71	58	0	72	0	0
20	0		0	0	0	0	0	0	0
21	70		150	82	68	0	74	0	0
22	140		160	26	24	0	77	0	0
23	0		0	0	0	0	0	0	0
24	70		170	95	78	0	74	0	0
25	180		180	15	15	0	81	14	31
26	0		0	0	0	0	0	0	0
27	180		190	22	22	0	87	7	24
28	0		0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0
30	180		210	24	23	0	81	23	37
31	140		220	28	52	0	77	3	0
32	180		230	38	35	0	80	38	51

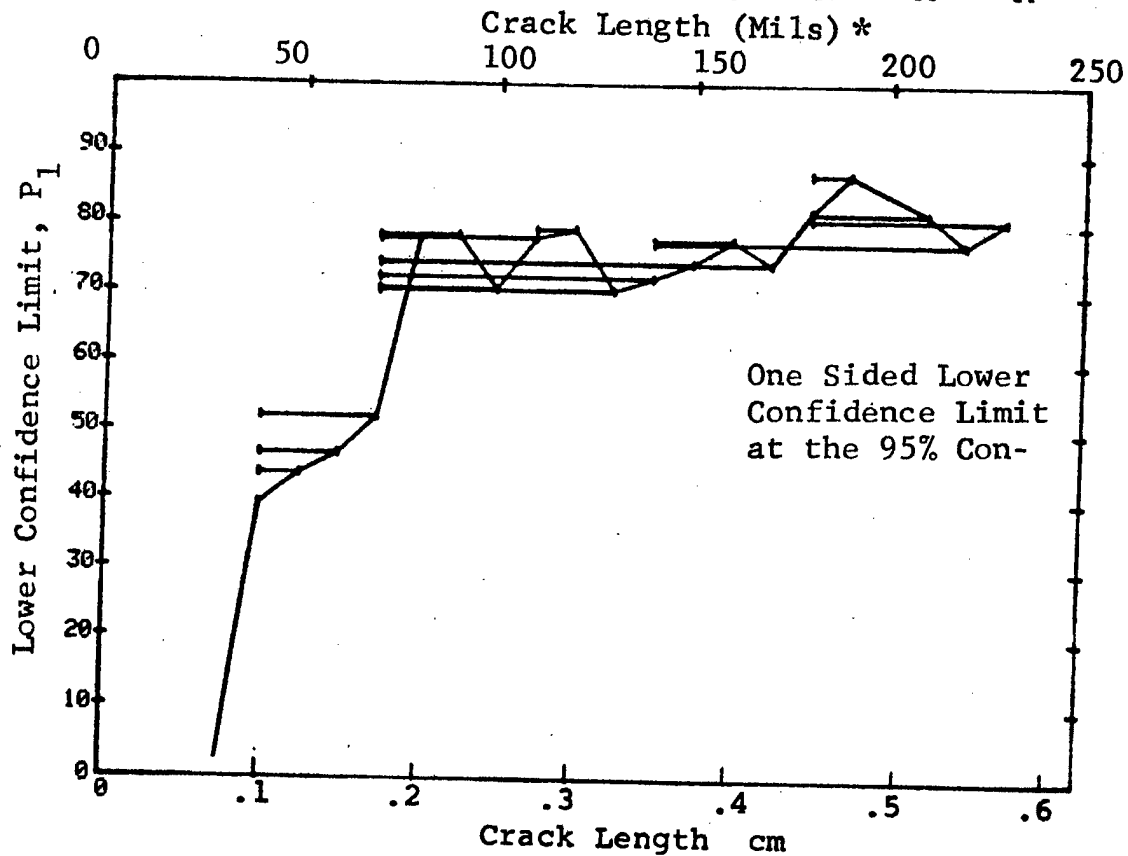


Figure D-60 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

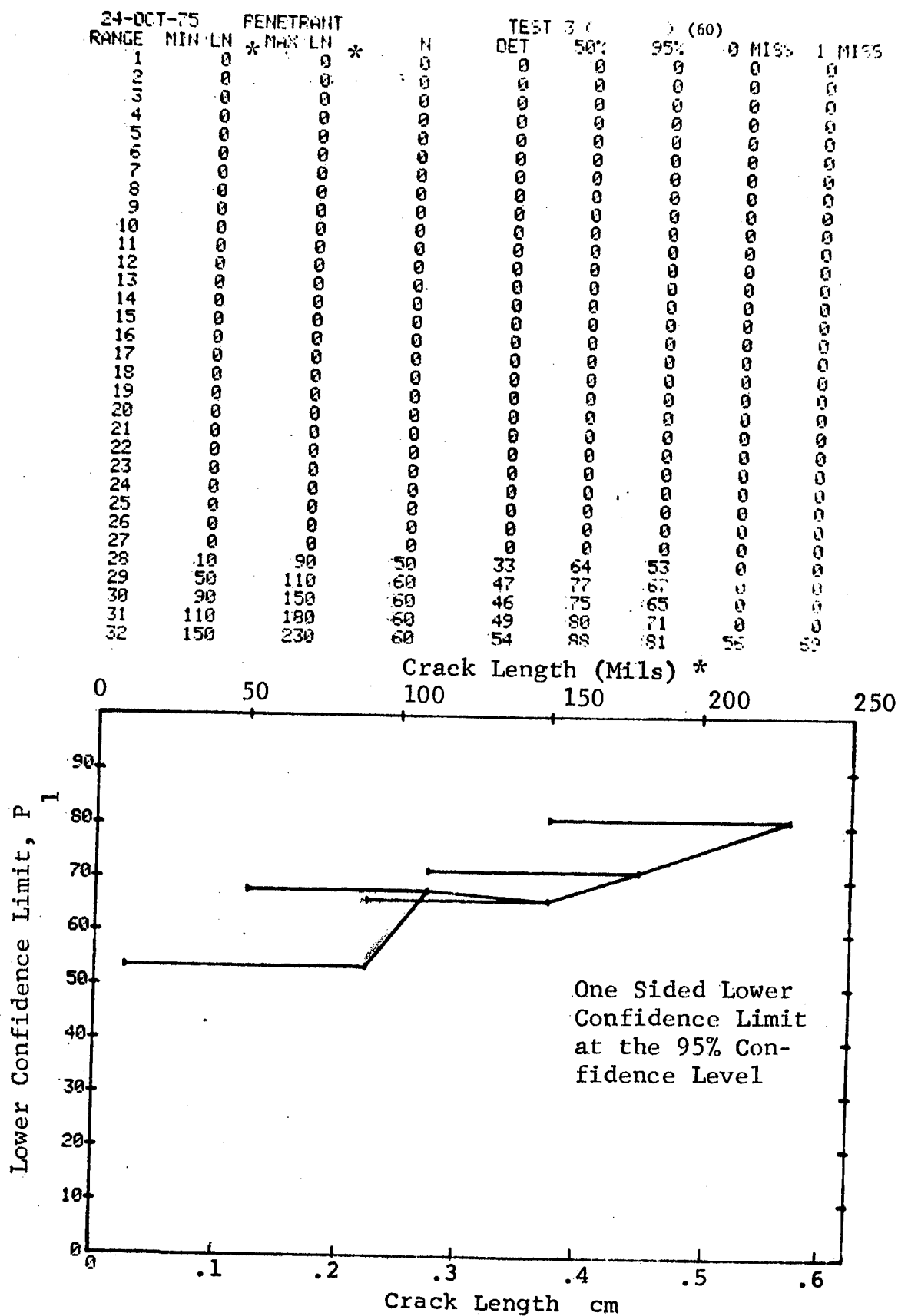


Figure D-60 (Concluded)

(a) Range Interval Method of Data Cumulation

24-OCT-75		PENETRANT		N	TEST 1		(61)		0 MISS	1 MISS
RANGE	MIN LN	MAX LN	*		DET	50%	95%			
1	40	40	*	4	0	0	0	0	0	0
2	70	70		3	1	20	1	0	0	0
3	0	0		0	0	0	0	0	0	0
4	100	110		18	14	74	56	0	0	0
5	130	130		6	4	57	27	0	0	0
6	0	0		0	0	0	0	0	0	0
7	0	0		0	0	0	0	0	0	0
8	190	190		1	1	50	5	0	0	0
9	210	210		3	1	20	1	0	0	0
10	230	230		3	2	50	13	0	0	0
11	0	0		0	0	0	0	0	0	0
12	250	250		6	4	57	27	0	0	0
13	270	270		1	1	50	5	0	0	0
14	300	300		3	3	79	36	0	0	0
15	310	310		4	4	84	47	0	0	0
16	0	0		0	0	0	0	0	0	0
17	350	350		3	3	79	36	0	0	0
18	380	380		3	3	79	36	0	0	0
19	0	0		0	0	0	0	0	0	0
20	410	410		1	1	50	5	0	0	0
21	0	0		0	0	0	0	0	0	0
22	450	450		3	3	79	36	0	0	0
23	460	460		1	1	50	5	0	0	0
24	480	480		3	3	79	36	0	0	0
25	0	0		0	0	0	0	0	0	0
26	0	0		0	0	0	0	0	0	0
27	0	0		0	0	0	0	0	0	0
28	0	0		0	0	0	0	0	0	0
29	0	0		0	0	0	0	0	0	0
30	0	0		0	0	0	0	0	0	0
31	0	0		0	0	0	0	0	0	0
32	650	650		3	3	79	36	0	0	0

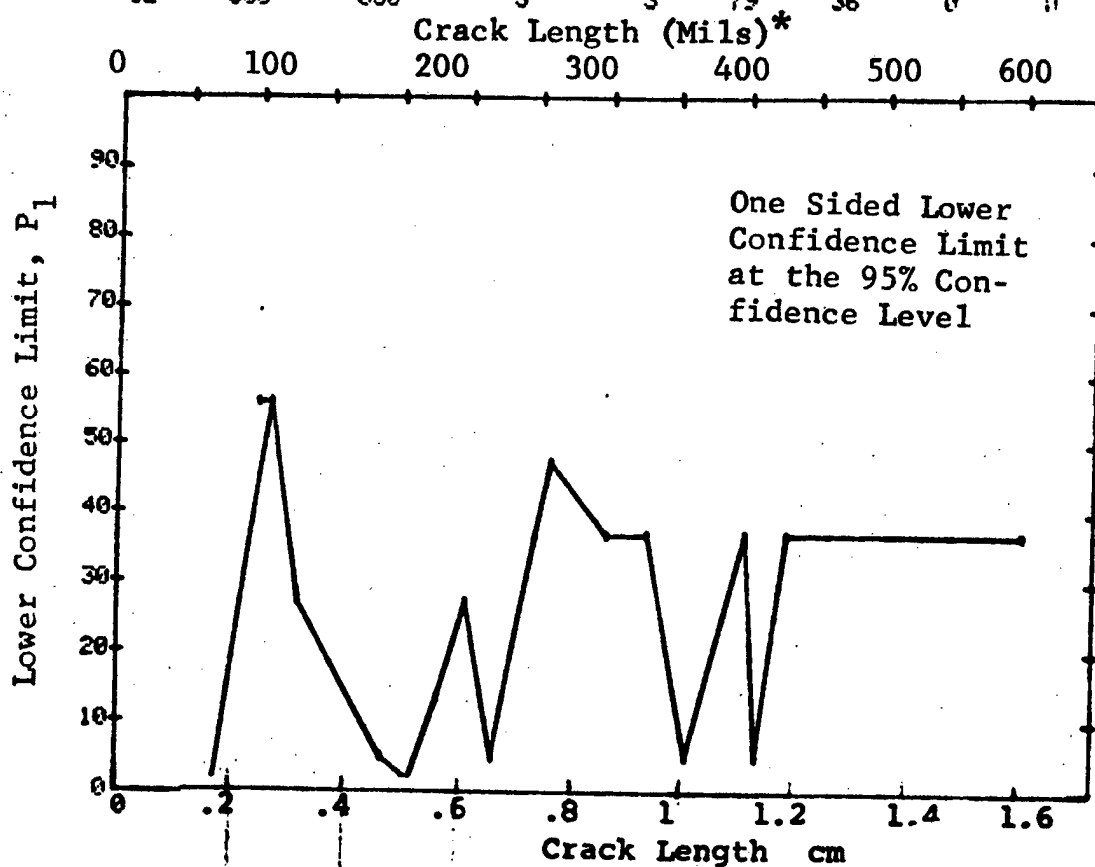


Figure D-61 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Solid Threaded Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

24-OCT-75		PENETRANT		N	TEST 2		(61)	
RANGE	MIN LN	* MAX LN	*		DET	50%	95%	0 MISS
1	40	40	*	4	0	0	0	0
2	70	70		3	1	0	1	0
3	0	0		0	0	0	0	0
4	100	110		18	0	0	0	0
5	100	130		24	14	0	56	0
6	0	0		0	16	0	56	0
7	0	0		0	0	0	0	0
8	100	190		25	0	0	0	0
9	100	210		28	19	0	58	0
10	100	230		31	20	0	54	0
11	0	0		0	22	0	54	0
12	100	250		37	0	0	0	0
13	100	270		38	26	0	55	0
14	100	300		41	27	0	56	0
15	270	310		8	30	0	59	0
16	0	0		0	8	0	68	0
17	270	350		11	0	0	0	0
18	270	380		14	11	0	76	0
19	0	0		0	14	0	80	15
20	270	410		15	0	0	0	0
21	0	0		0	0	0	81	14
22	270	450		18	0	0	0	0
23	270	460		19	16	0	84	11
24	270	480		22	19	0	85	10
25	0	0		0	22	0	87	7
26	0	0		0	0	0	0	0
27	0	0		0	0	0	0	0
28	0	0		0	0	0	0	0
29	0	0		0	0	0	0	0
30	0	0		0	0	0	0	0
31	0	0		0	0	0	0	0
32	270	650		25	0	0	0	0
					25	0	88	4
								21

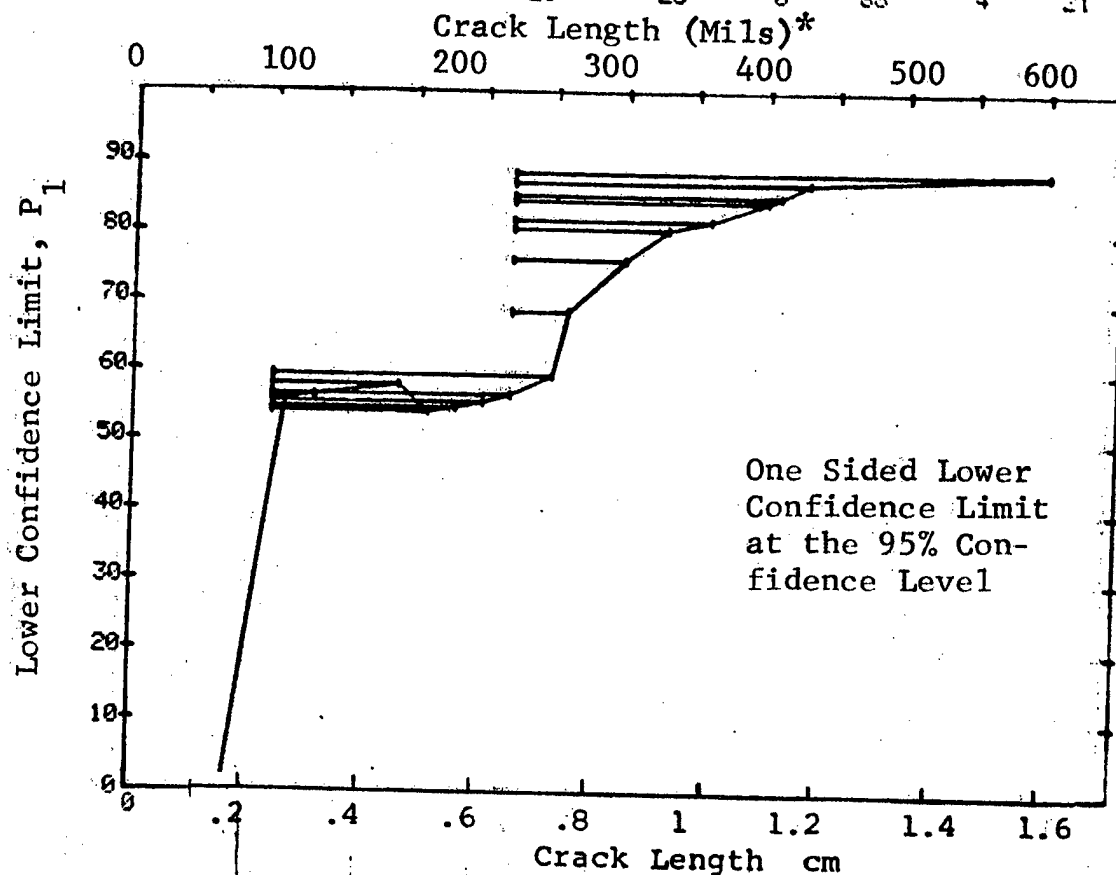


Figure D-61 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

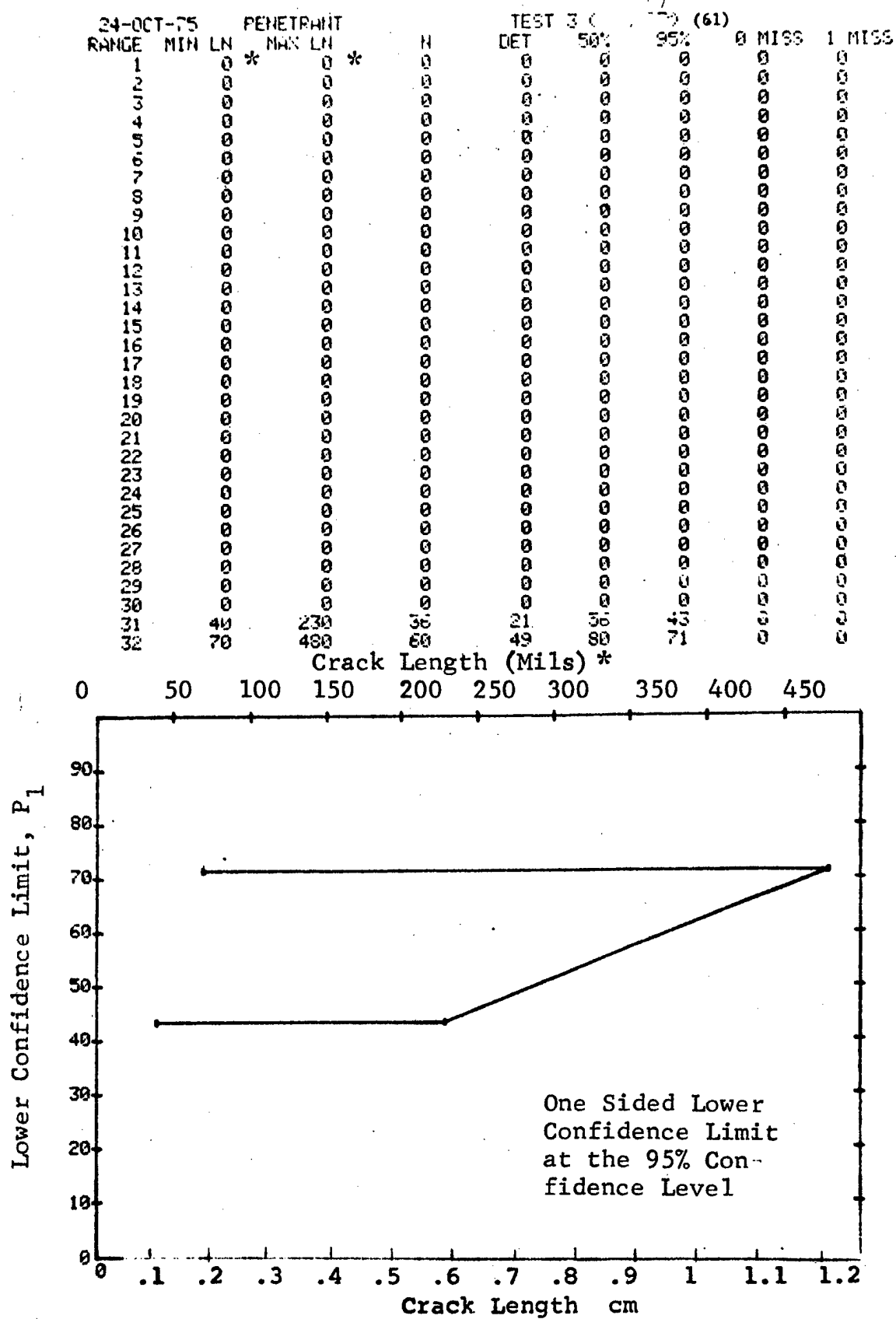


Figure D-61 (Concluded)

(a) Range Interval Method of Data Cumulation

24-OCT-75		PENETRANT		N	TEST 1 (1)		(62)	
RANGE	MIN LN	* MAX LN *			DET	50%	95%	0 MISS
1	80	90	8	2	20	4	0	0
2	0	0	0	0	0	0	0	0
3	110	110	3	0	0	0	0	0
4	120	120	3	1	20	1	0	0
5	130	130	2	0	0	0	0	0
6	140	140	6	3	42	15	0	0
7	160	160	3	1	20	1	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	250	250	2	1	29	2	0	0
16	270	270	5	3	50	18	0	0
17	280	280	0	1	29	2	0	0
18	0	0	0	0	0	0	0	0
19	300	300	3	2	50	13	0	0
20	310	310	4	2	50	13	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	440	440	3	1	20	1	0	0
32	450	460	5	3	50	18	0	0

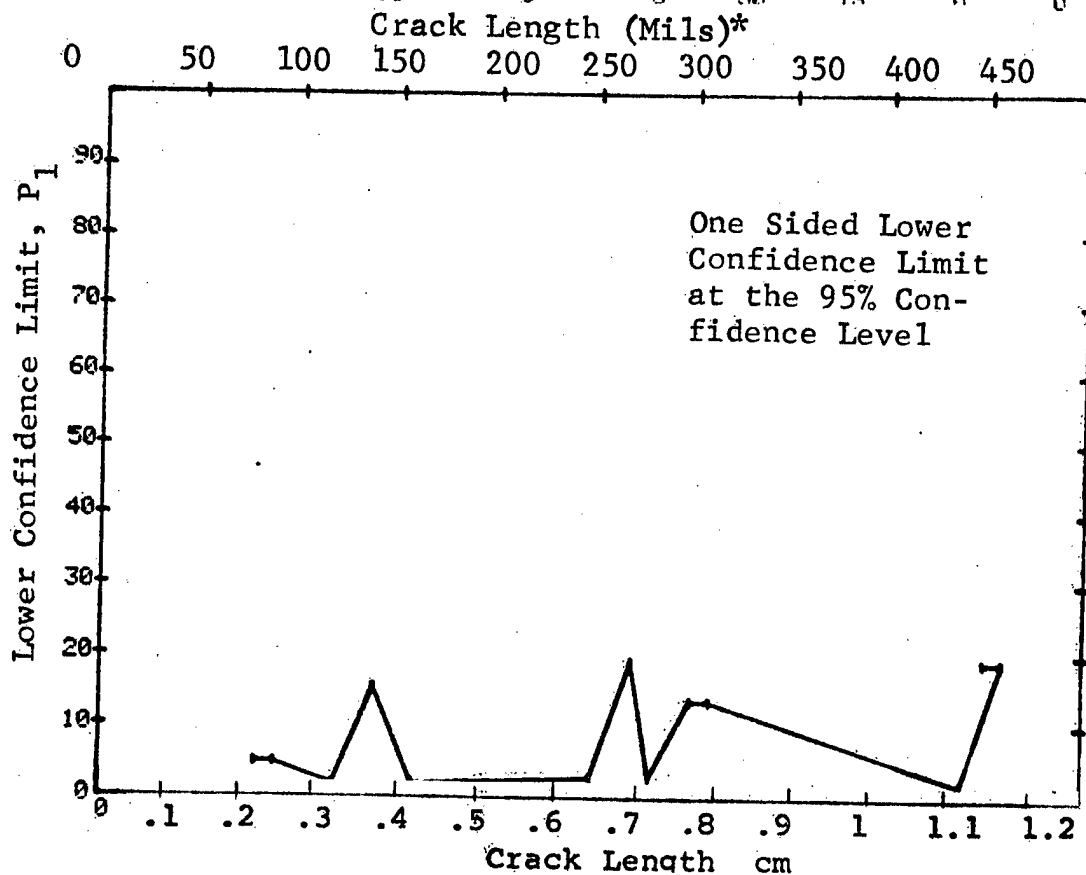


Figure D-62 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Hollow Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

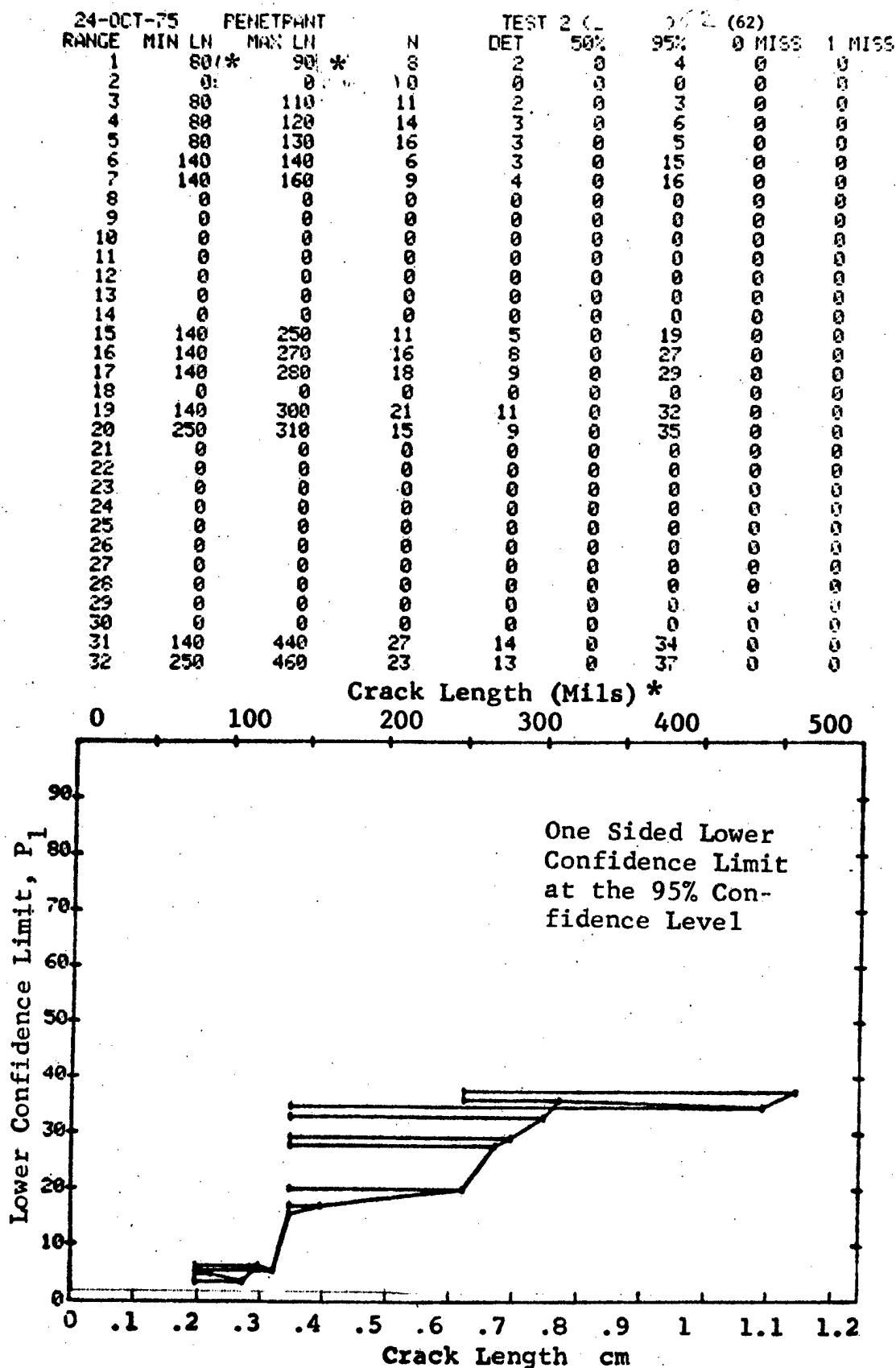


Figure D-62 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

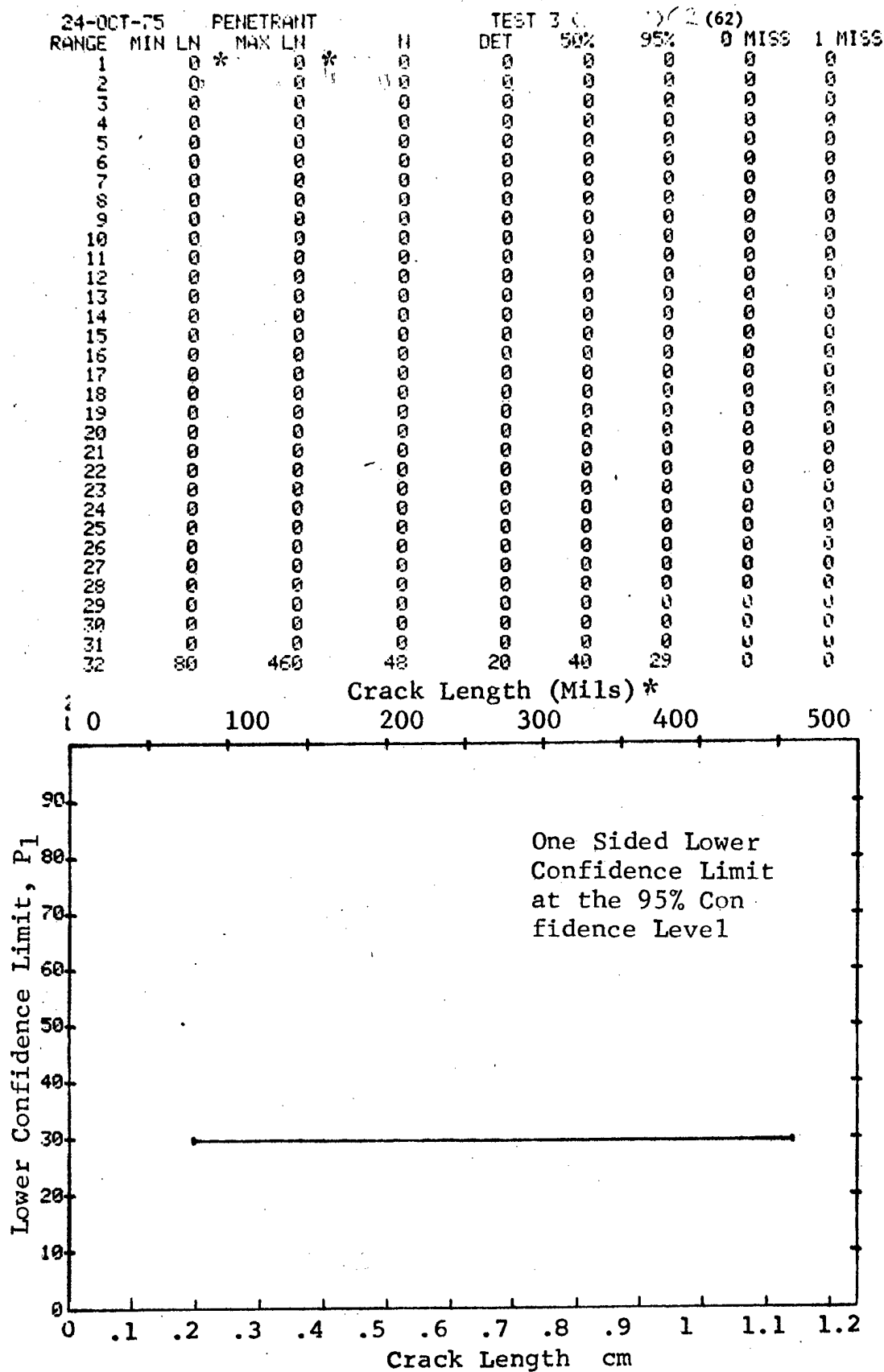


Figure D-62 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75		PENETRANT		N	TEST 1		S/C (63)		P
RANGE	MIN LN	MAX LN		DET	50%	95%	0 MIN	0 MAX	
1	60*	60*	2	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	100	100	13	1	5	0	0	0	0
4	120	120	4	0	0	0	0	0	0
5	130	130	1	0	0	0	0	0	0
6	140	140	6	2	26	6	0	0	0
7	160	160	2	1	29	2	0	0	0
8	180	180	4	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	230	230	2	1	29	2	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	310	310	4	3	61	24	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	350	350	11	7	58	34	0	0	0
20	0	0	0	0	0	0	0	0	0
21	390	390	4	4	84	47	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	570	570	4	4	84	47	0	0	0

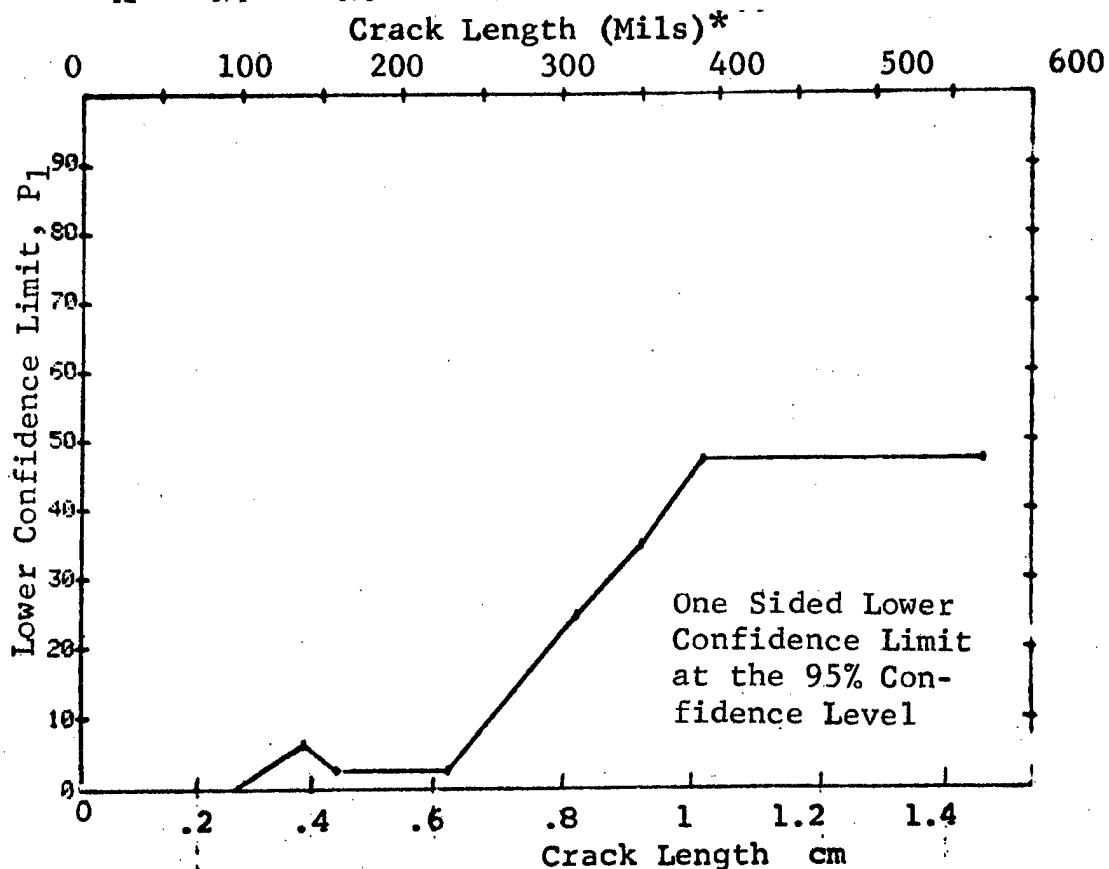


Figure D-63 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Filleted Hollow Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

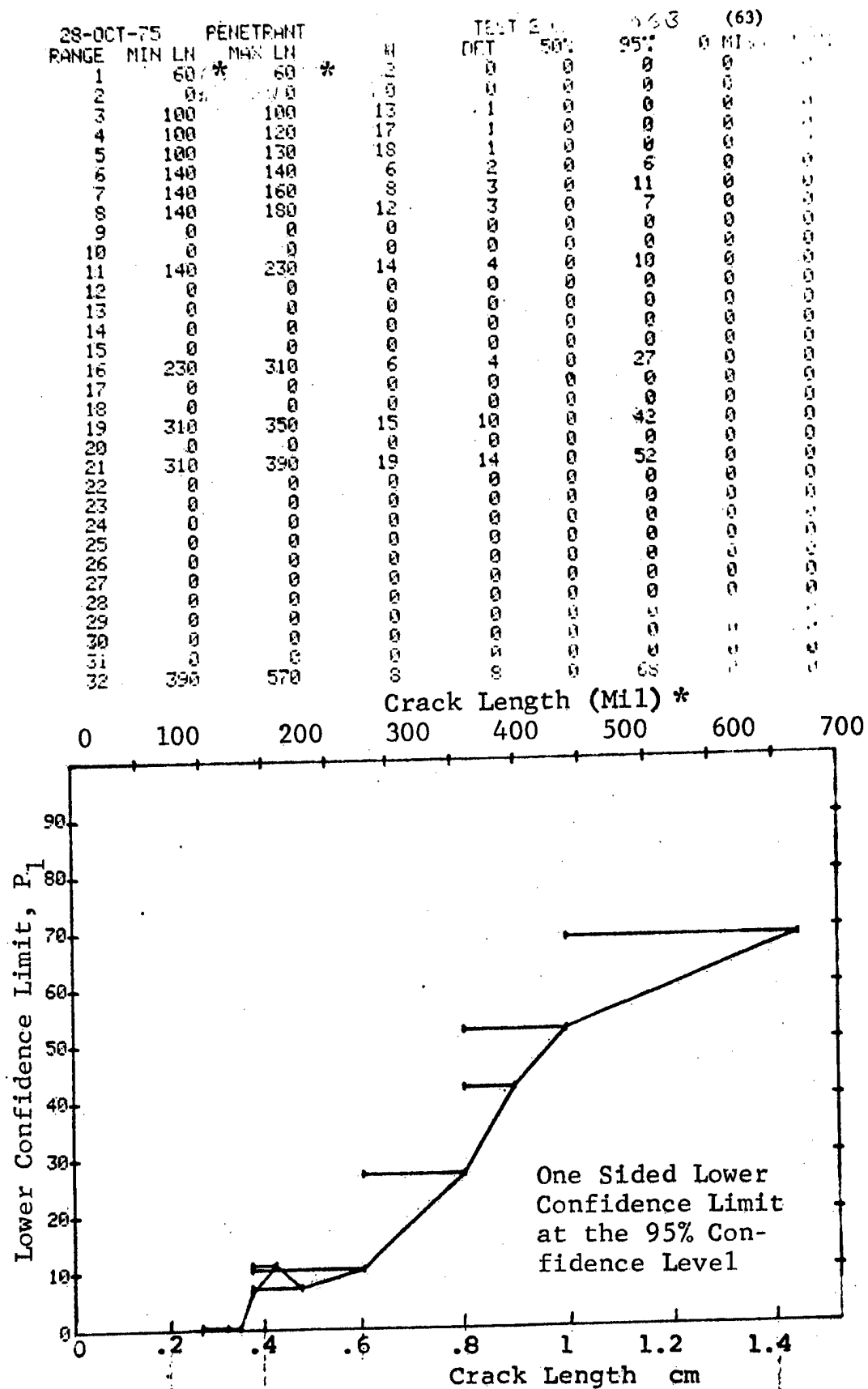


Figure D-63 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

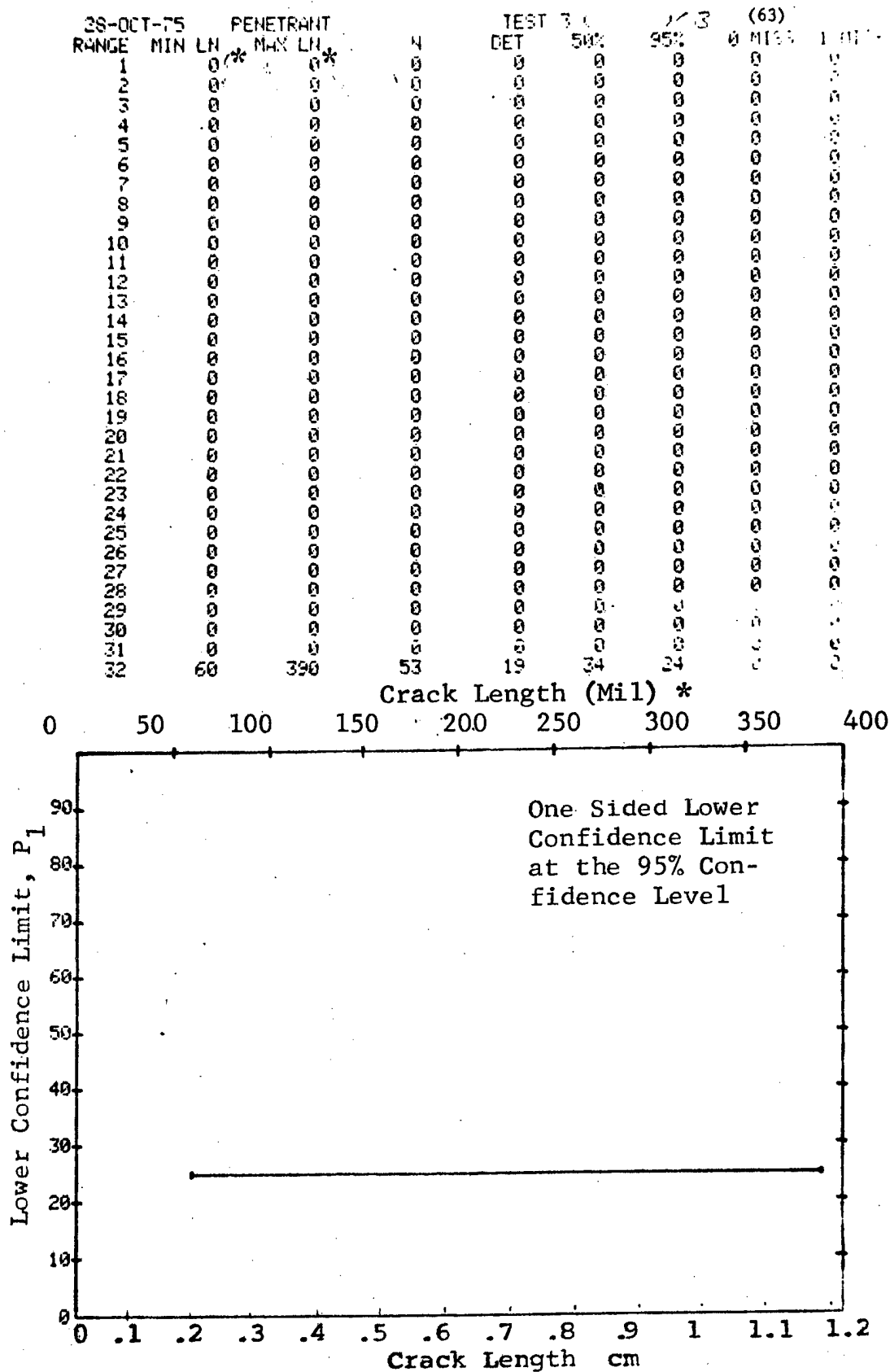


Figure D-63 (Concluded)

(a) Range Interval Method of Data Cumulation

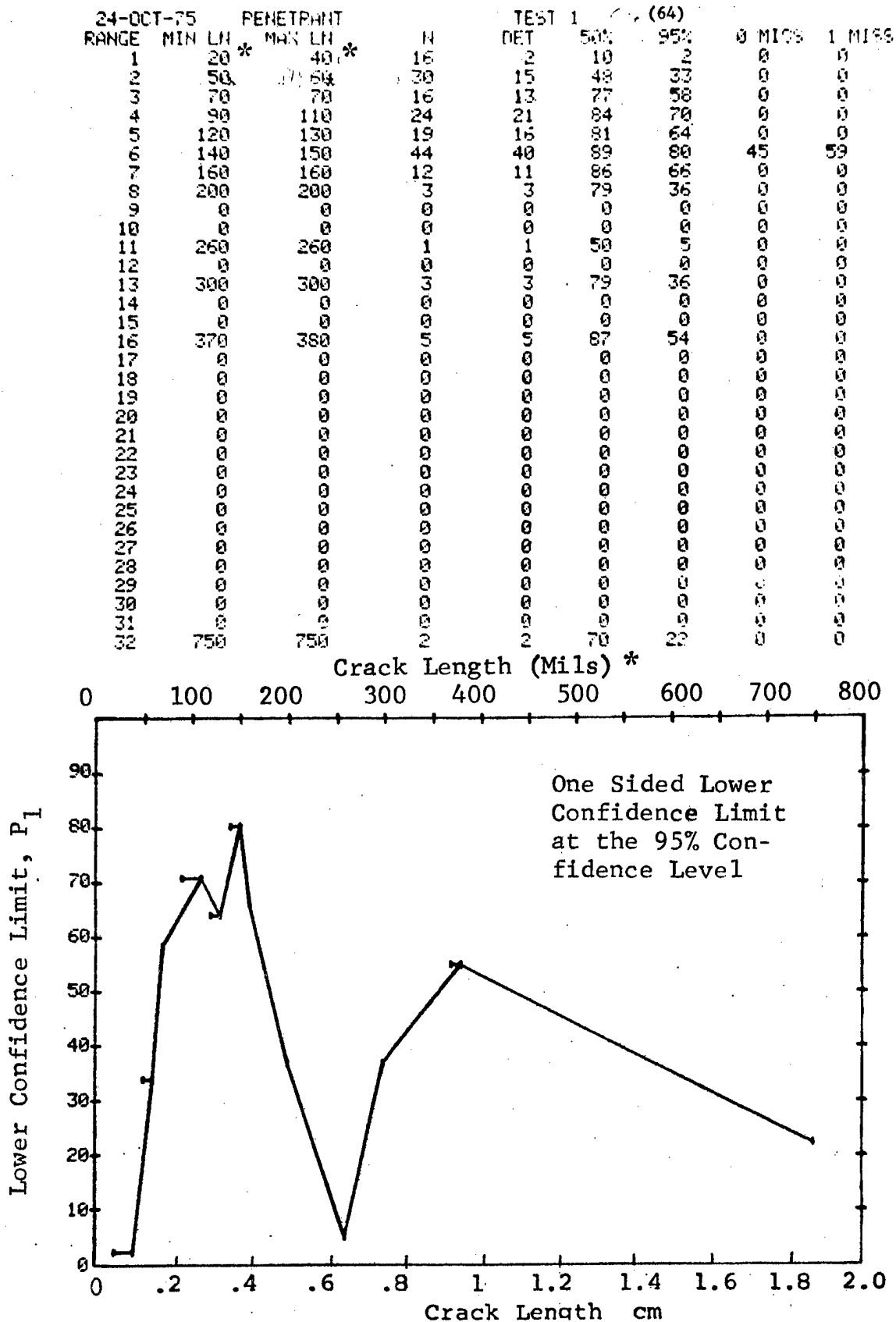


Figure D-64 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Solid Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

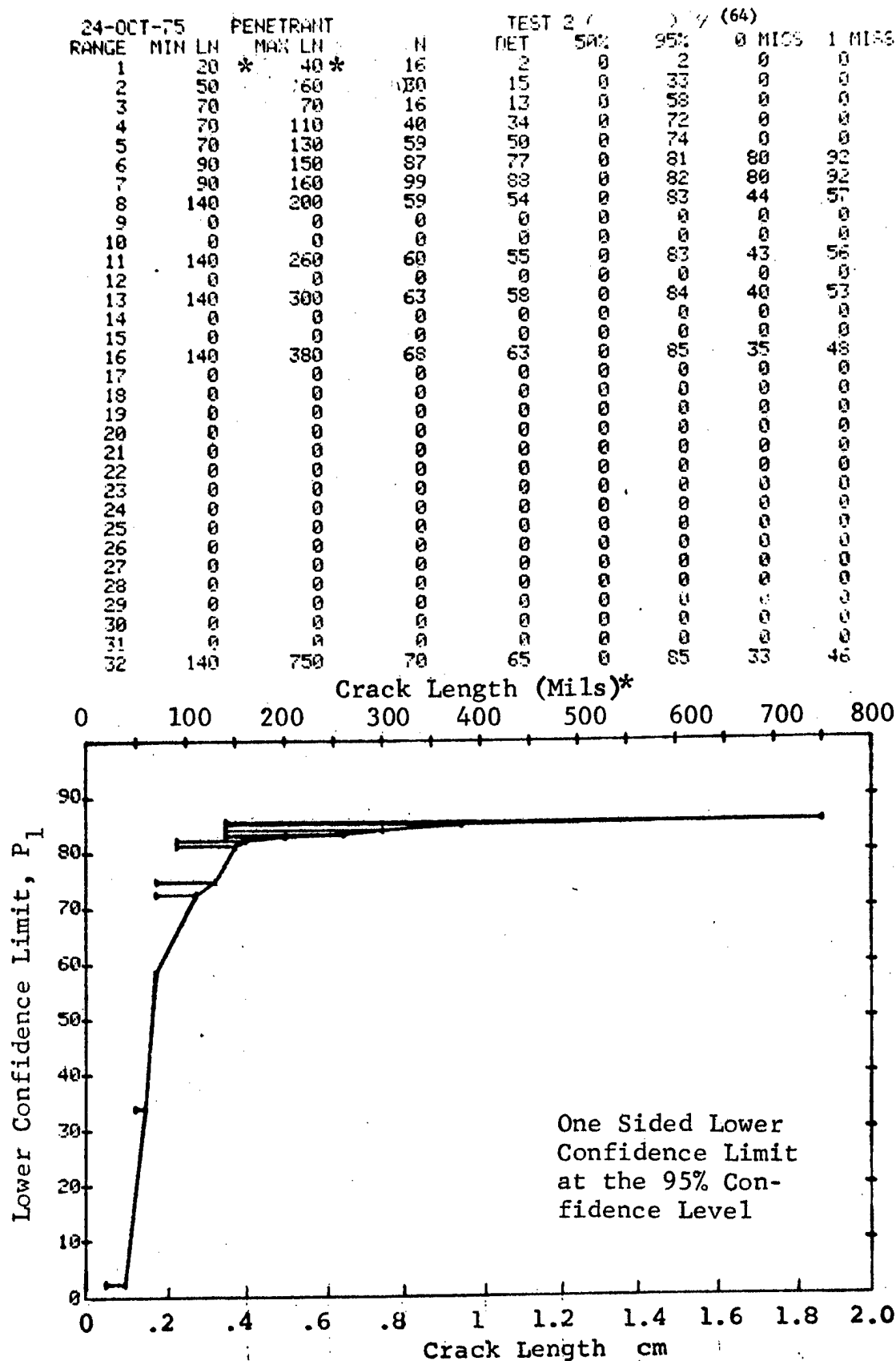


Figure D-64 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

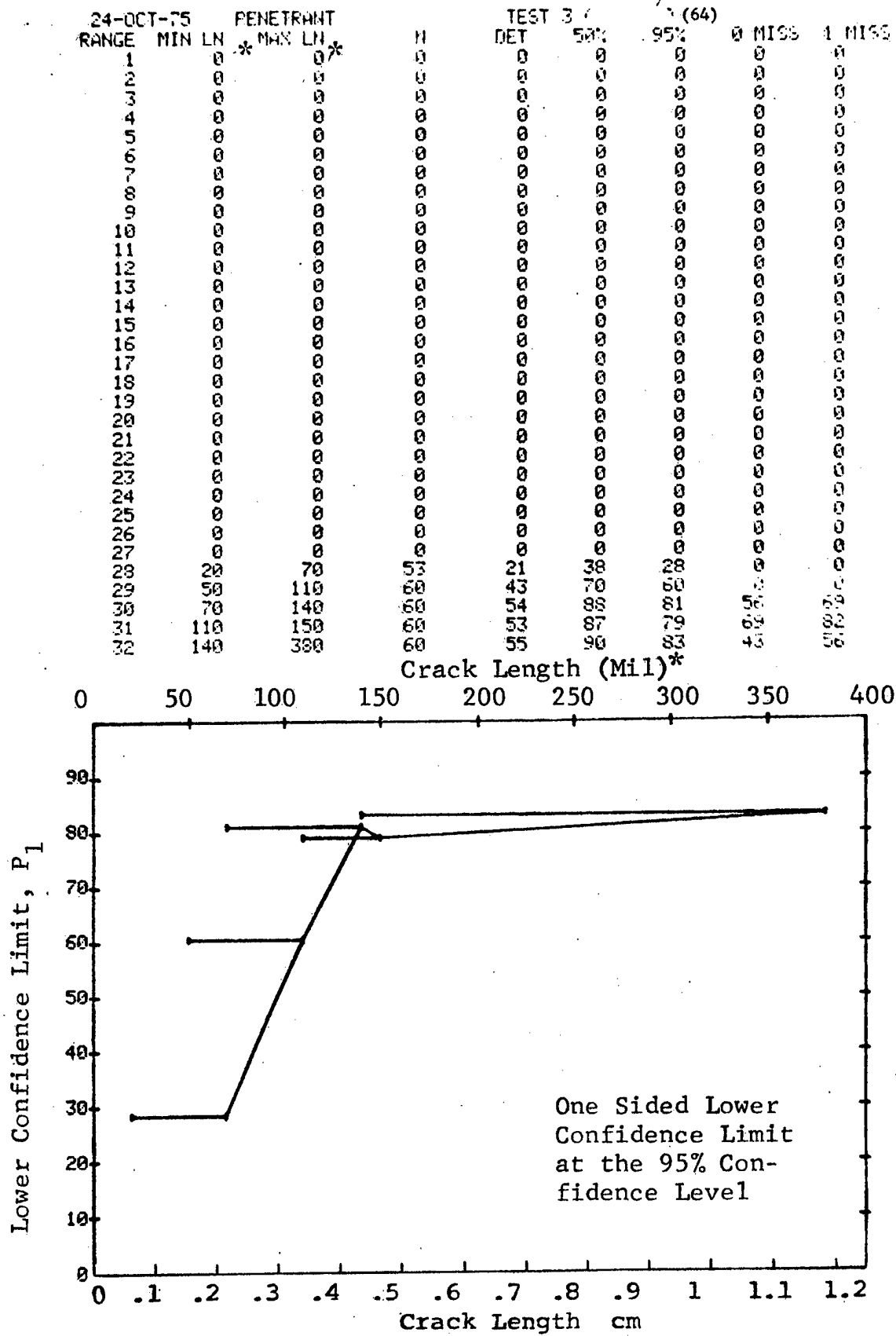


Figure D-64 (Concluded)

(a) Range Interval Method of Data Cumulation

24-OCT-75	PENETRANT		TEST 1		(65)		MISS	
RANGE	MIN	LN	DET	50%	95%	0	1	MISS
1	10	10	1	10	0	0	0	0
2	0	0	0	0	0	0	0	0
3	30	30	3	79	36	0	0	0
4	0	0	0	0	0	0	0	0
5	40	40	11	93	76	18	35	0
6	50	50	32	92	82	27	42	0
7	0	0	0	0	0	0	0	0
8	60	60	12	94	77	17	34	0
9	70	70	2	70	22	0	0	0
10	0	0	0	0	0	0	0	0
11	80	80	9	92	71	0	0	0
12	90	90	14	95	80	15	32	0
13	0	0	0	0	0	0	0	0
14	100	100	1	50	5	0	0	0
15	110	110	22	96	87	7	24	0
16	120	120	2	70	22	0	0	0
17	0	0	0	0	0	0	0	0
18	130	130	8	55	28	0	0	0
19	140	140	7	90	65	0	0	0
20	0	0	0	0	0	0	0	0
21	150	150	18	96	84	11	28	0
22	160	160	2	70	22	0	0	0
23	0	0	0	0	0	0	0	0
24	170	170	11	93	76	18	35	0
25	180	180	11	93	76	18	35	0
26	0	0	0	0	0	0	0	0
27	190	190	1	50	5	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	210	210	3	79	36	0	0	0
31	220	220	2	70	22	0	0	0
32	230	230	0	91	68	0	0	0

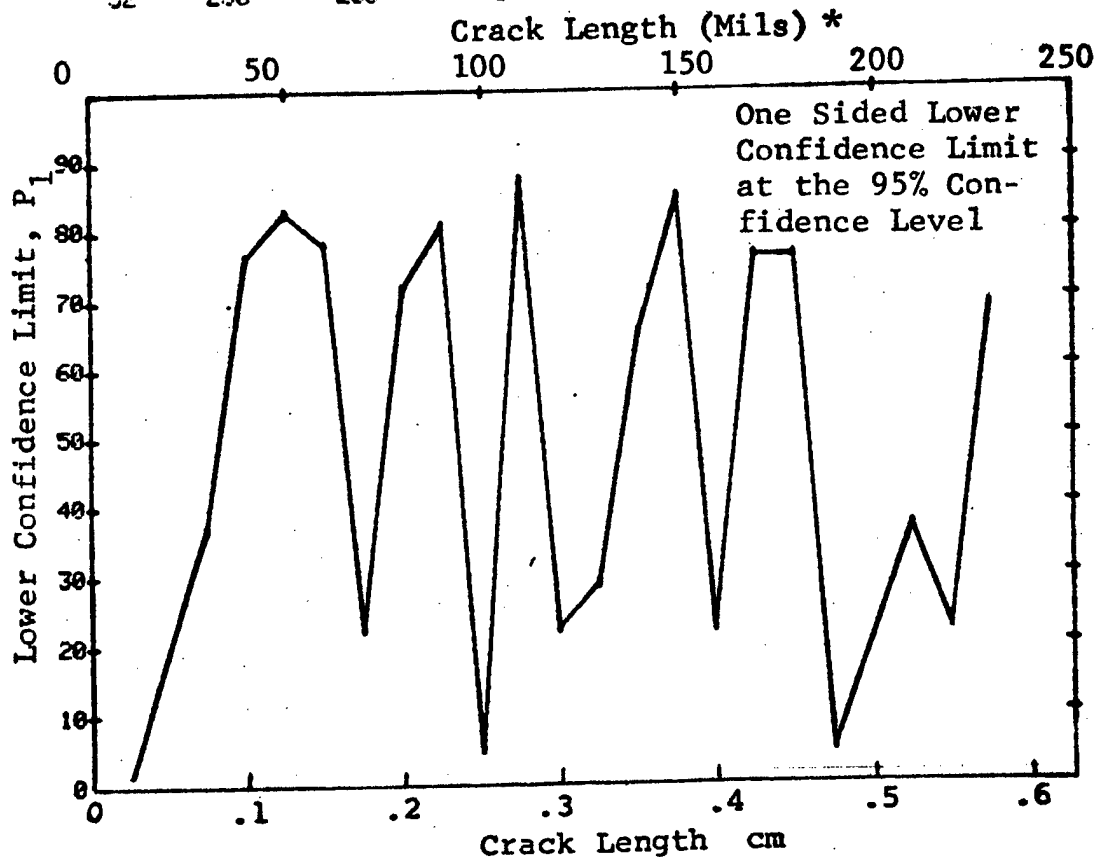


Figure D-65 Probability of Detection for 2024-T6 Al Using Liquid Penetrant. Compressed Notch Flaws in Tandem T Specimen. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

24-OCT-75		PENETRANT		N	TEST 2 C		(65)		
RANGE	MIN	LN *	MAX LN *		DET	50%	95%	0 MISS	1 MISS
1		10	10	5	1	0	0	0	0
2		0	0	3	0	0	0	0	0
3		30	30	3	3	0	36	0	0
4		0	0	0	0	0	0	0	0
5		30	40	14	14	0	80	15	32
6		30	50	48	46	0	87	13	28
7		0	0	0	0	0	0	0	0
8		30	60	60	58	0	89	1	16
9		30	70	62	60	0	90	0	14
10		0	0	0	0	0	0	0	0
11		30	80	71	69	0	91	0	5
12		30	90	85	83	0	92	0	0
13		0	0	0	0	0	0	0	0
14		30	100	86	84	0	92	0	0
15		60	110	60	60	0	95	0	0
16		60	120	62	62	0	95	0	0
17		0	0	0	0	0	0	0	0
18		30	130	118	113	0	91	0	0
19		30	140	125	120	0	91	0	0
20		0	0	0	0	0	0	0	0
21		30	150	143	138	0	92	0	0
22		30	160	145	140	0	92	0	0
23		0	0	0	0	0	0	0	0
24		30	170	156	151	0	93	0	0
25		140	180	49	49	0	94	0	0
26		0	0	0	0	0	0	0	0
27		140	190	50	50	0	94	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		140	210	53	53	0	94	0	0
31		140	220	55	55	0	94	0	0
32		140	230	63	63	0	95	0	0

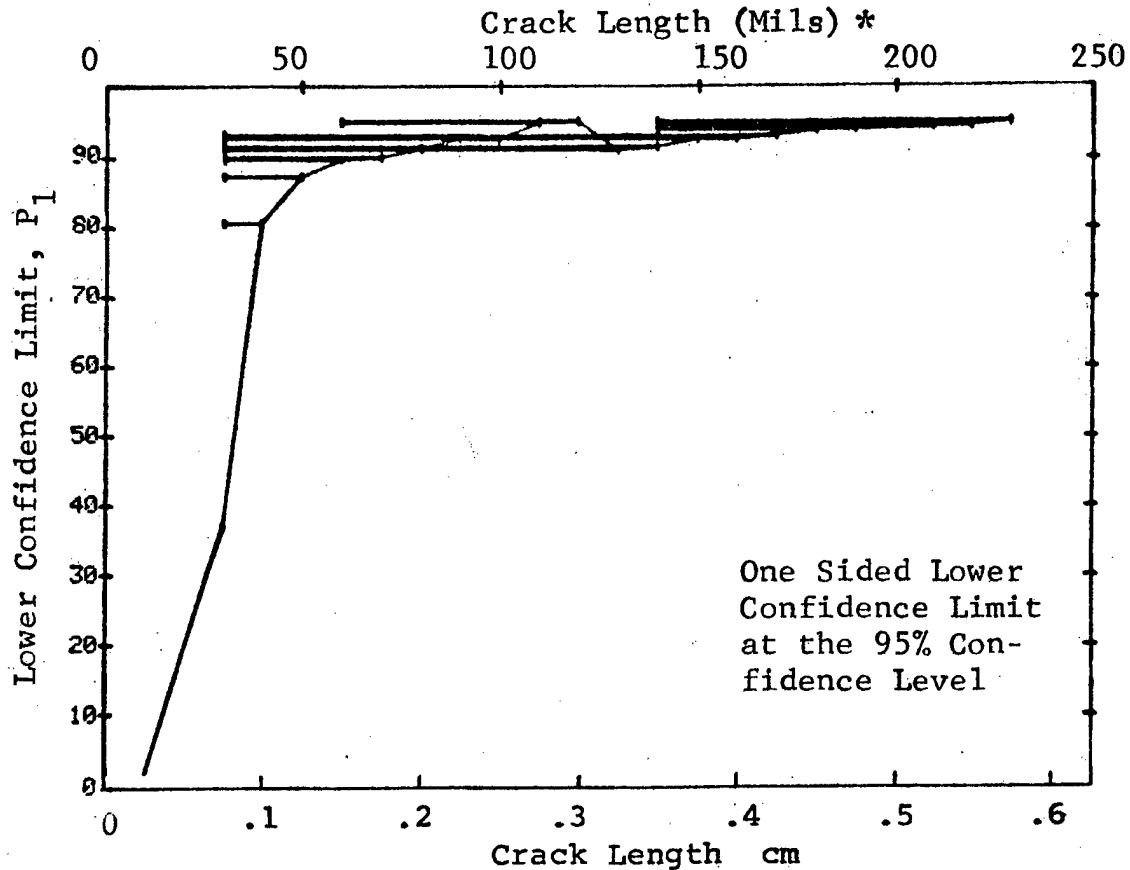


Figure D-65 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

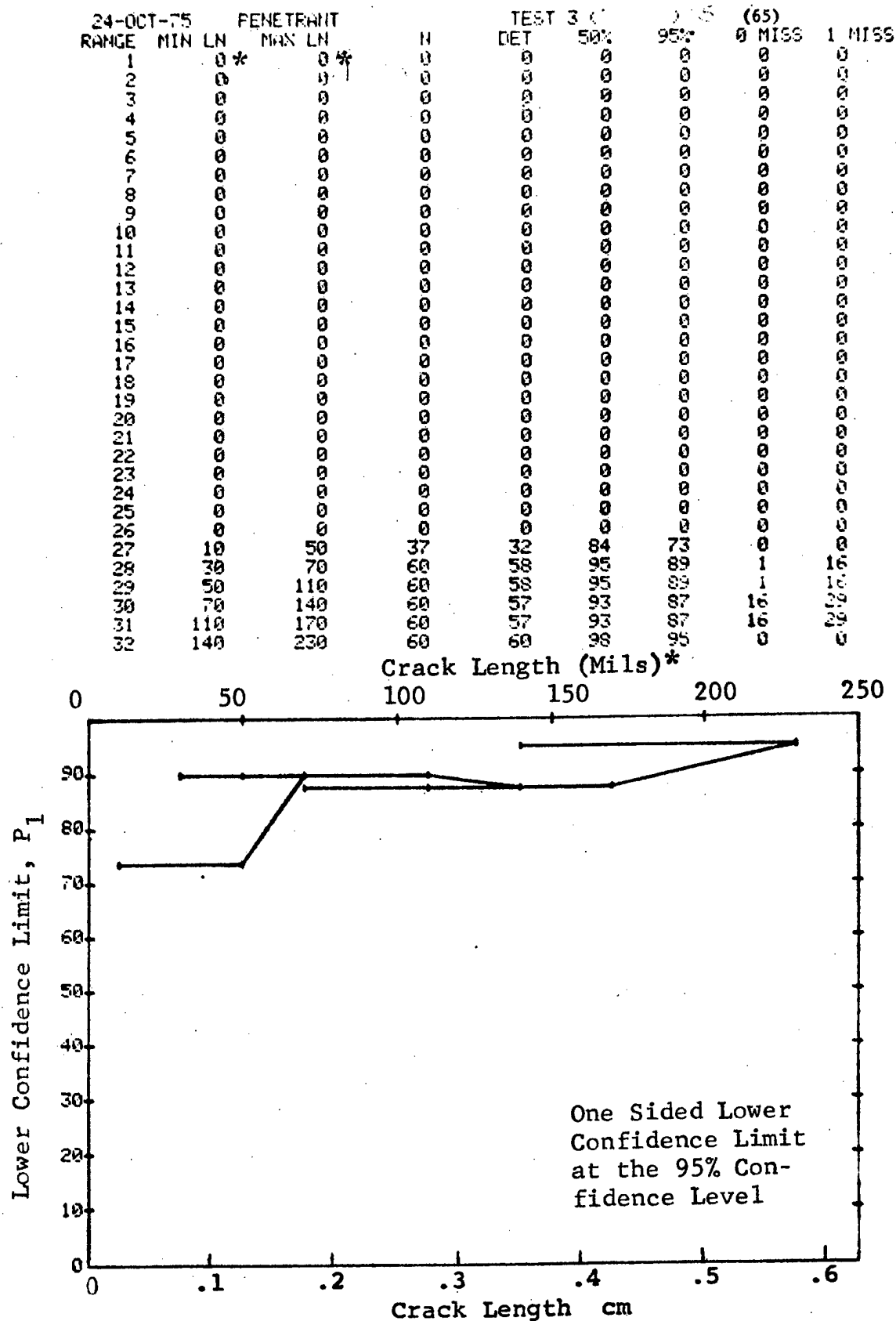


Figure D-65 (Concluded)

(a) Range Interval Method of Data Cumulation

37-OCT-75	PENETRANT			TEST 1 (C)		TEST 2 (66)			
RANGE	MIN LN	* MAX LN	*	DET	50%	95%	0 MISS	1 MISS	
1	40	40		4	84	47	0	0	
2	70	70		4	84	47	0	0	
3	0	0		0	0	0	0	0	
4	100	110		25	84	71	0	0	
5	130	130		16	95	82	13	30	
6	0	0		0	0	0	0	0	
7	0	0		0	0	0	0	0	
8	190	190		4	84	47	0	0	
9	210	210		4	84	47	0	0	
10	230	230		5	87	54	0	0	
11	0	0		0	0	0	0	0	
12	250	250		5	87	54	0	0	
13	270	270		4	84	47	0	0	
14	300	300		4	84	47	0	0	
15	310	310		4	84	47	0	0	
16	340	340		4	84	47	0	0	
17	350	350		4	84	47	0	0	
18	360	360		4	84	47	0	0	
19	0	0		0	0	0	0	0	
20	410	410		4	84	47	0	0	
21	0	0		0	0	0	0	0	
22	450	450		5	87	54	0	0	
23	460	460		4	84	47	0	0	
24	490	480		4	84	47	0	0	
25	0	0		0	0	0	0	0	
26	0	0		0	0	0	0	0	
27	0	0		0	0	0	0	0	
28	0	0		0	0	0	0	0	
29	0	0		0	0	0	0	0	
30	0	0		0	0	0	0	0	
31	0	0		0	0	0	0	0	
32	650	650		4	84	47	0	0	

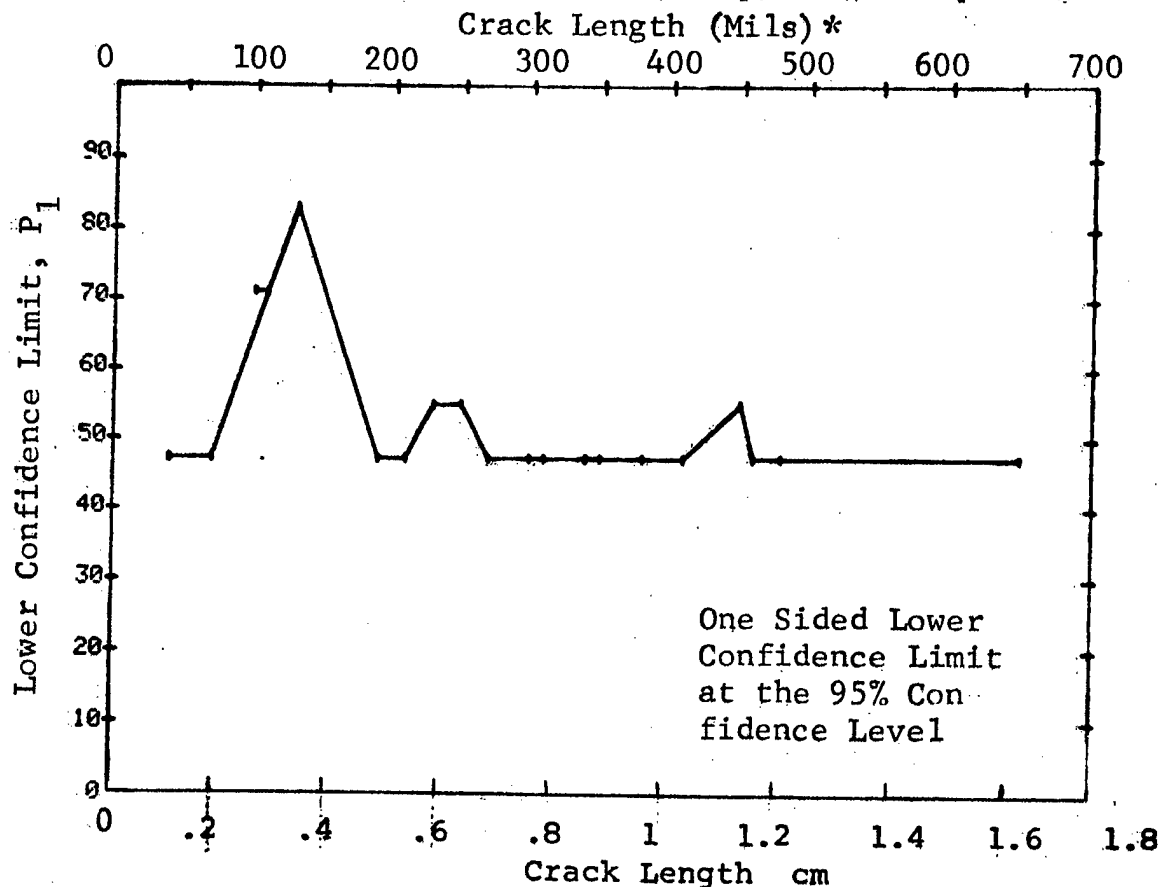


Figure D-66 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Solid Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		PENETRANT		N	TEST 2 (		66)		0 MISS	1 MISS
RANGE	MIN LN	MAX LN			DET	50%	95%			
1	40	40*	4	4	0	0	47	0	0	0
2	40	70	8	0	0	0	68	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	40	110	37	33	0	0	76	0	0	0
5	40	130	53	49	0	0	83	36	50	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	130	190	20	20	0	0	86	9	26	0
9	130	210	24	24	0	0	88	5	22	0
10	130	230	29	29	0	0	90	0	17	0
11	0	0	0	0	0	0	0	0	0	0
12	130	250	34	34	0	0	91	0	12	0
13	130	270	38	38	0	0	92	0	0	0
14	130	300	42	42	0	0	93	0	4	0
15	130	310	46	46	0	0	93	0	0	0
16	130	340	50	50	0	0	94	0	0	0
17	130	350	54	54	0	0	94	0	0	0
18	130	380	58	58	0	0	94	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	130	410	62	62	0	0	95	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	130	450	67	67	0	0	95	0	0	0
23	130	460	71	71	0	0	95	0	0	0
24	130	480	75	75	0	0	96	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	130	650	79	79	0	0	96	0	0	0

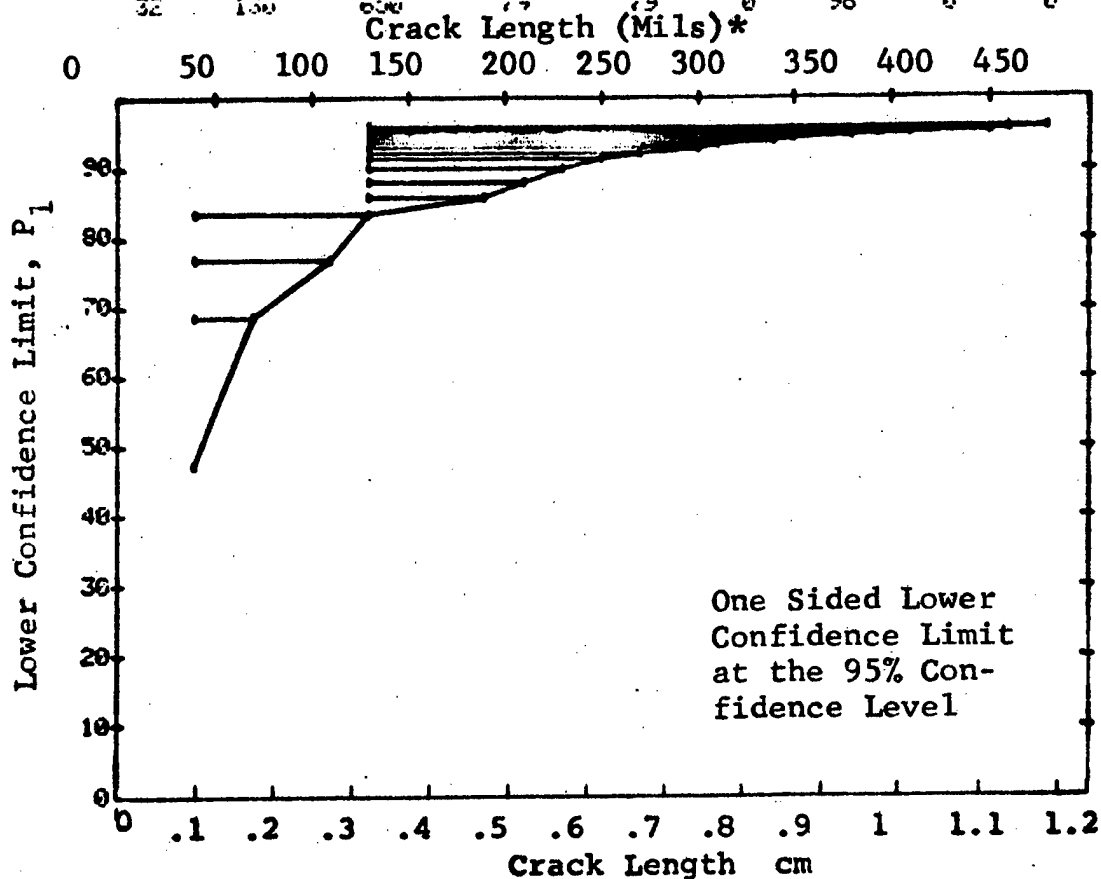


Figure D-66 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

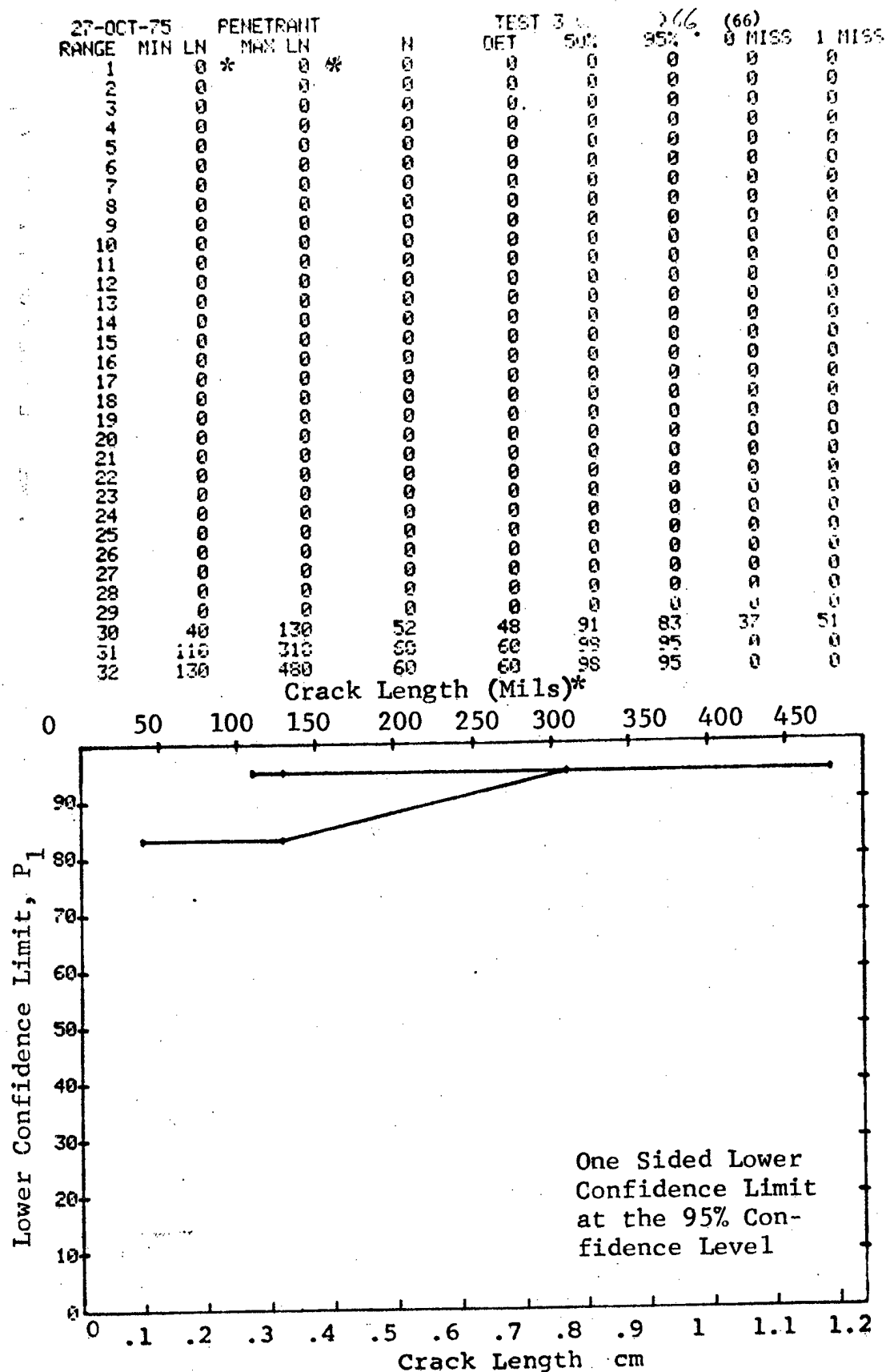


Figure D-66 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75			PENETRANT		N	TEST		7 (67)		
RANGE	MIN	LN	* MAX	LN *		DET	50%	95%	0 MISS	1 MISS
1	80	0	90	0	33	13	53	38	0	0
2	0	0	0	0	0	0	0	0	0	0
3	110	110	110	110	8	2	20	4	0	0
4	120	120	120	120	4	4	84	47	0	0
5	130	130	130	130	10	5	45	22	0	0
6	140	140	140	140	16	16	95	82	13	30
7	160	160	160	160	3	3	79	36	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	250	250	250	250	1	1	50	5	0	0
16	270	270	270	270	1	1	50	5	0	0
17	280	280	280	280	2	2	70	22	0	0
18	0	0	0	0	0	0	0	0	0	0
19	300	300	300	300	4	4	84	47	0	0
20	310	310	310	310	4	4	84	47	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	390	390	390	390	4	4	84	47	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	450	460	460	460	5	5	87	54	0	0

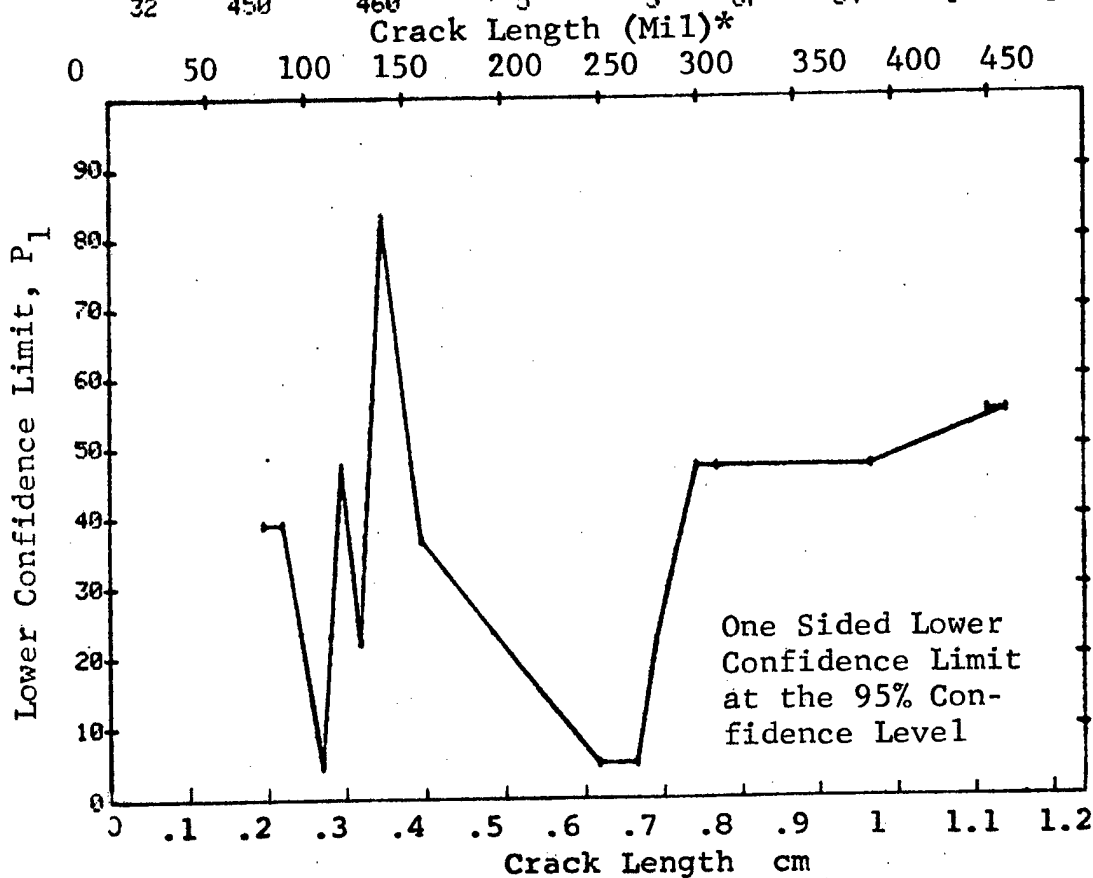


Figure D-67 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Hollow Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		PENETRANT		N	TEST 2		X2 (67)		
RANGE	MIN	LN *	MAX LN *		DET	50%	95%	0 MISS	1 MISS
1		80	90	33	18	0	38	0	0
2		0	0	0	0	0	0	0	0
3		80	110	41	20	0	35	0	0
4		120	120	4	4	0	47	0	0
5		80	130	55	29	0	40	0	0
6		140	140	16	16	0	82	13	30
7		140	160	19	19	0	85	10	27
8		0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0
15		140	250	20	20	0	86	9	26
16		140	270	21	21	0	86	8	25
17		140	280	23	23	0	87	6	23
18		0	0	0	0	0	0	0	0
19		140	300	27	27	0	89	2	19
20		140	310	31	31	0	90	0	15
21		0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0
27		140	390	35	35	0	91	0	11
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0
32		140	460	40	40	0	92	0	6

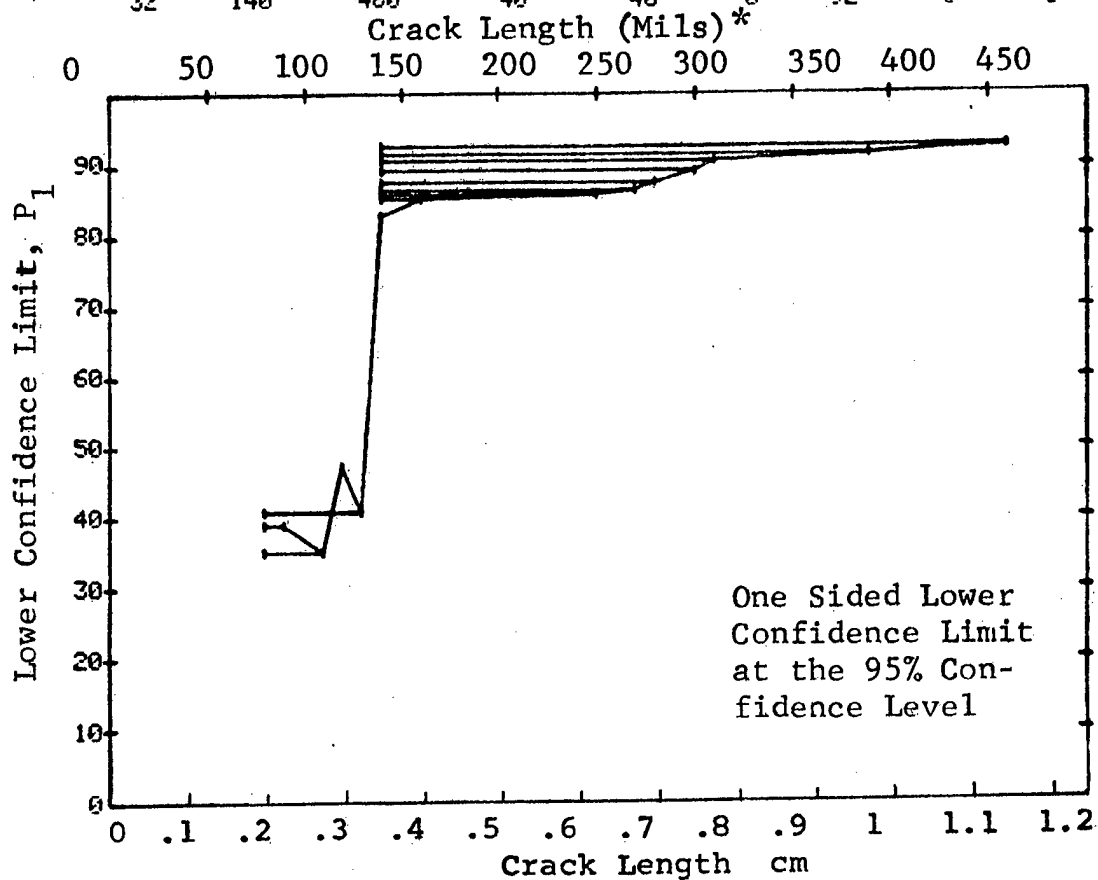


Figure D-67 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

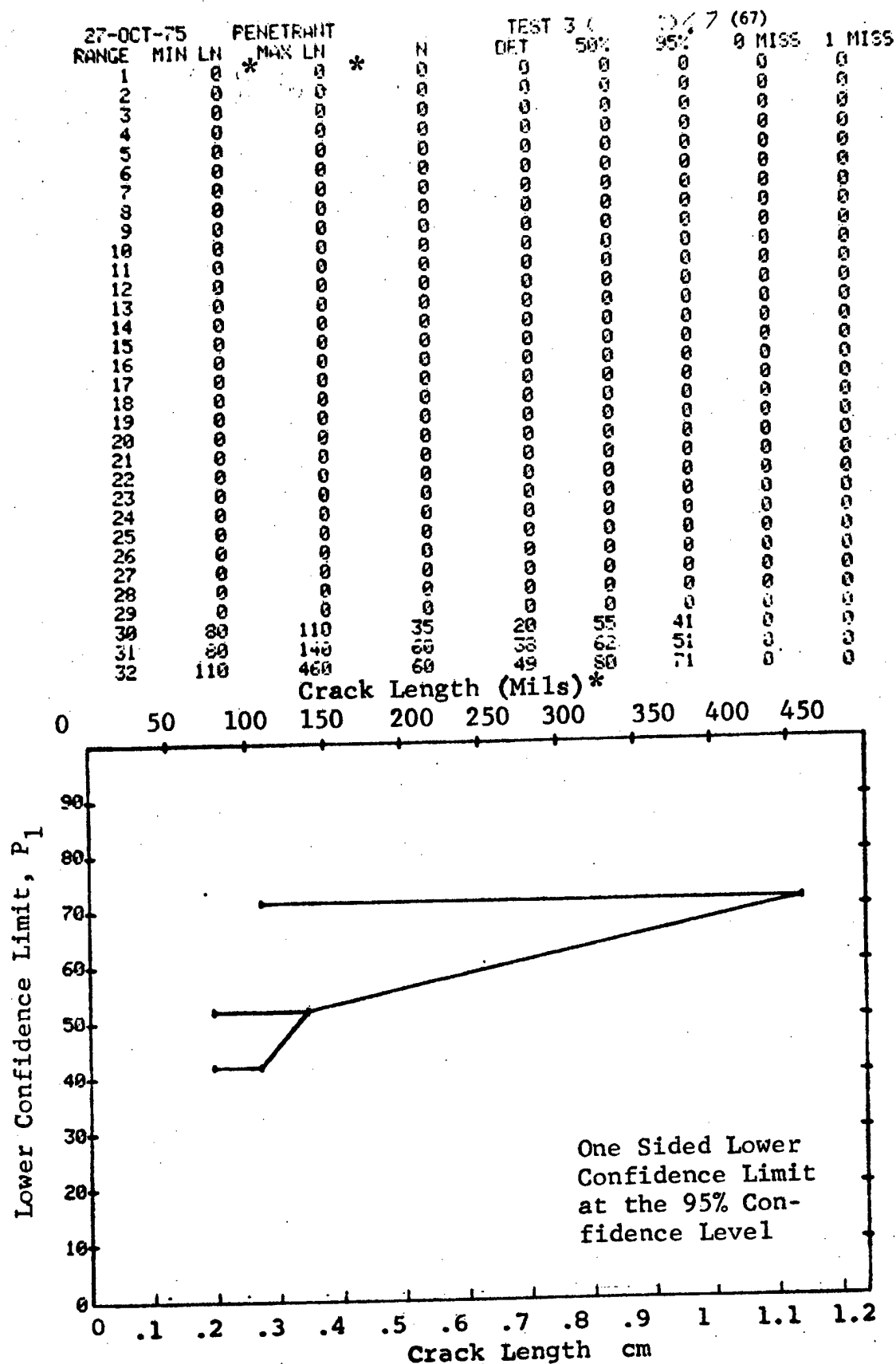


Figure D-67 (Concluded)

(a) Range Interval Method of Data Cumulation

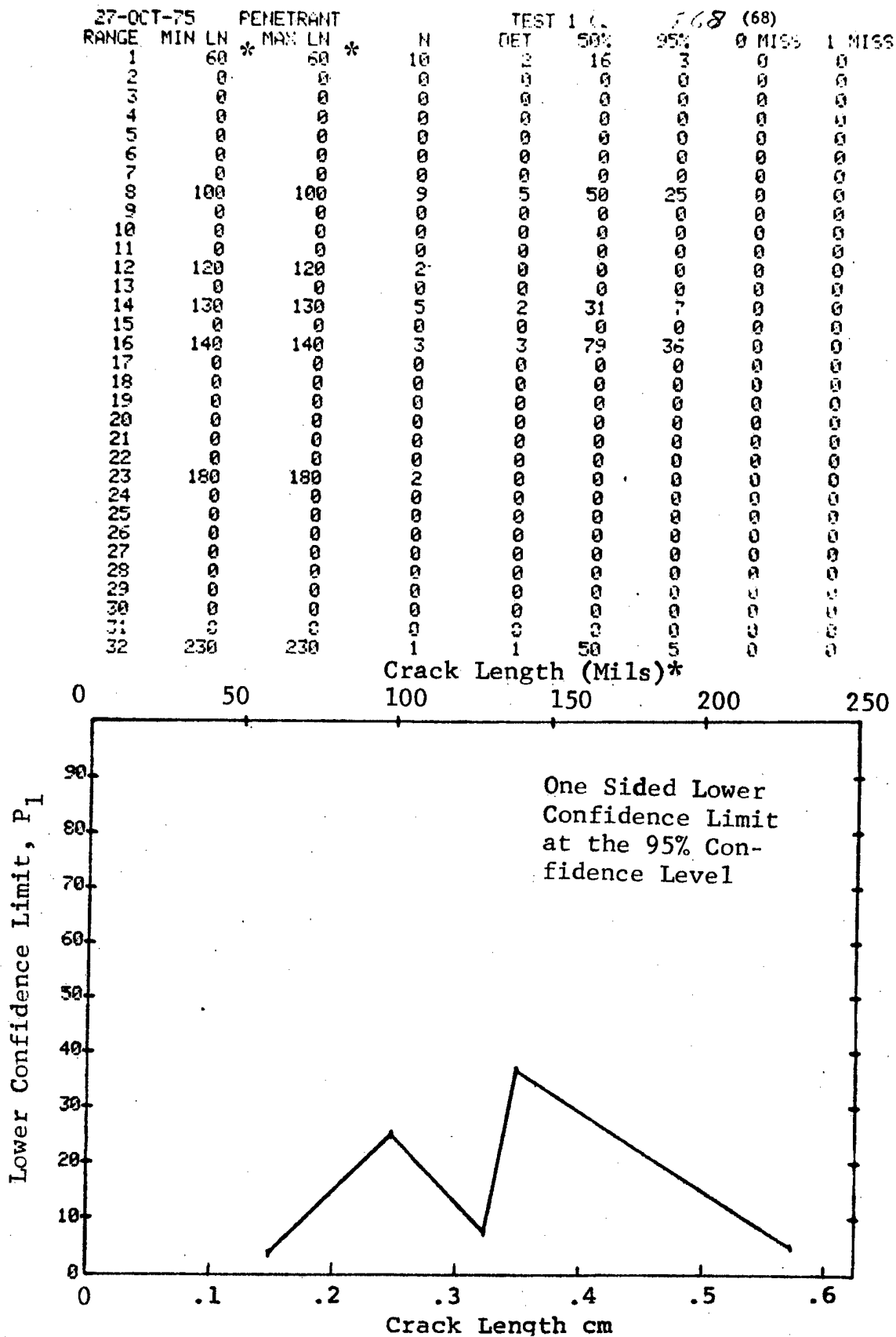


Figure D-68 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Filleted Hollow Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

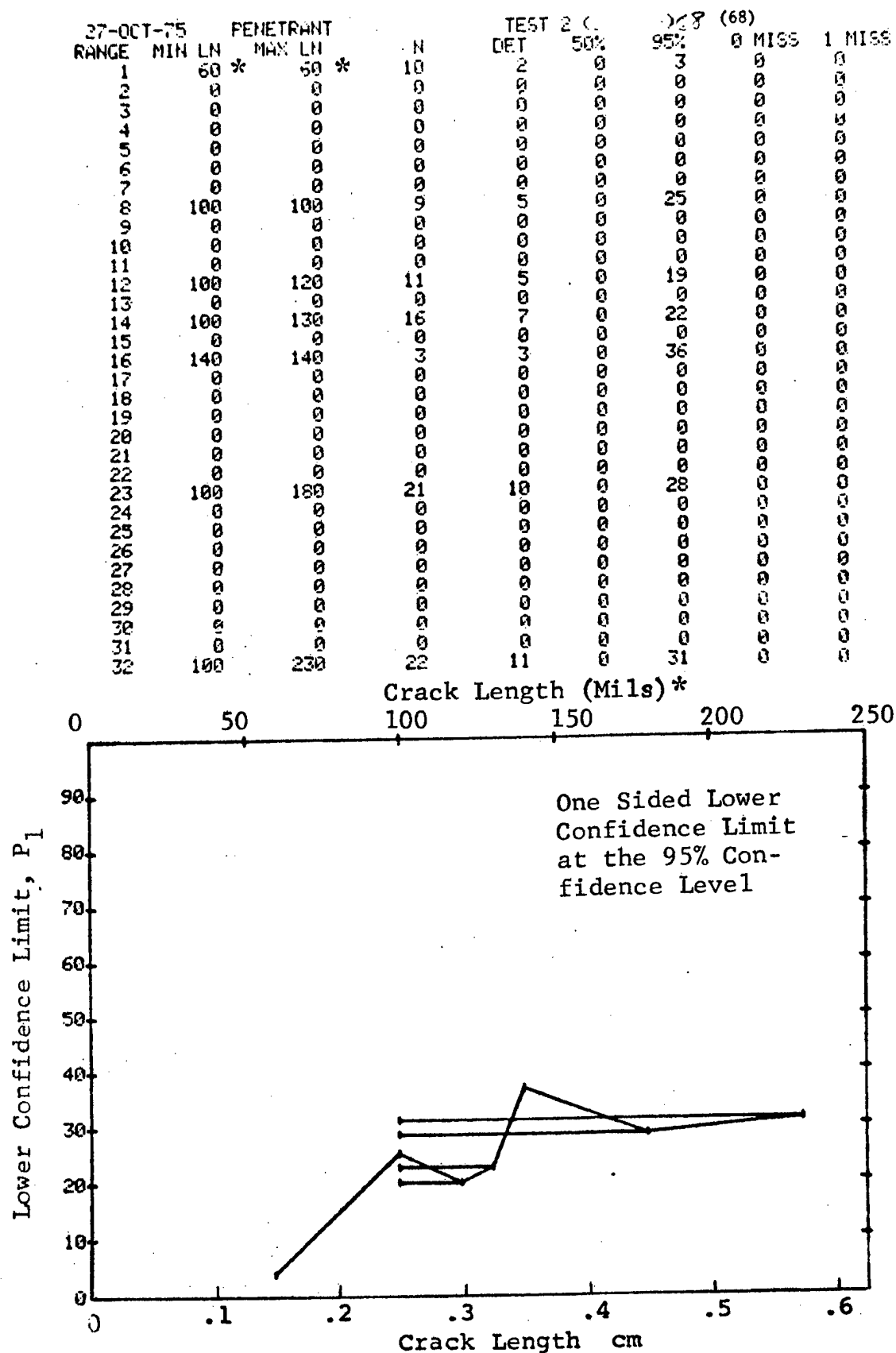


Figure D-68 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

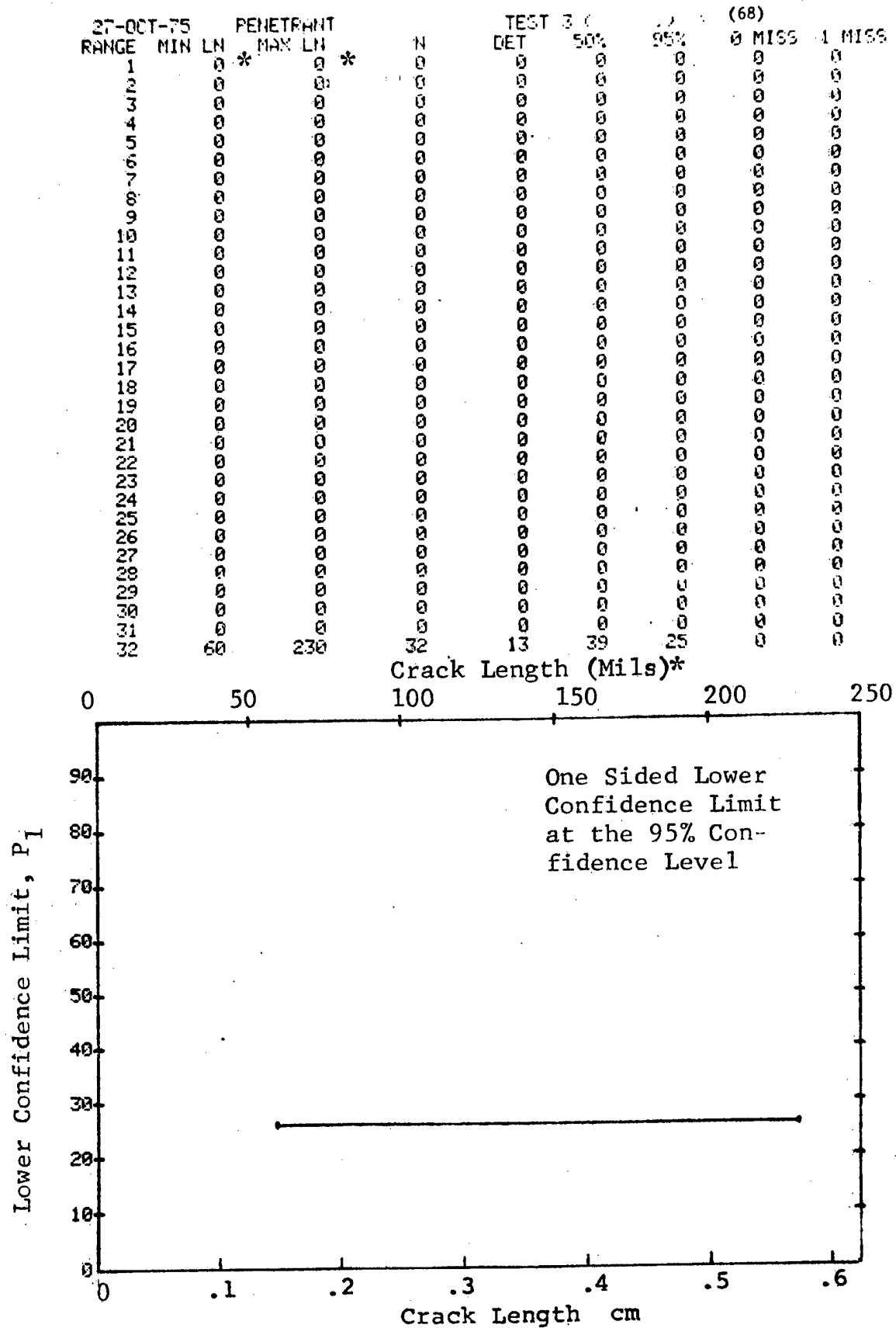


Figure D-68 (Concluded)

(a) Range Interval Method of Data Cumulation

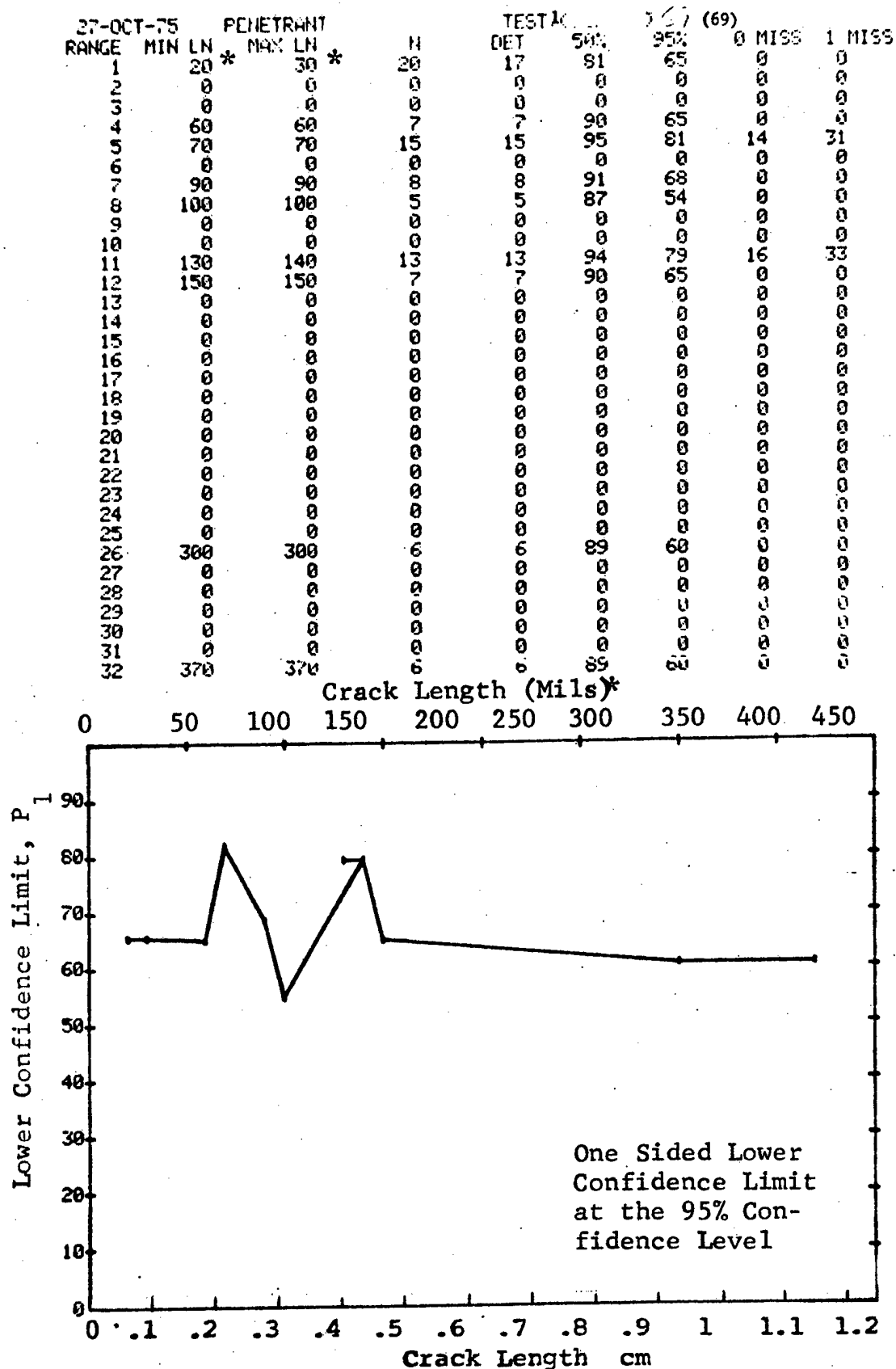


Figure D-69 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Filleted Solid Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

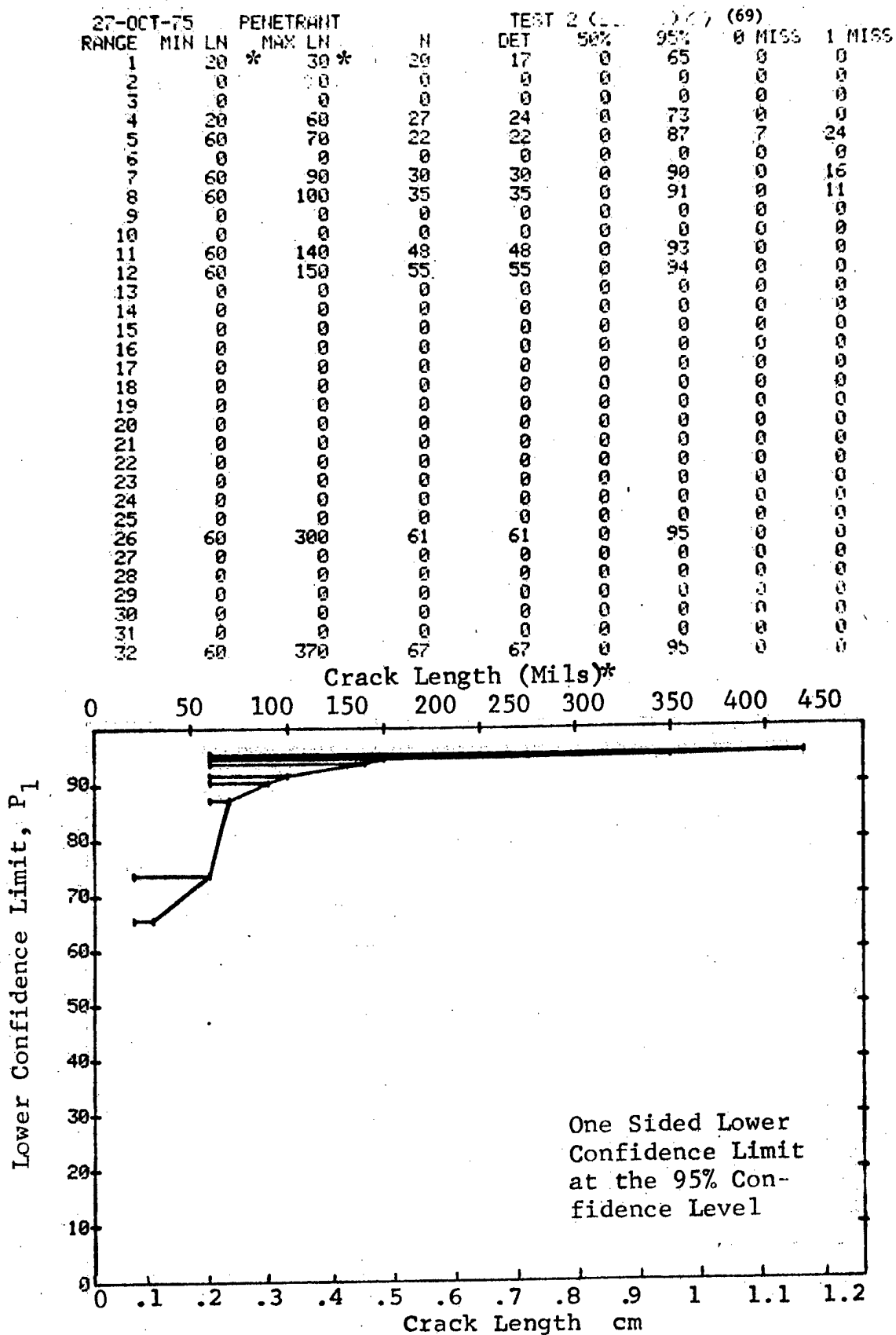


Figure D-69 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

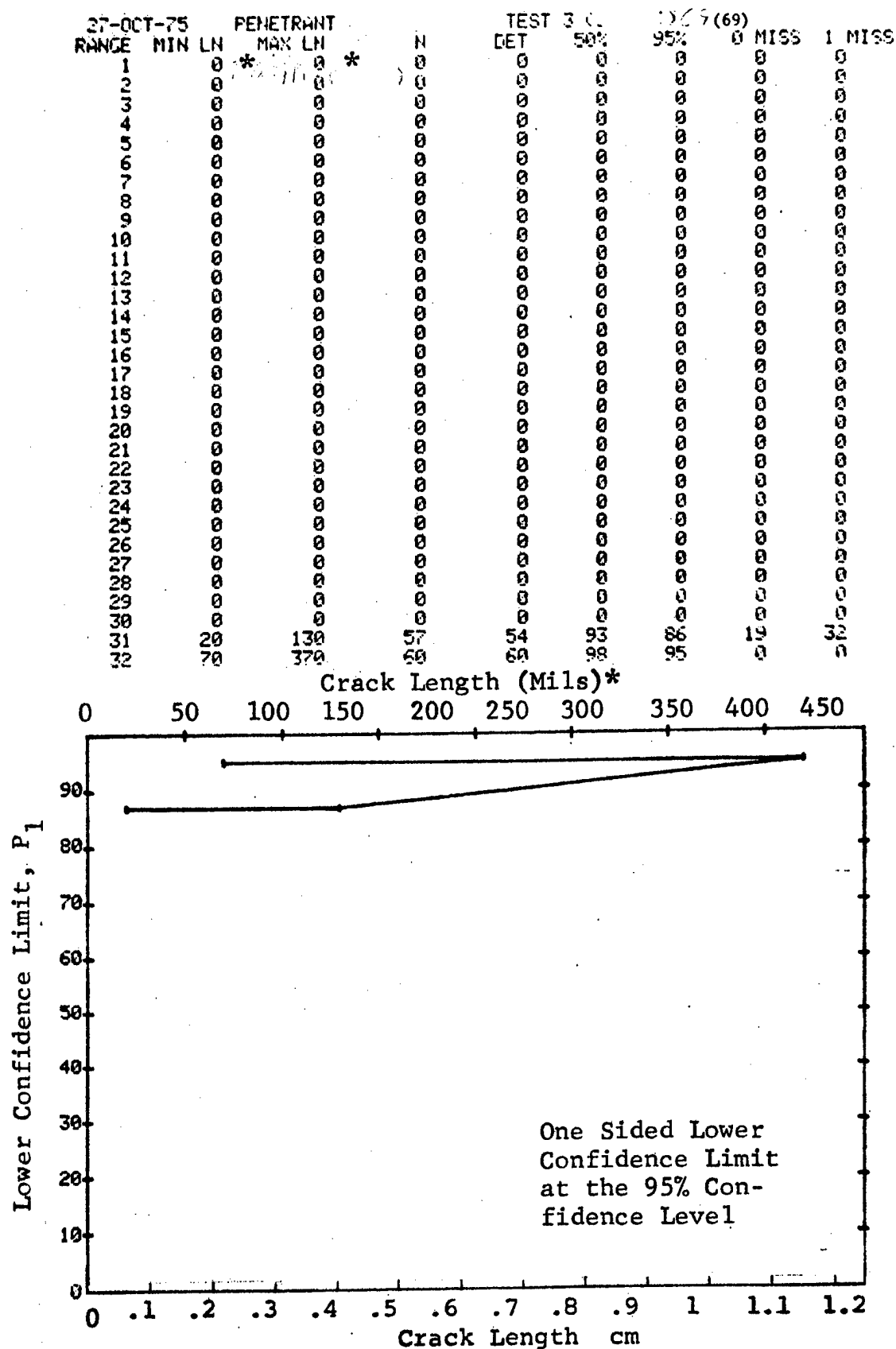


Figure D-69 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		PENETRANT		N	TEST 1 (		) 70 (70)		0 MISS	1 MISS
RANGE	MIN LN	MAX LN	MAX LN *		DET	50%	95%	95%		
1	30*	50*		22	6	25	12	0	0	
2	60	70*		15	12	76	56	0	0	
3	0	0		0	0	0	0	0	0	
4	110	120		12	10	78	56	0	0	
5	140	140		21	21	96	86	8	25	
6	150	160		14	14	95	80	15	32	
7	0	0		0	0	0	0	0	0	
8	200	200		1	1	50	5	0	0	
9	0	0		0	0	0	0	0	0	
10	0	0		0	0	0	0	0	0	
11	0	0		0	0	0	0	0	0	
12	0	0		0	0	0	0	0	0	
13	0	0		0	0	0	0	0	0	
14	0	0		0	0	0	0	0	0	
15	0	0		0	0	0	0	0	0	
16	0	0		0	0	0	0	0	0	
17	0	0		0	0	0	0	0	0	
18	0	0		0	0	0	0	0	0	
19	0	0		0	0	0	0	0	0	
20	0	0		0	0	0	0	0	0	
21	0	0		0	0	0	0	0	0	
22	0	0		0	0	0	0	0	0	
23	0	0		0	0	0	0	0	0	
24	0	0		0	0	0	0	0	0	
25	0	0		0	0	0	0	0	0	
26	0	0		0	0	0	0	0	0	
27	0	0		0	0	0	0	0	0	
28	0	0		0	0	0	0	0	0	
29	0	0		0	0	0	0	0	0	
30	0	0		0	0	0	0	0	0	
31	0	0		0	0	0	0	0	0	
32	750	750		7	7	90	65	0	0	

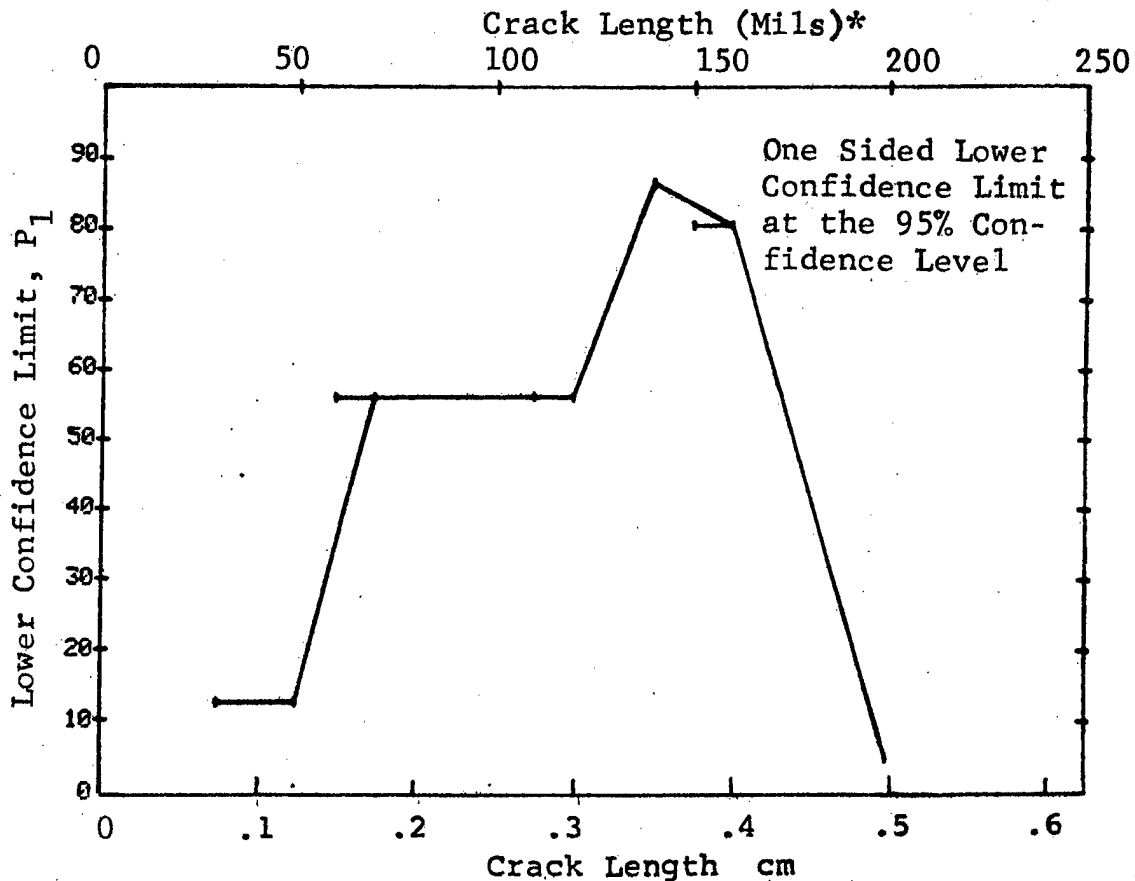


Figure D-70 Probability of Detection for 4340M Steel Using Liquid Penetrant. Compressed Notch Flaws in Filleted Solid Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

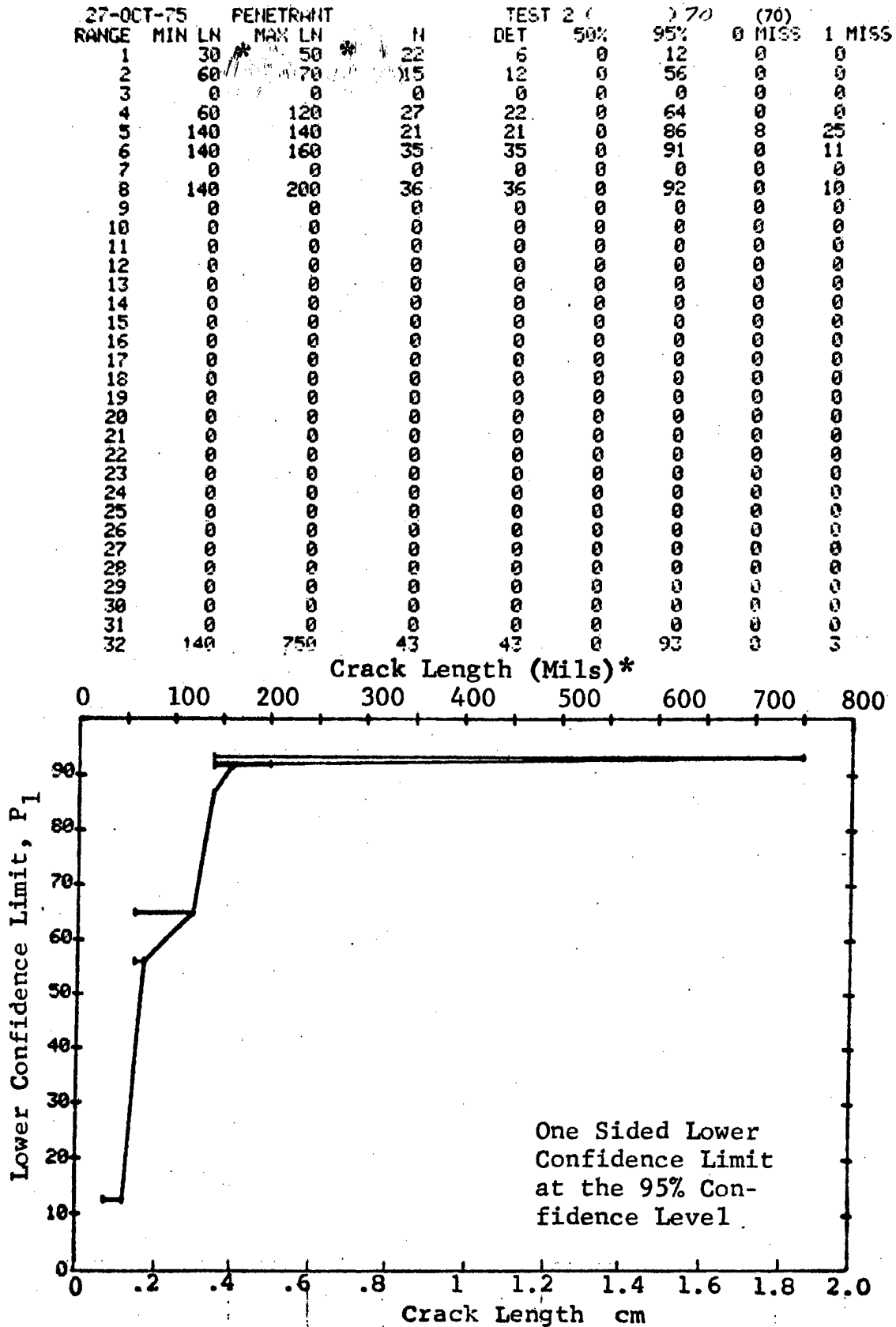


Figure D-70 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

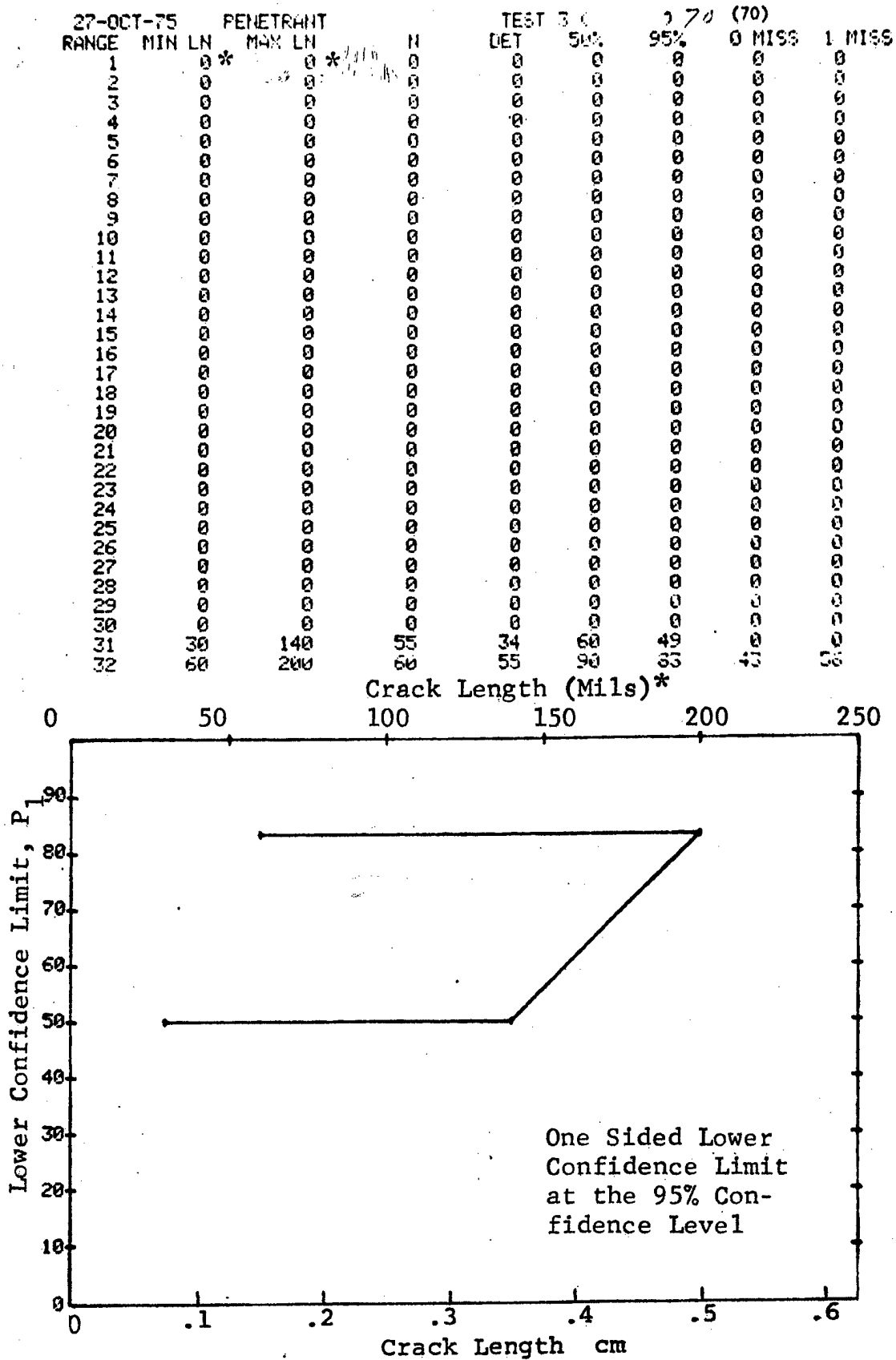


Figure D-70 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75				ULTRASONIC		TEST 1		(71) 2/			
RANGE	MIN	LN	MAX	LN	N	DET	50%	95%	0 MISS	1 MISS	
1	30	30	30	30	2	1	29	2	0	0	
2	40	40	40	40	7	4	50	22	0	0	
3	0	0	0	0	0	0	0	0	0	0	
4	50	50	50	50	9	6	60	34	0	0	
5	0	0	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	0	0	
7	70	70	70	70	3	3	79	36	0	0	
8	80	80	80	80	10	9	83	60	0	0	
9	0	0	0	0	0	0	0	0	0	0	
10	90	90	90	90	12	10	78	56	0	0	
11	0	0	0	0	0	0	0	0	0	0	
12	100	100	100	100	9	8	82	57	0	0	
13	110	110	110	110	22	20	88	74	0	0	
14	0	0	0	0	0	0	0	0	0	0	
15	120	120	120	120	9	9	92	71	0	0	
16	130	130	130	130	9	9	92	71	0	0	
17	0	0	0	0	0	0	0	0	0	0	
18	140	140	140	140	7	6	77	47	0	0	
19	0	0	0	0	0	0	0	0	0	0	
20	150	150	150	150	16	14	83	65	0	0	
21	160	160	160	160	6	5	73	41	0	0	
22	0	0	0	0	0	0	0	0	0	0	
23	170	170	170	170	16	16	95	82	13	30	
24	180	180	180	180	8	8	91	68	0	0	
25	0	0	0	0	0	0	0	0	0	0	
26	190	190	190	190	4	4	84	47	0	0	
27	0	0	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	0	0	
29	210	210	210	210	2	2	70	22	0	0	
30	0	0	0	0	0	0	0	0	0	0	
31	220	220	220	220	9	9	92	71	0	0	
32	230	230	230	230	12	9	83	60	0	0	

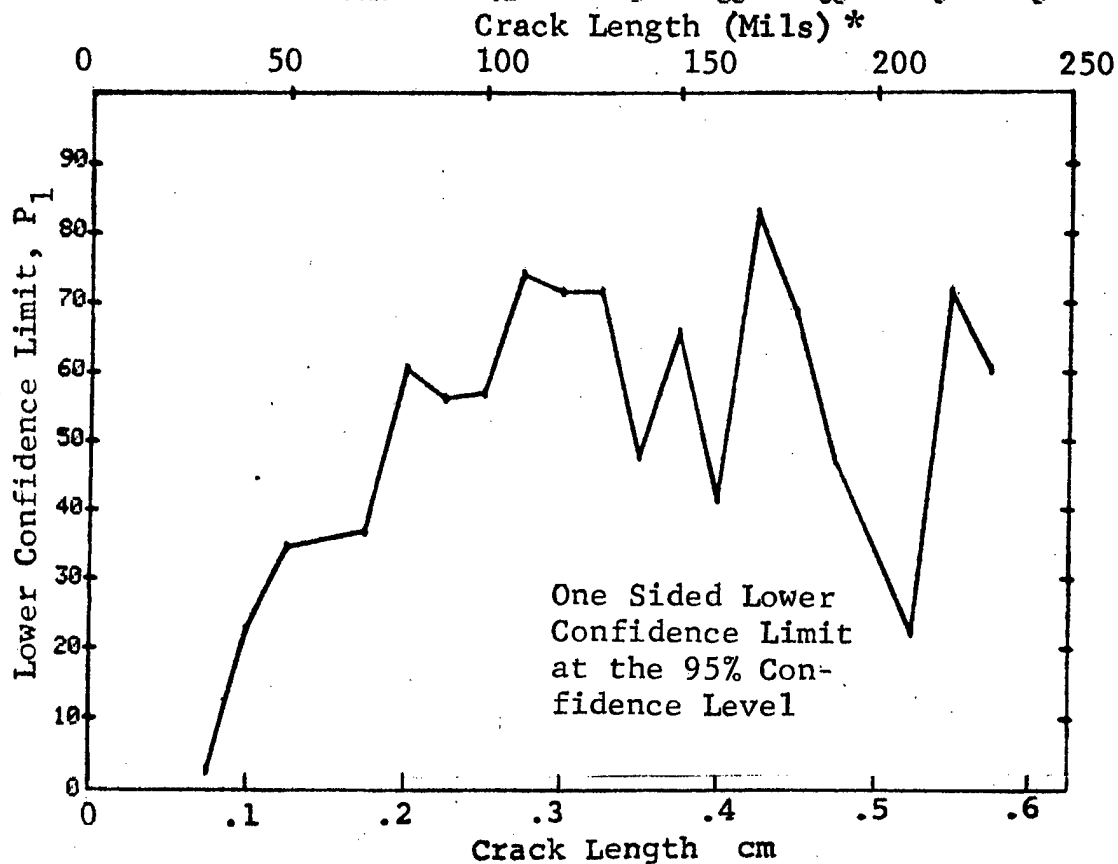


Figure D-71 Probability of Detection for 2024-T6 Al for Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Tandem T. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		ULTRASONIC		N	TEST 2		27 (71)		1 MISS
RANGE	MIN LN	MAX LN	*		DEL	50%	95%	0 MISS	
1	30	30	*	2	1	0	0	0	0
2	30	40		3	5	0	25	0	0
3	0	0		0	0	0	0	0	0
4	30	50		18	11	0	39	0	0
5	0	0		0	0	0	0	0	0
6	0	0		0	0	0	0	0	0
7	50	70		12	9	0	47	0	0
8	70	80		13	12	0	68	0	0
9	0	0		0	0	0	0	0	0
10	70	90		25	22	0	71	0	0
11	0	0		0	0	0	0	0	0
12	70	100		34	30	0	75	0	0
13	70	110		56	50	0	79	0	0
14	0	0		0	0	0	0	0	0
15	70	120		65	59	0	82	51	64
16	110	130		40	38	0	85	21	36
17	0	0		0	0	0	0	0	0
18	100	140		56	52	0	84	33	47
19	0	0		0	0	0	0	0	0
20	70	150		97	88	0	84	57	70
21	70	160		103	93	0	84	0	0
22	0	0		0	0	0	0	0	0
23	110	170		85	79	0	86	31	44
24	170	180		24	24	0	88	5	20
25	0	0		0	0	0	0	0	0
26	170	190		28	28	0	89	1	18
27	0	0		0	0	0	0	0	0
28	0	0		0	0	0	0	0	0
29	170	210		30	30	0	90	0	16
30	0	0		0	0	0	0	0	0
31	170	220		39	39	0	92	0	7
32	170	230		49	48	0	90	0	12

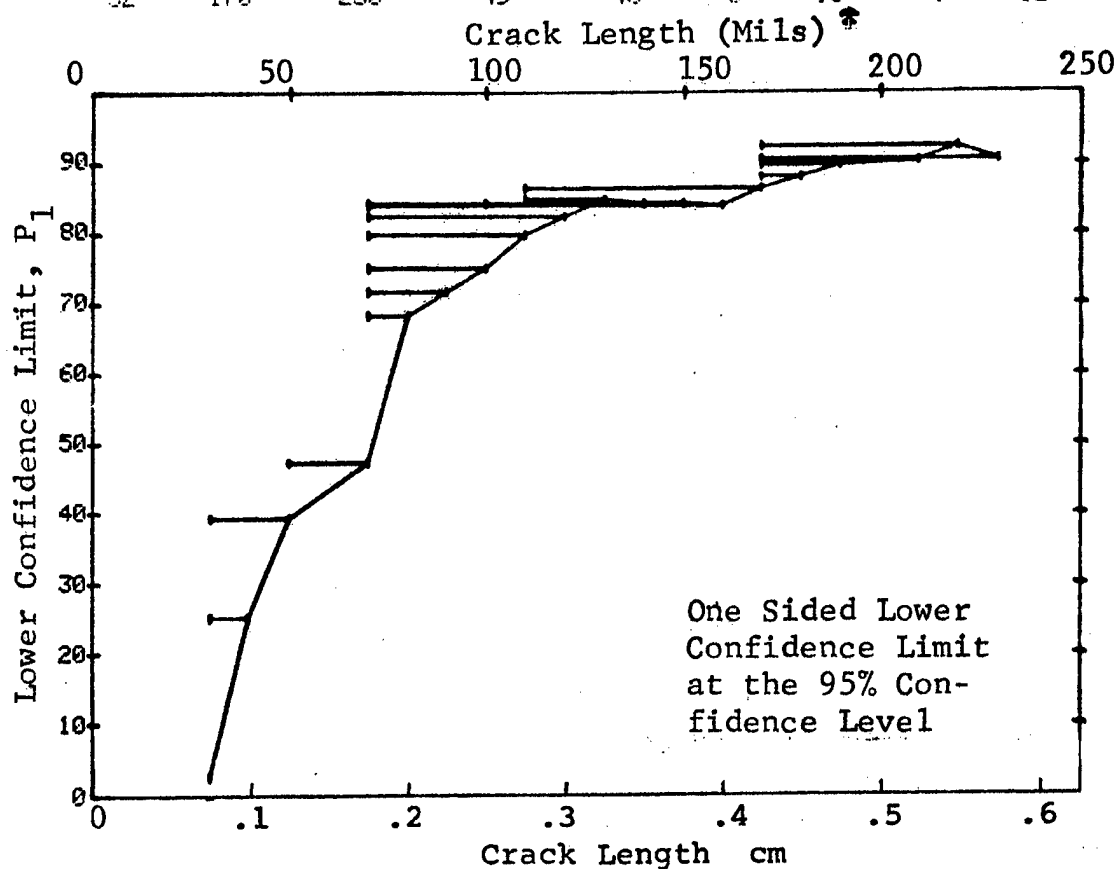


Figure D-71 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

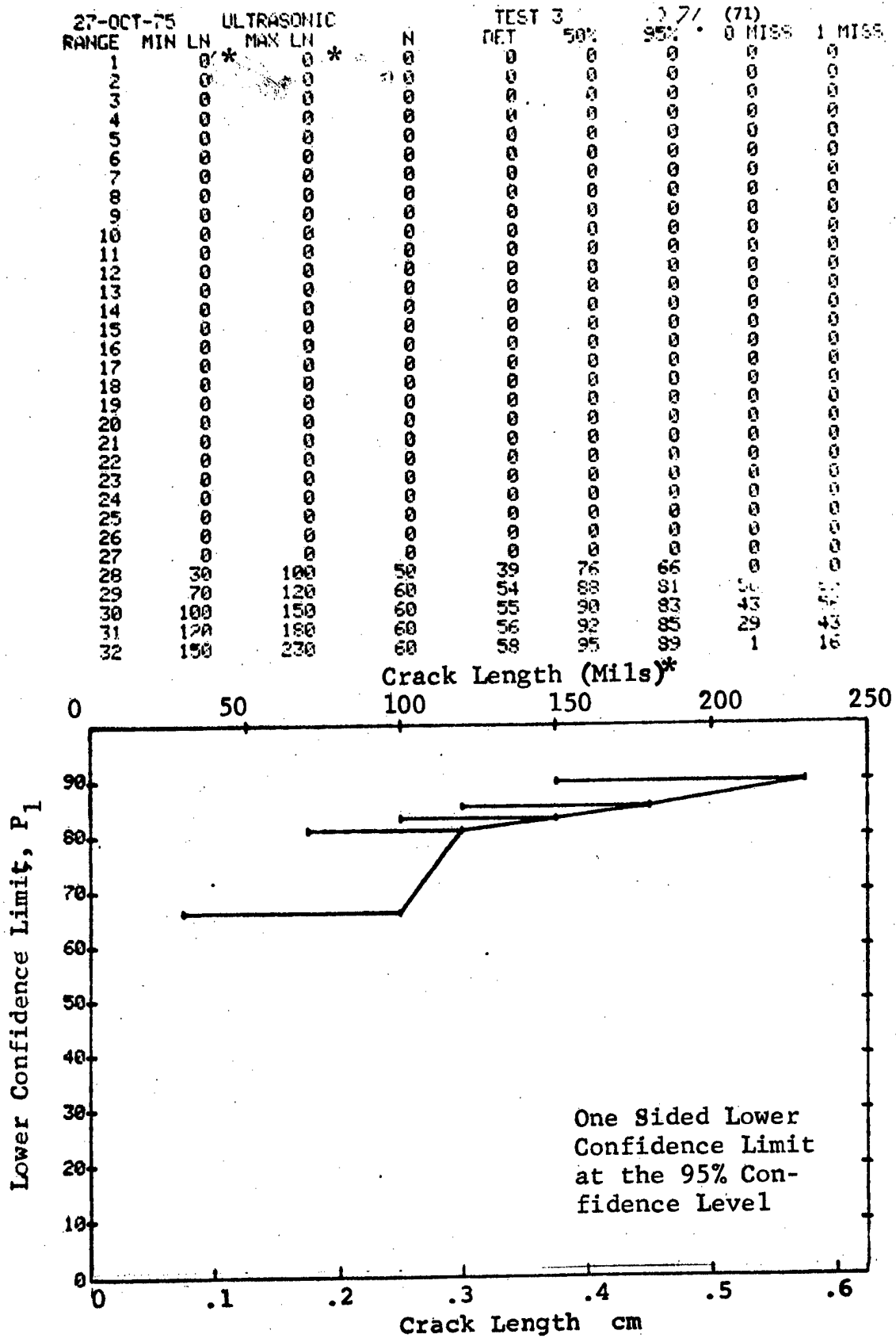


Figure D-71 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75	ULTRASONIC		TEST 1 (72)		TEST 2 (72)		TEST 3 (72)	
RANGE	MIN LN	* MAX LN *	DET	50%	95%	0 MISS	1 MISS	2 MISS
1	40	40	0	0	0	0	0	0
2	70	70	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	100	110	11	14	3	0	0	0
5	130	130	4	15	1	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	190	190	1	50	5	0	0	0
9	210	210	1	0	0	0	0	0
10	230	230	2	70	22	0	0	0
11	0	0	0	0	0	0	0	0
12	250	250	3	79	36	0	0	0
13	0	0	0	0	0	0	0	0
14	300	300	2	70	22	0	0	0
15	310	310	2	70	22	0	0	0
16	0	0	0	0	0	0	0	0
17	350	350	2	70	22	0	0	0
18	380	380	2	70	22	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	450	450	2	70	22	0	0	0
23	460	460	1	50	5	0	0	0
24	480	480	2	70	22	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	650	650	2	70	22	0	0	0

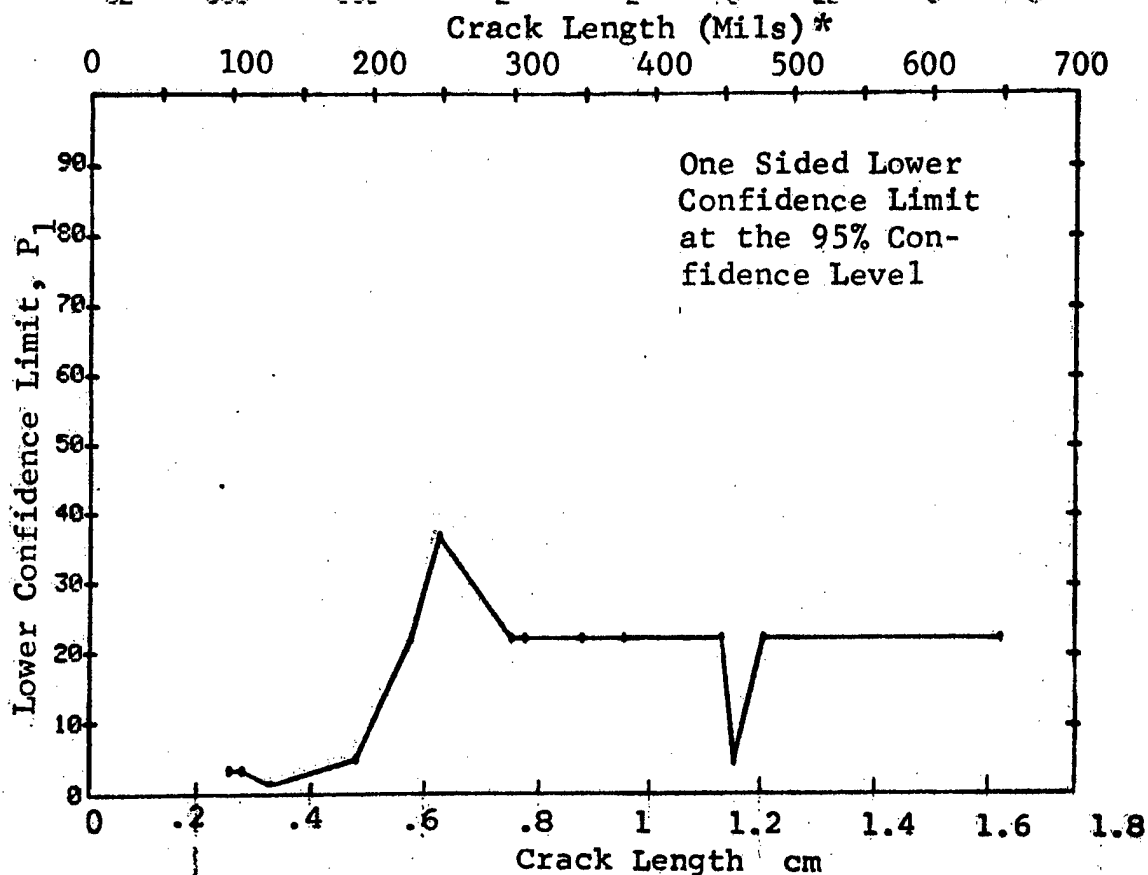


Figure D-72 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Solid Threaded Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

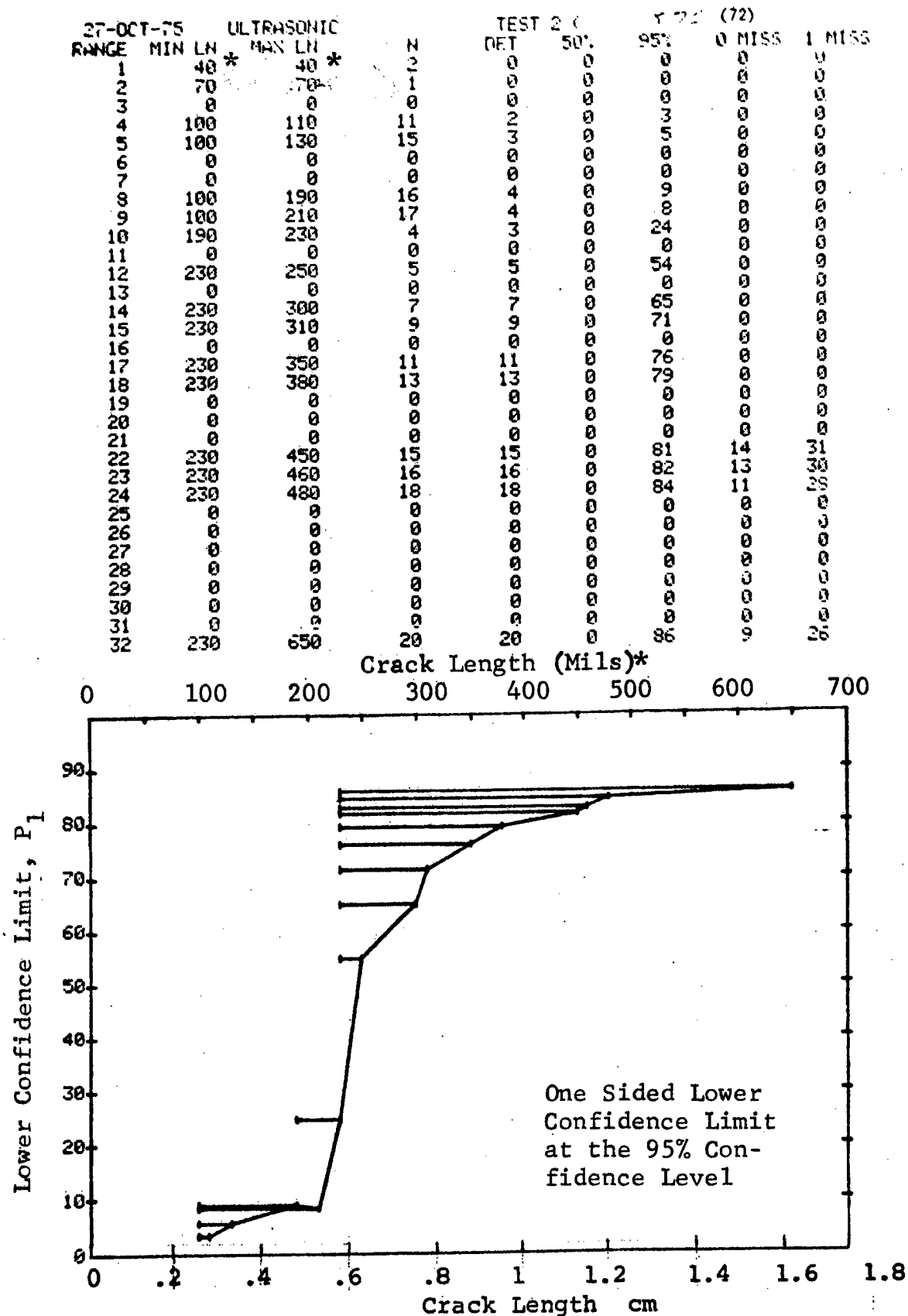


Figure D-72 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

27-OCT-75	ULTRASONIC		TEST 3 (		172	(72)		
RANGE	MIN LN	* MAX LN	H	DET	50%	95%	0 MISS	1 MISS
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	40	480	38	22	56	43	0	0

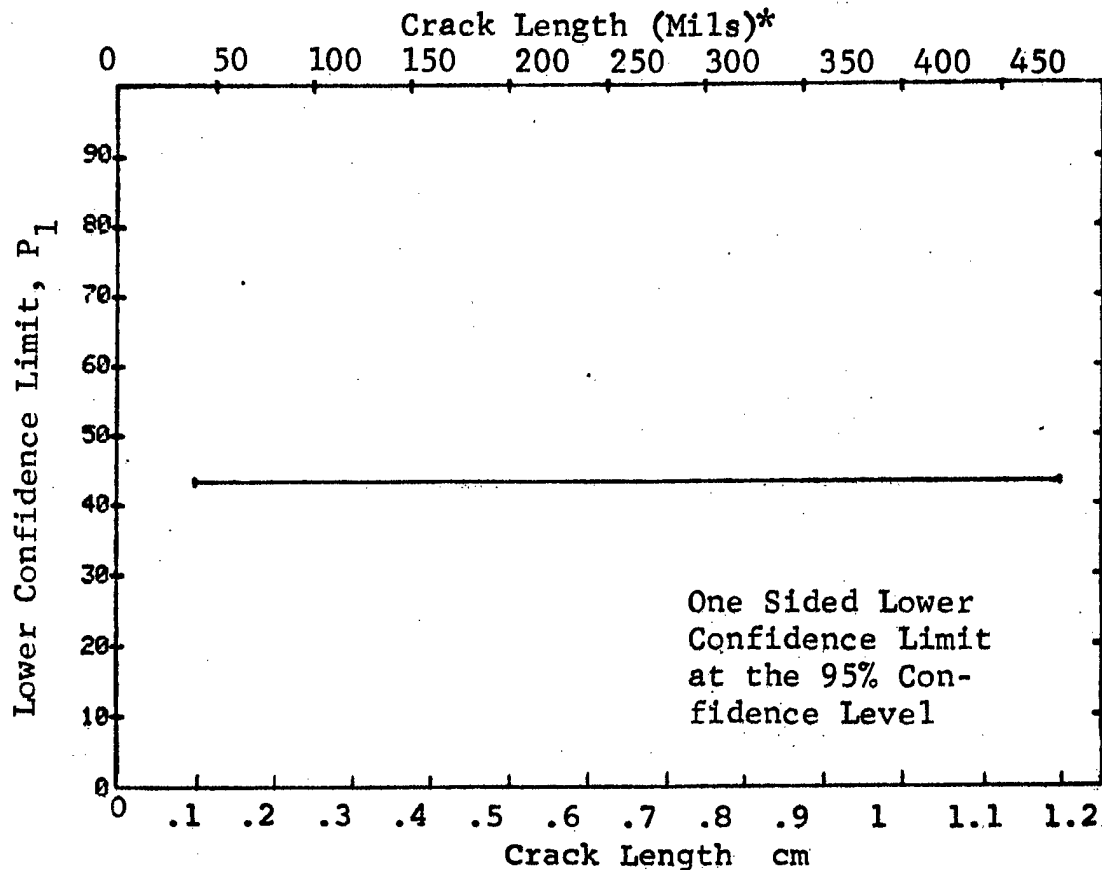


Figure D-72 (Concluded)

(a) Range Interval Method of Data Cumulation

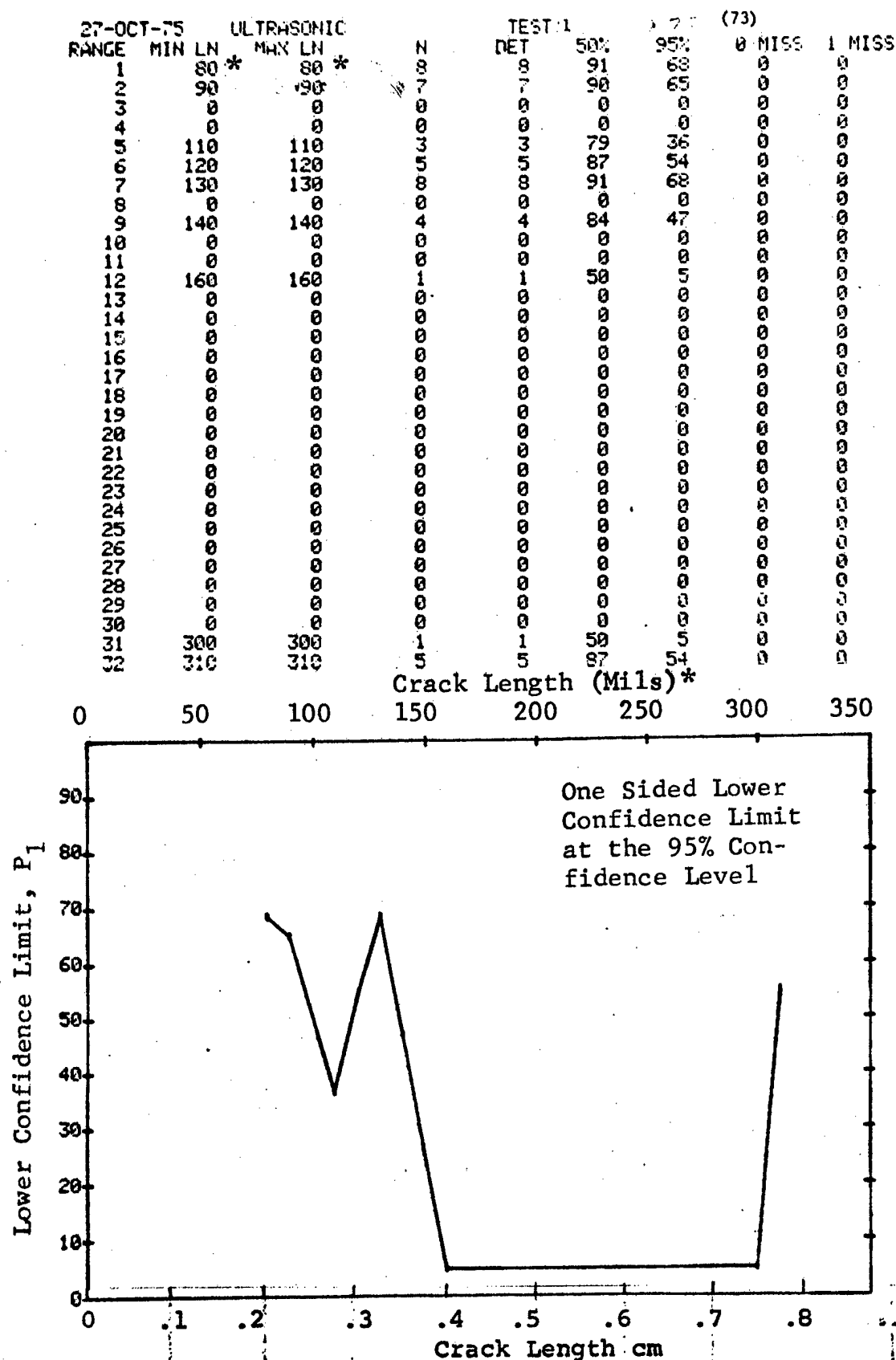


Figure D-73 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Hollow Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

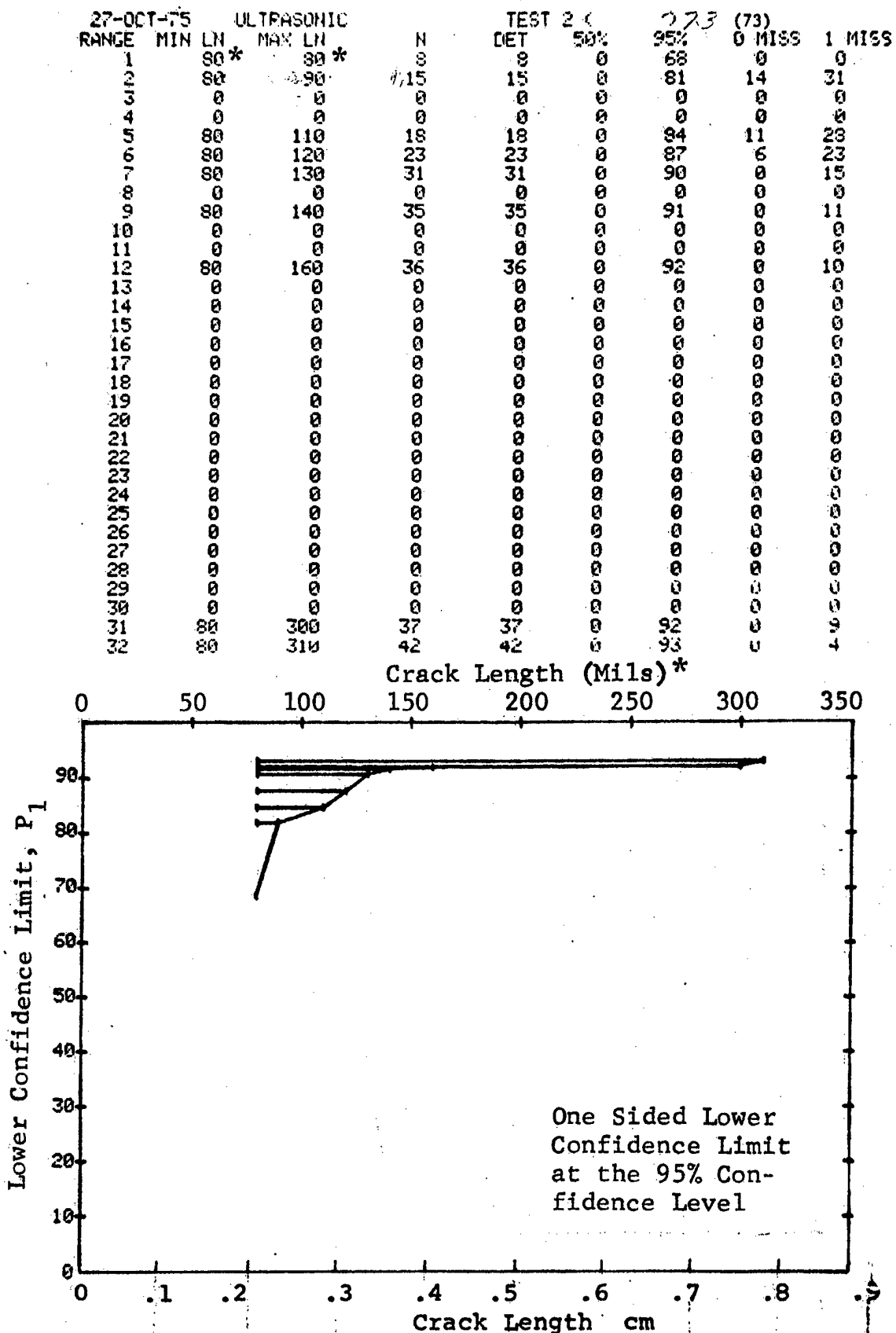


Figure D-73 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

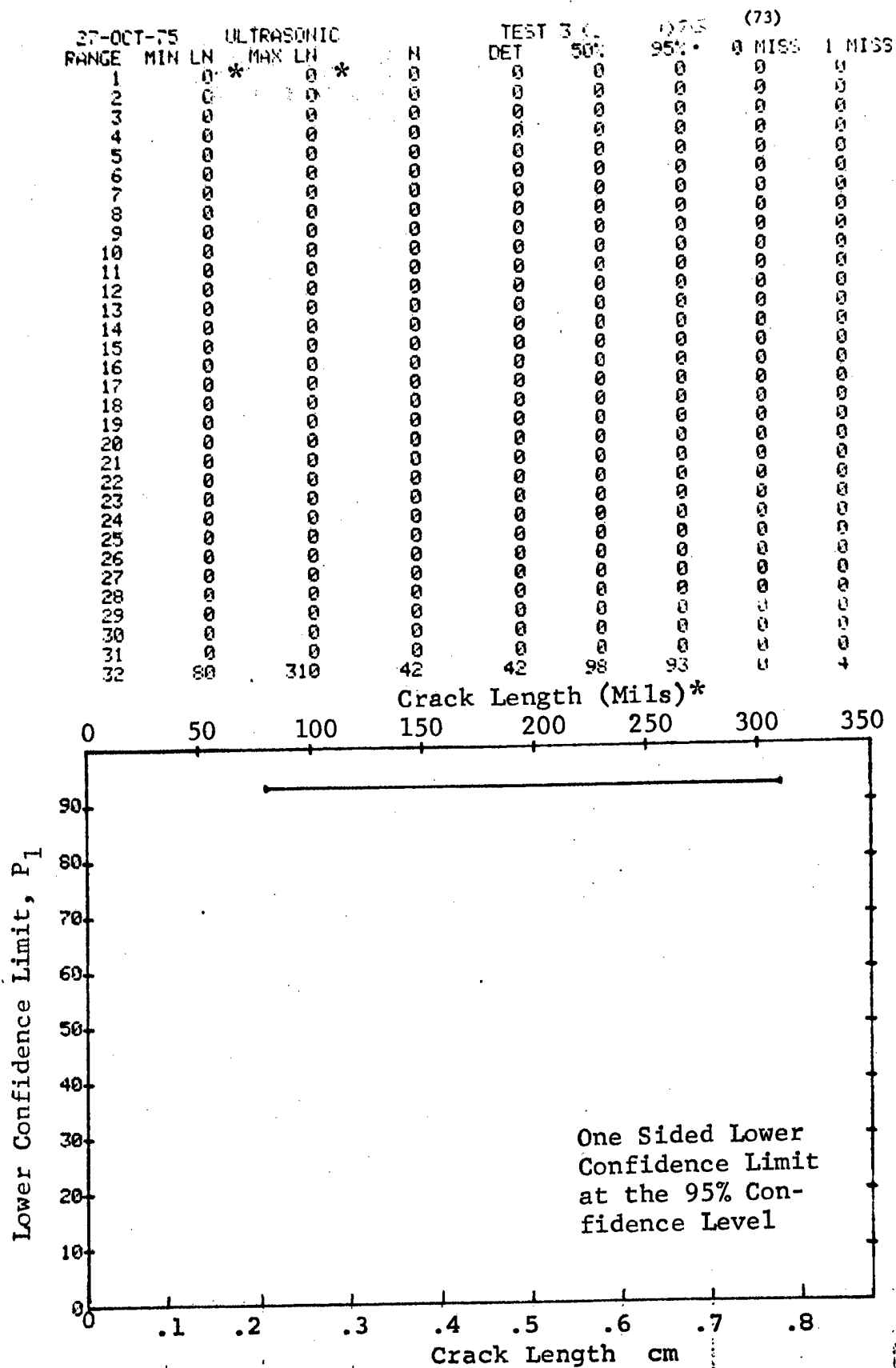


Figure D-73 (Concluded)

(a) Range Interval Method of Data Cumulation

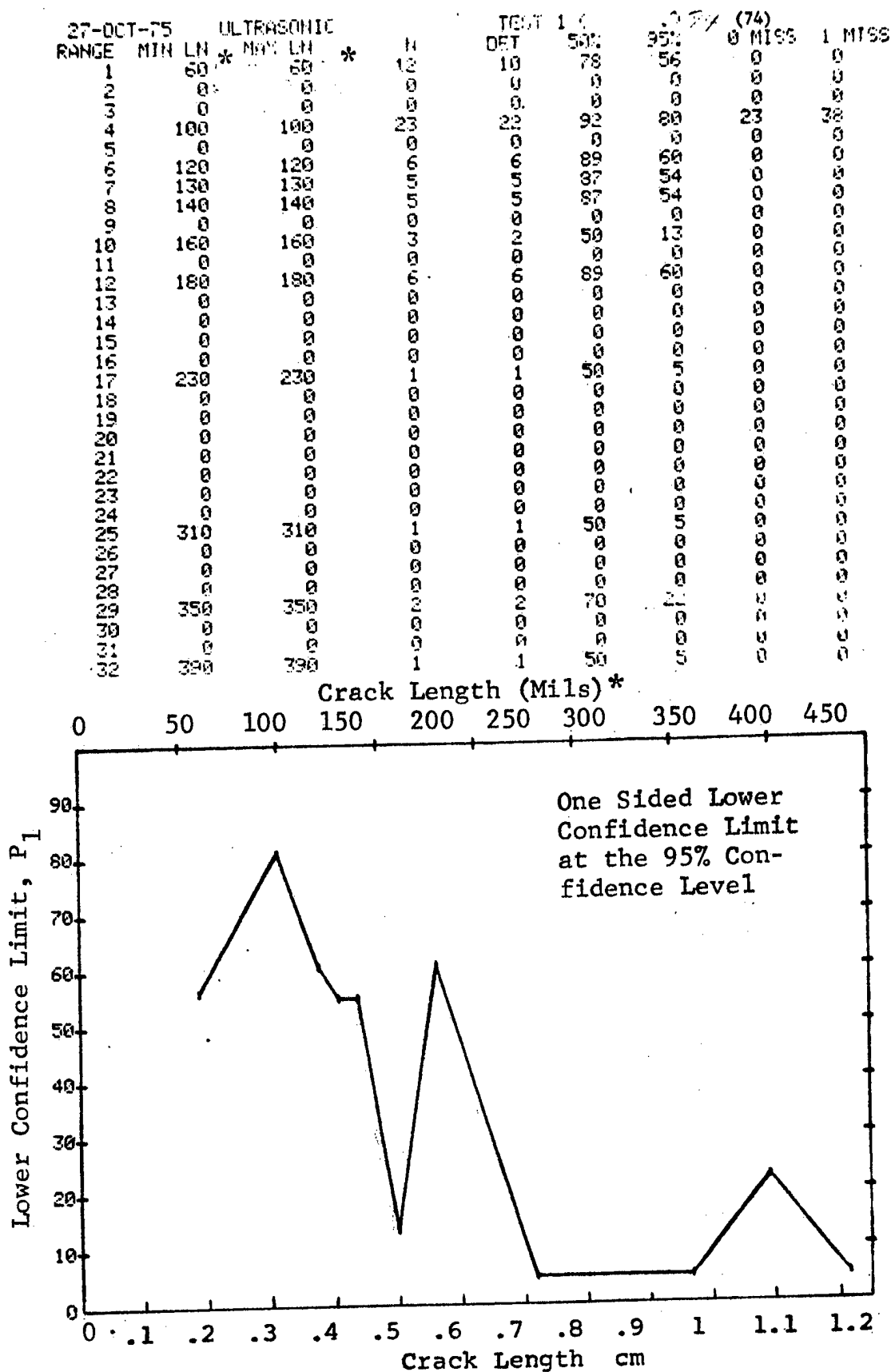


Figure D-74 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Filleted Hollow Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		ULTRASONIC		N	TEST 2		(74)		0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DET	50%	95%	77		
1		60	* 60 *	12	10	0	56	0	0	0
2		0	0	0	0	0	0	0	0	0
3		0	0	0	0	0	0	0	0	0
4	100		100	23	22	0	80	23	38	0
5		0	0	0	0	0	0	0	0	0
6	100		120	29	28	0	84	17	32	0
7	100		130	34	33	0	86	12	27	0
8	100		140	39	38	0	88	7	22	0
9		0	0	0	0	0	0	0	0	0
10	100		160	42	40	0	85	19	34	0
11		0	0	0	0	0	0	0	0	0
12	100		180	48	46	0	87	13	28	0
13		0	0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0	0
17	100		230	49	47	0	87	12	27	0
18		0	0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0	0
25	100		310	50	48	0	87	11	26	0
26		0	0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0	0
29	100		350	52	50	0	88	7	24	0
30		0	0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0	0
32	100		390	53	51	0	88	8	25	0

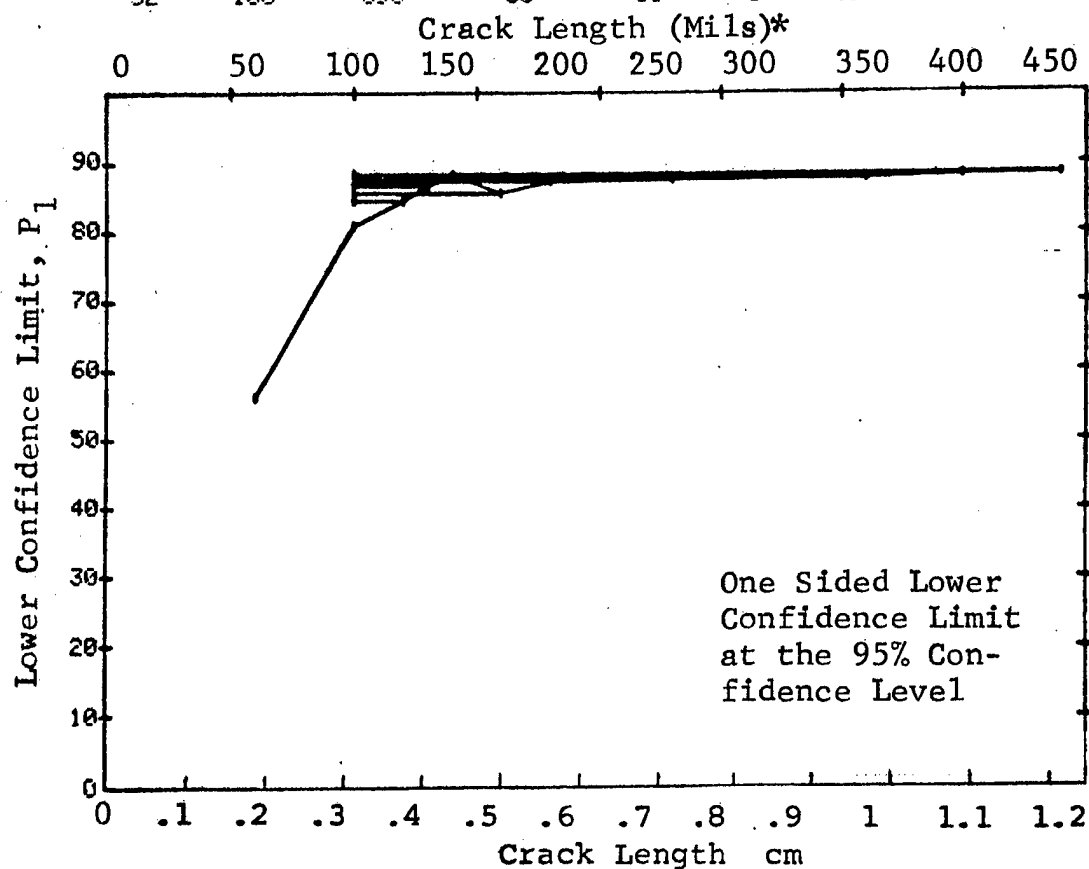


Figure D-74 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

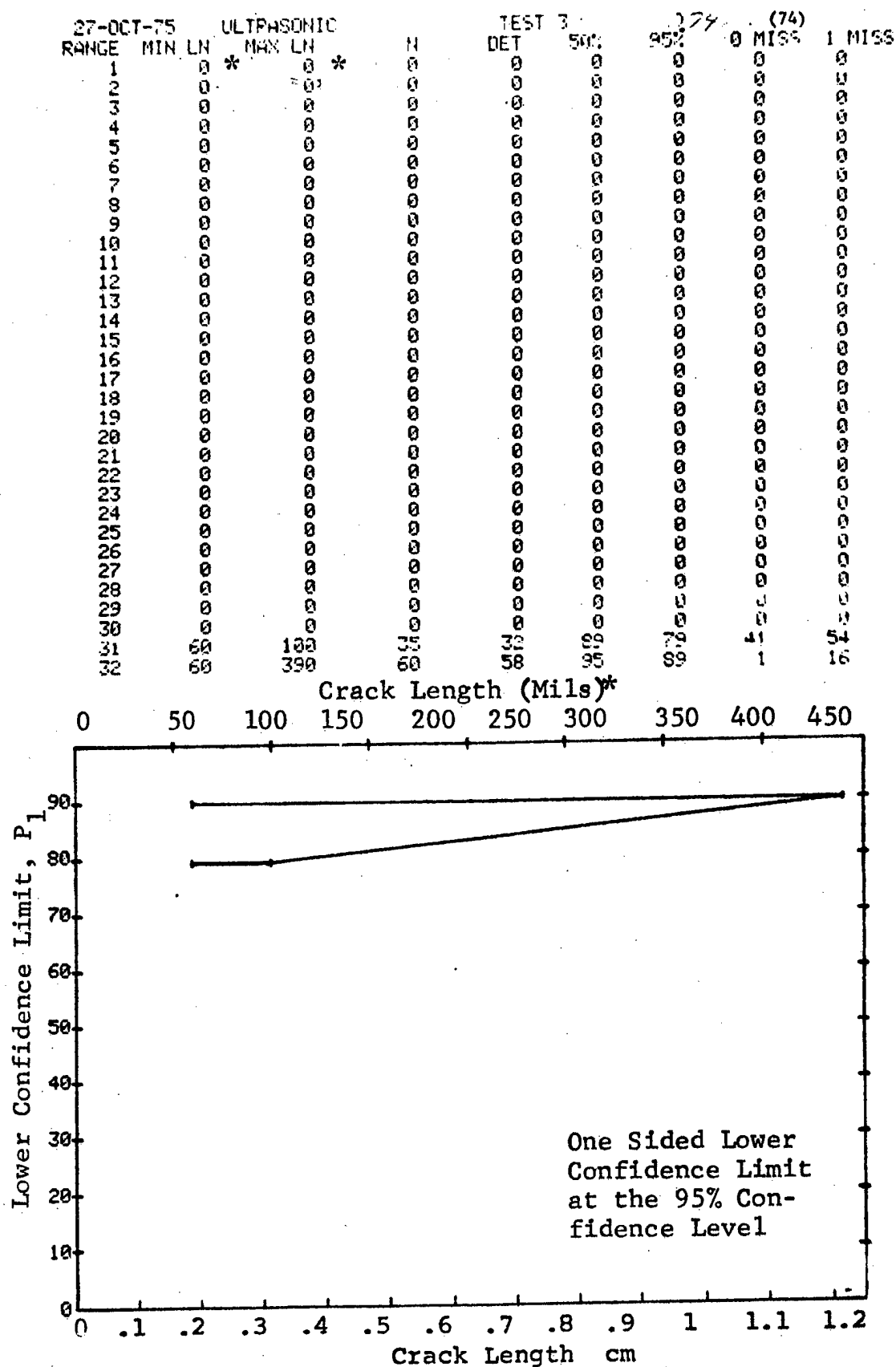


Figure D-74 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		ULTRASONIC		H	TEST 1 (		(75)		1 MISS
RANGE	MIN LN	* MAX LN	*		DET	90%	95%	0 MISS	
1	20	30	*	12	4	29	12	0	0
2	0	0		0	0	0	0	0	0
3	0	0		0	0	0	0	0	0
4	60	60		12	12	94	77	17	34
5	70	70		21	21	96	86	8	25
6	0	0		0	0	0	0	0	0
7	90	90		12	12	94	77	17	34
8	100	100		11	11	93	76	18	35
9	0	0		0	0	0	0	0	0
10	130	130		1	1	50	5	0	0
11	140	140		3	3	79	36	0	0
12	150	150		12	12	94	77	17	34
13	0	0		0	0	0	0	0	0
14	0	0		0	0	0	0	0	0
15	0	0		0	0	0	0	0	0
16	0	0		0	0	0	0	0	0
17	0	0		0	0	0	0	0	0
18	0	0		0	0	0	0	0	0
19	0	0		0	0	0	0	0	0
20	0	0		0	0	0	0	0	0
21	0	0		0	0	0	0	0	0
22	0	0		0	0	0	0	0	0
23	0	0		0	0	0	0	0	0
24	0	0		0	0	0	0	0	0
25	300	300		3	3	79	36	0	0
26	0	0		0	0	0	0	0	0
27	0	0		0	0	0	0	0	0
28	0	0		0	0	0	0	0	0
29	0	0		0	0	0	0	0	0
30	0	0		0	0	0	0	0	0
31	0	0		0	0	0	0	0	0
32	370	380		2	2	70	22	0	0

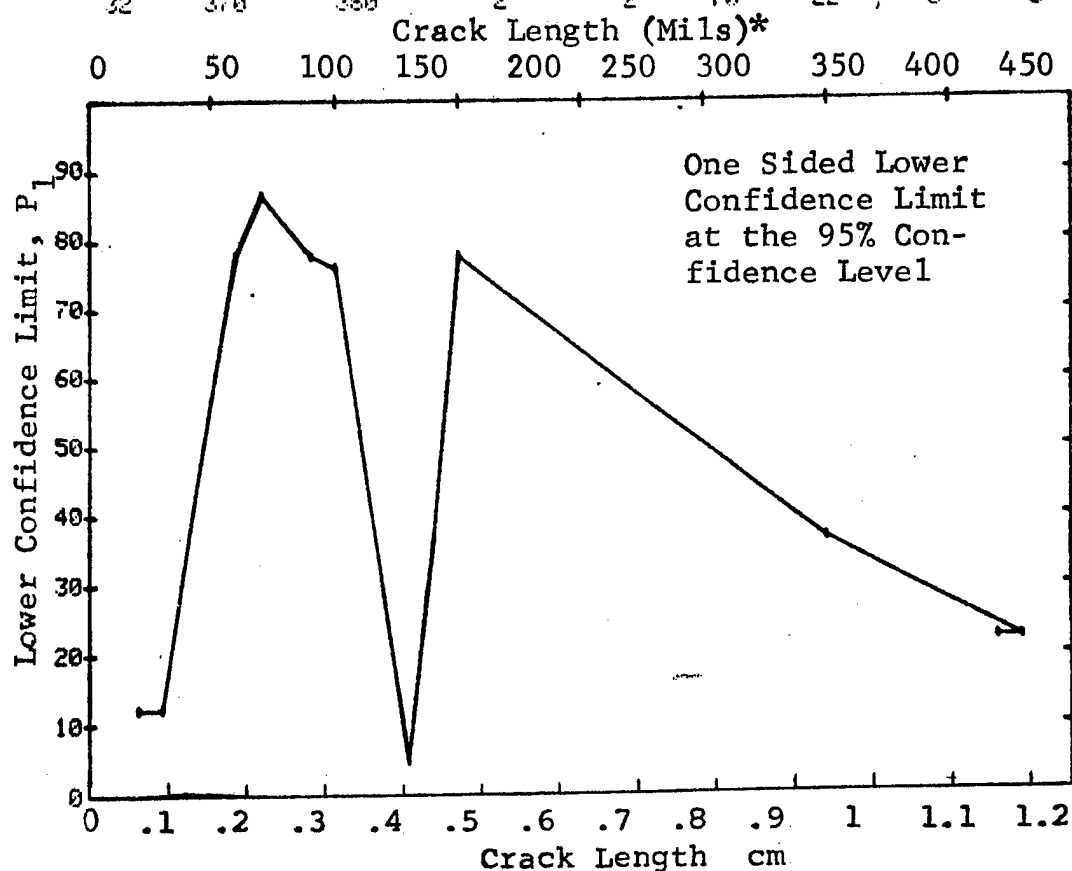


Figure D-75 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Filleted Solid Cylinder. Prod Env.

(b) Optimum Probability Method of Data Cumulation

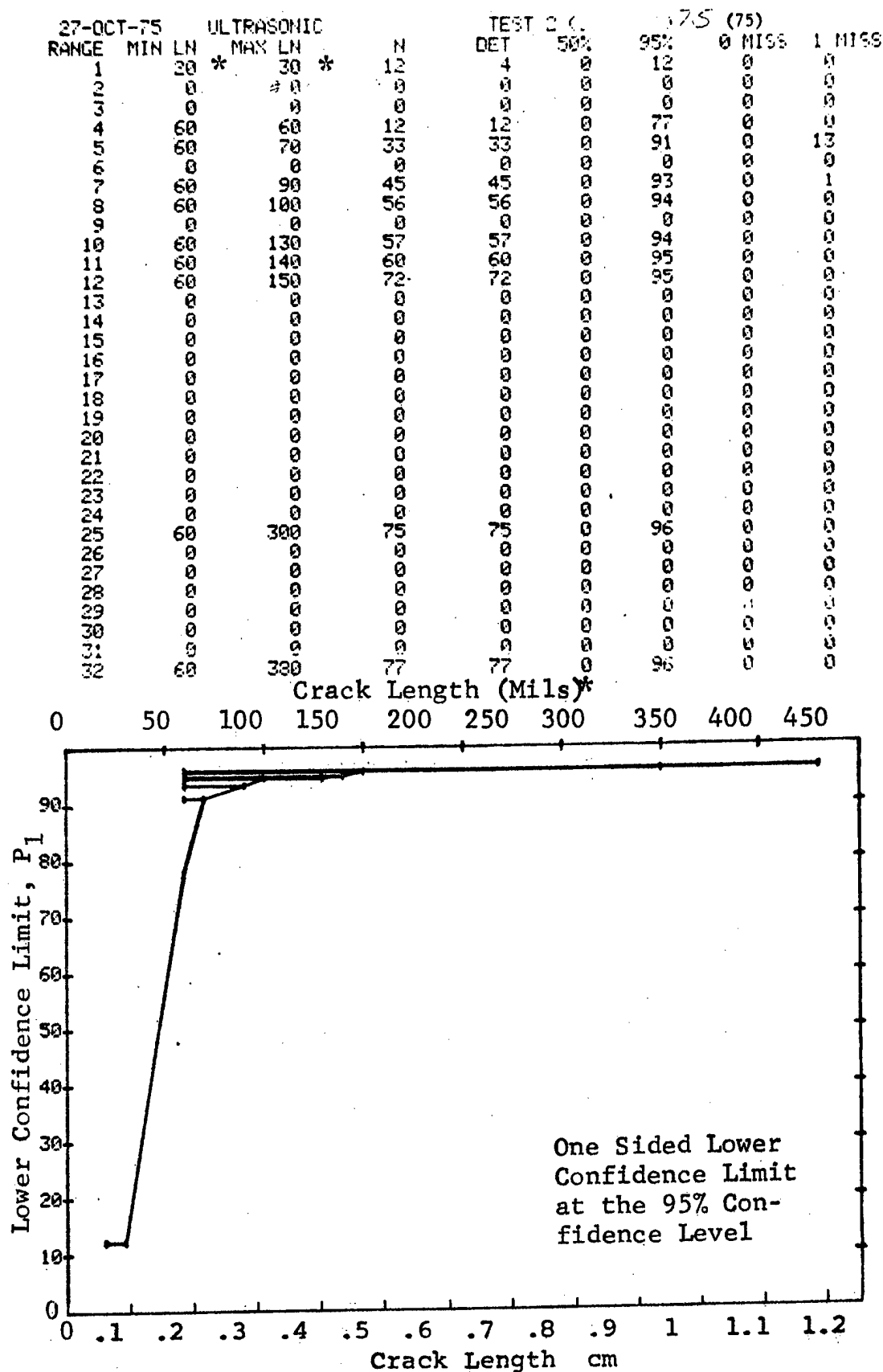


Figure D-75 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

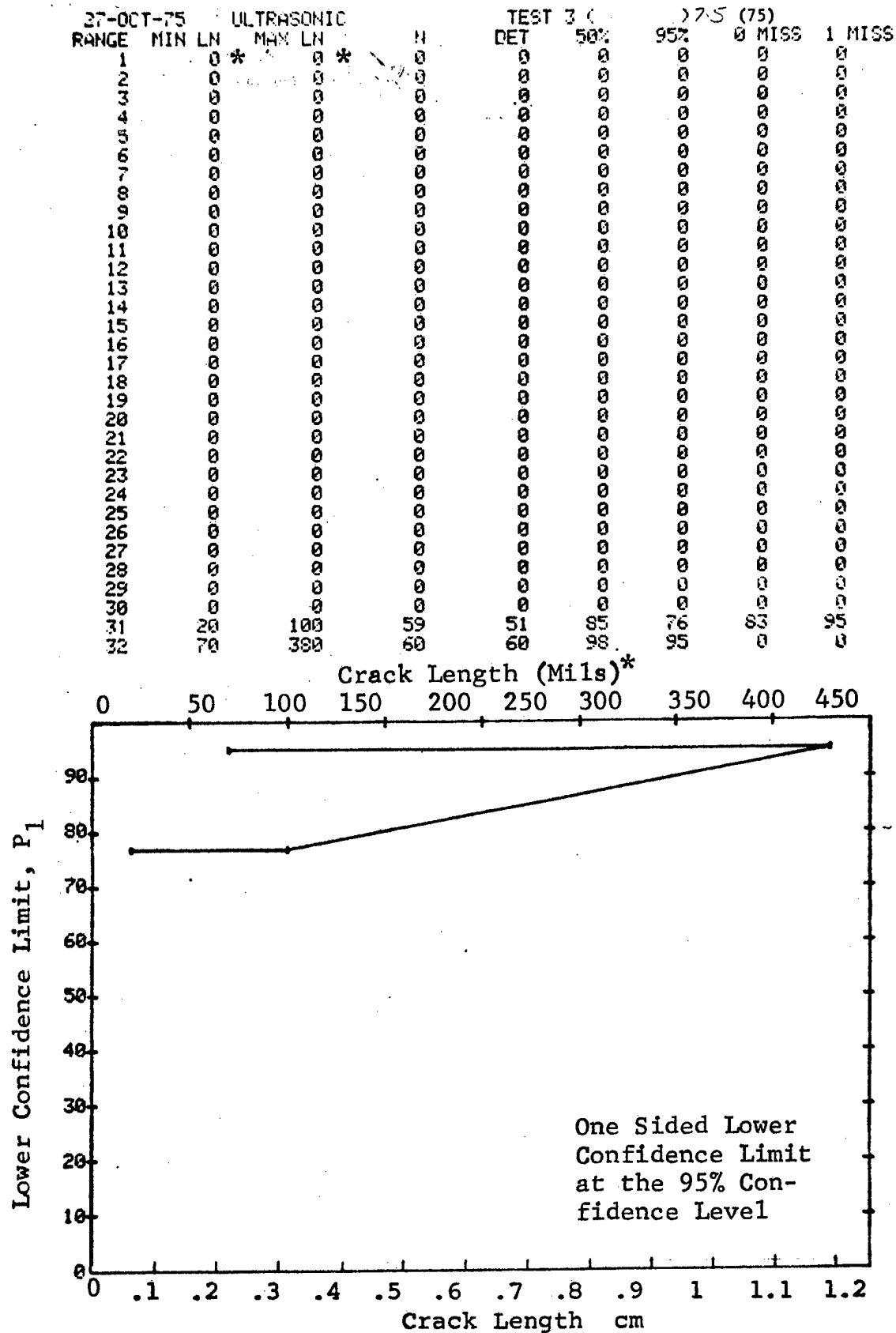


Figure D-75 (Concluded)

(a) Range Interval Method of Data Cumulation

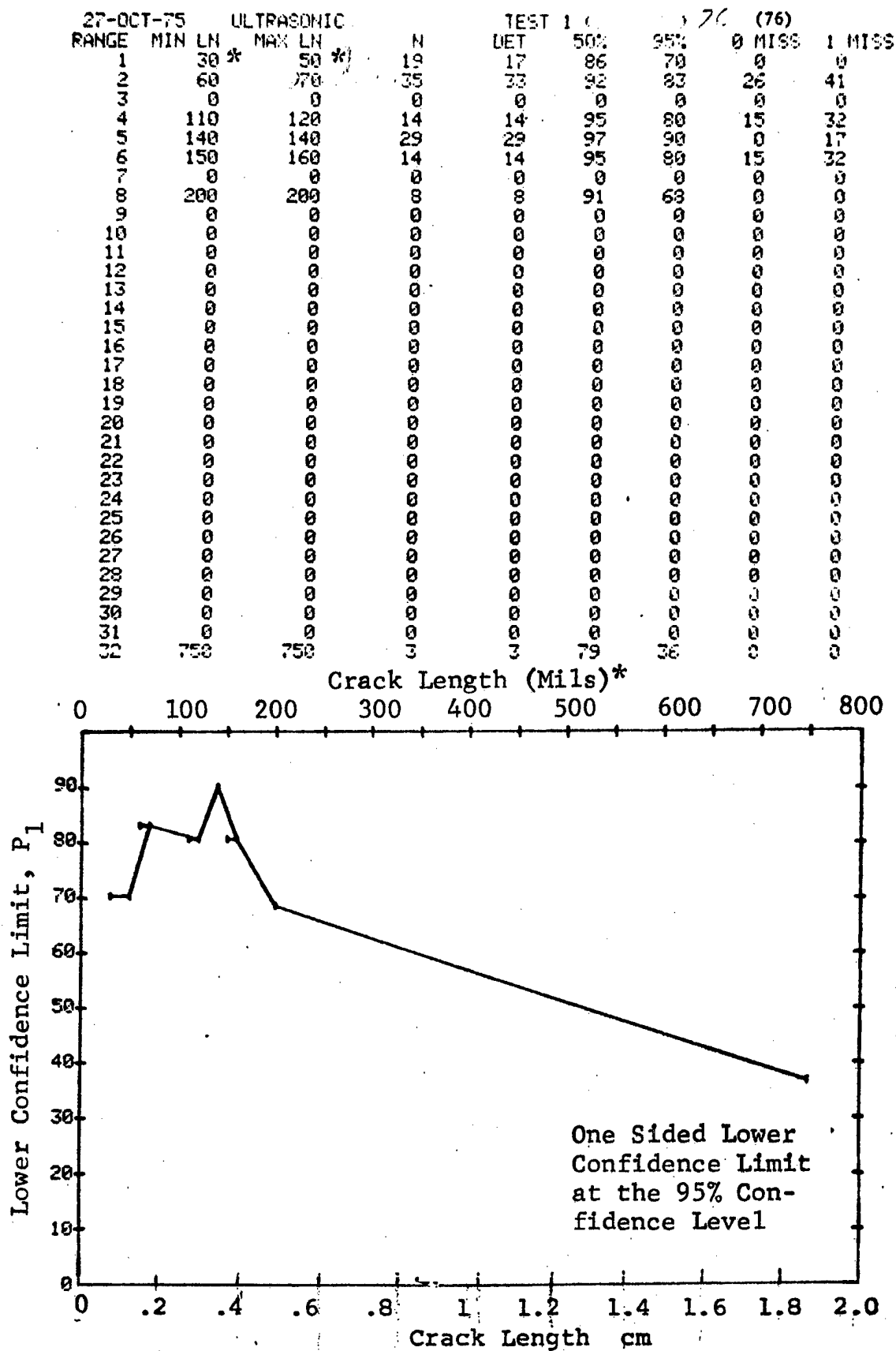


Figure D-76 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Filleted Solid Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

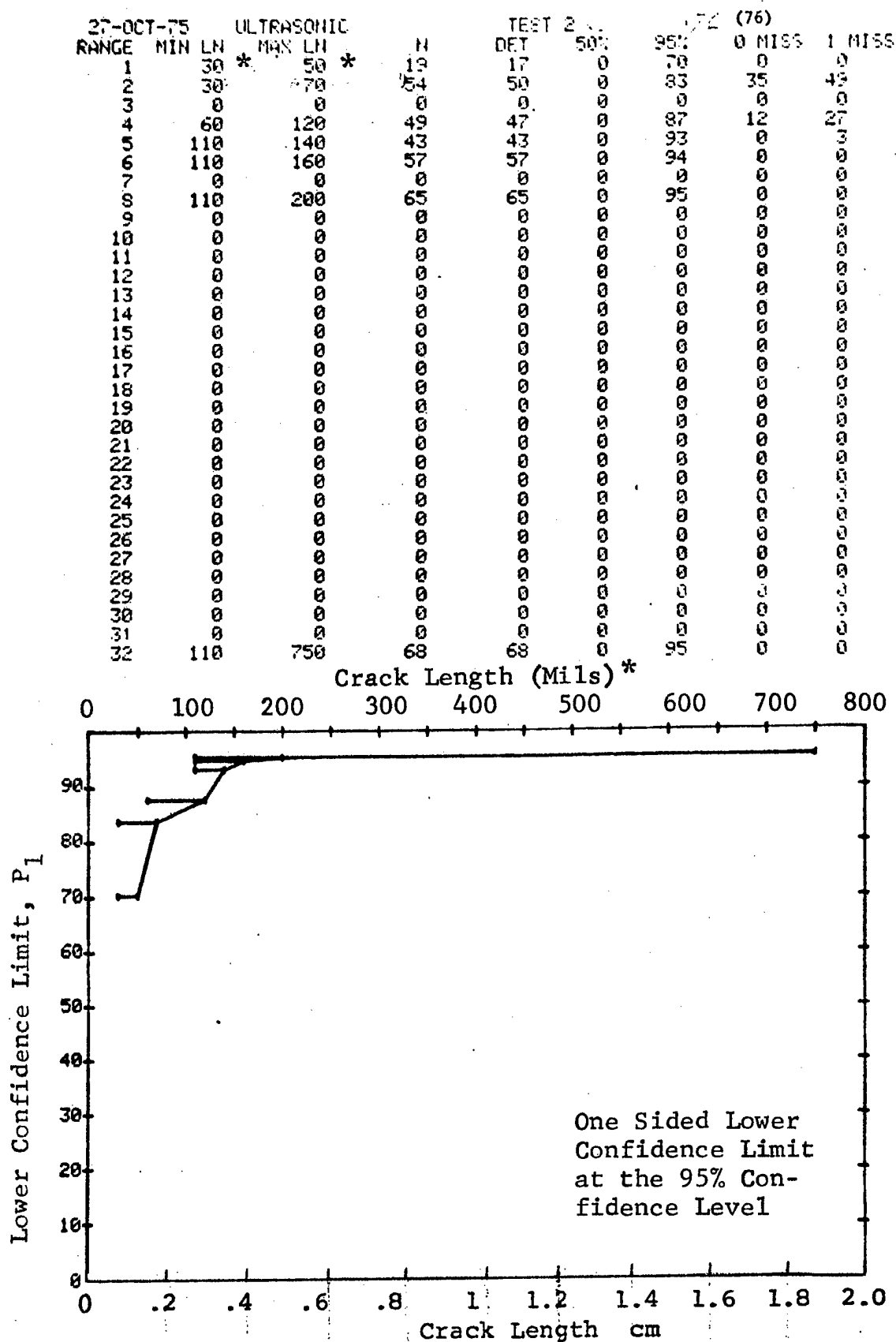


Figure D-76 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

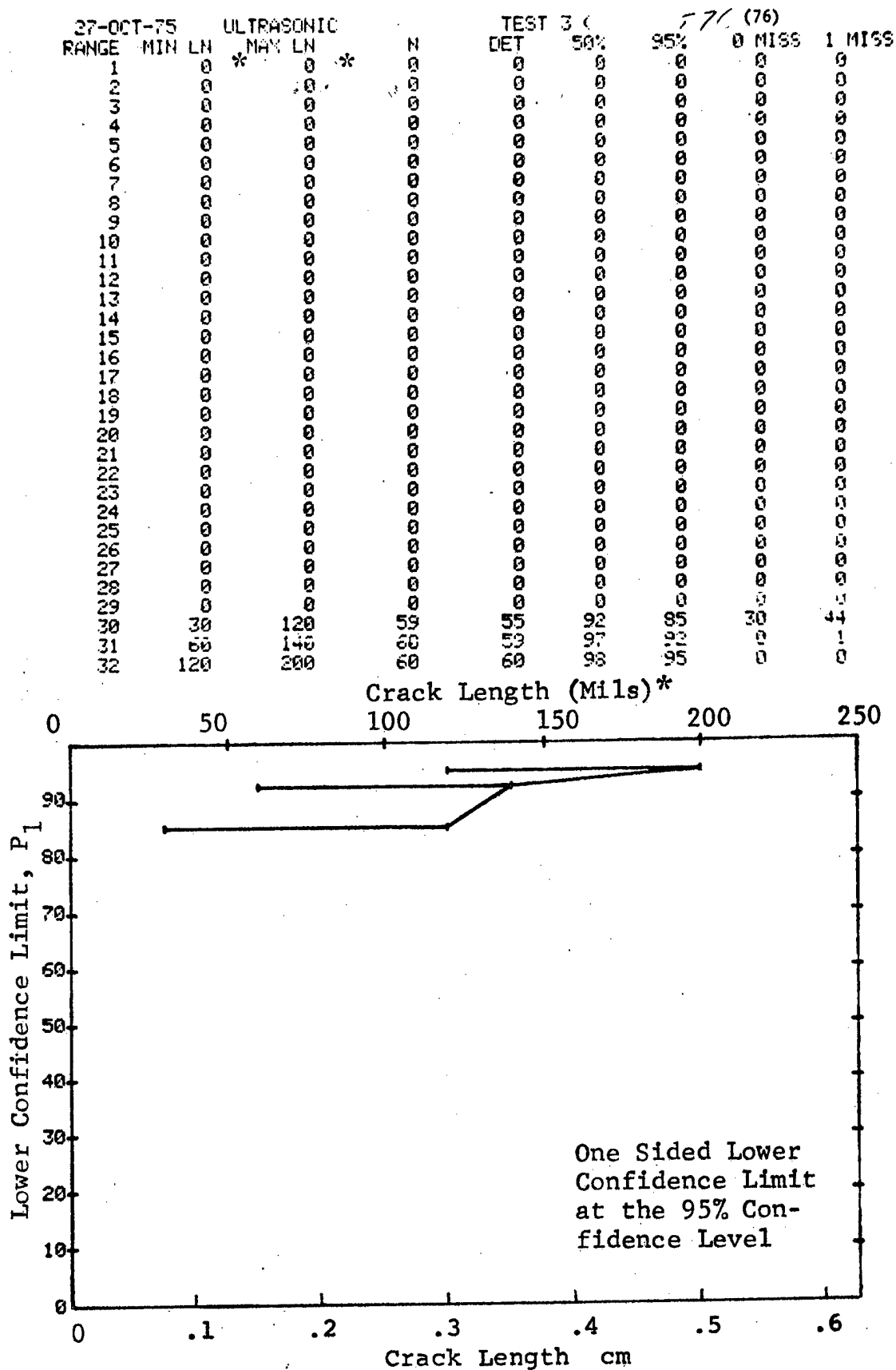


Figure D-76 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75			ULTRASONIC			TEST 1 (			77) (77)		
RANGE	MIN	LN	* MAX	LN	*	DET	50%	95%	0 MISS	1 MISS	
1		30		50		23	86	72	0	0	
2		60		70		39	93	85	20	35	
3		0		0		0	0	0	0	0	
4		110		120		18	96	84	11	28	
5		130		140		33	97	91	0	13	
6		150		160		13	94	79	16	33	
7		0		0		0	0	0	0	0	
8		200		200		11	93	76	18	35	
9		0		0		0	0	0	0	0	
10		0		0		0	0	0	0	0	
11		0		0		0	0	0	0	0	
12		0		0		0	0	0	0	0	
13		0		0		0	0	0	0	0	
14		0		0		0	0	0	0	0	
15		0		0		0	0	0	0	0	
16		0		0		0	0	0	0	0	
17		0		0		0	0	0	0	0	
18		0		0		0	0	0	0	0	
19		0		0		0	0	0	0	0	
20		0		0		0	0	0	0	0	
21		0		0		0	0	0	0	0	
22		0		0		0	0	0	0	0	
23		0		0		0	0	0	0	0	
24		0		0		0	0	0	0	0	
25		0		0		0	0	0	0	0	
26		0		0		0	0	0	0	0	
27		0		0		0	0	0	0	0	
28		0		0		0	0	0	0	0	
29		0		0		0	0	0	0	0	
30		0		0		0	0	0	0	0	
31		0		0		0	0	0	0	0	
32		750		750		2	70	22	0	0	

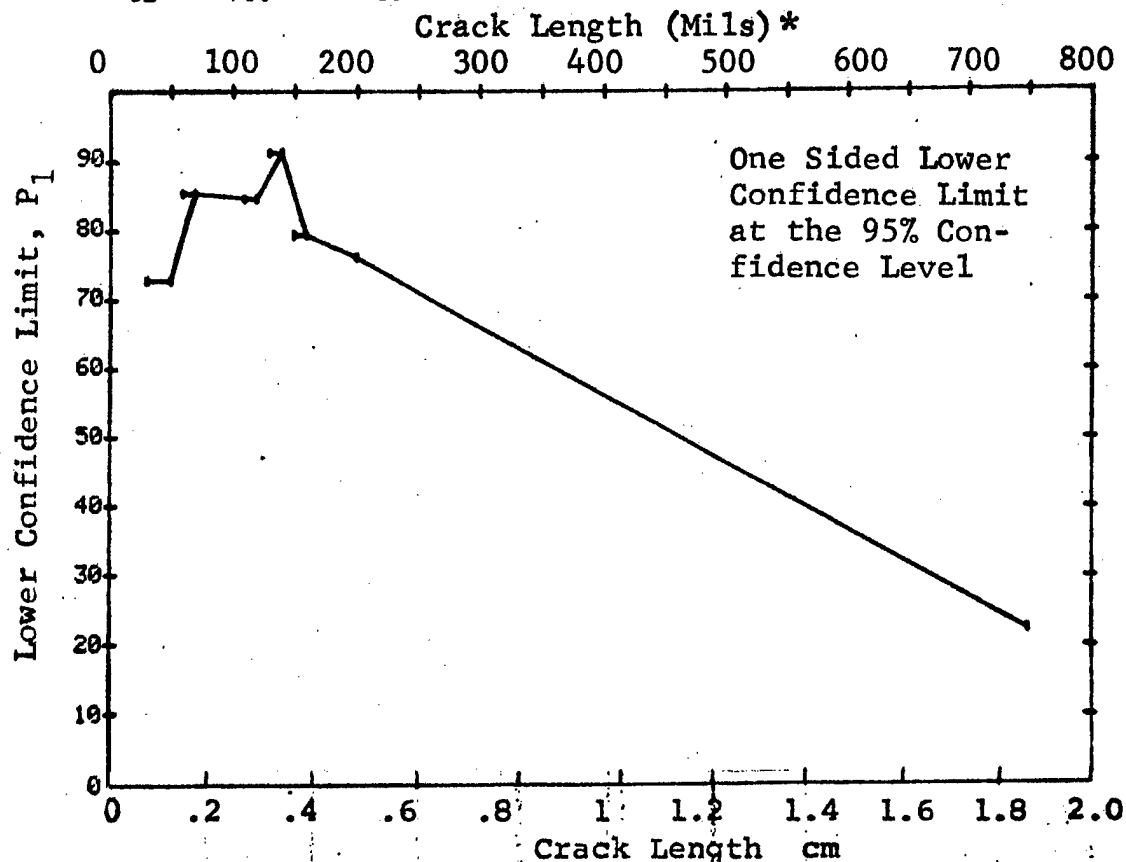


Figure D-77 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves, Compressed Notch Flaws in Filleted Solid Cylinder. Lab. Env. D-237

(b) Optimum Probability Method of Data Cumulation

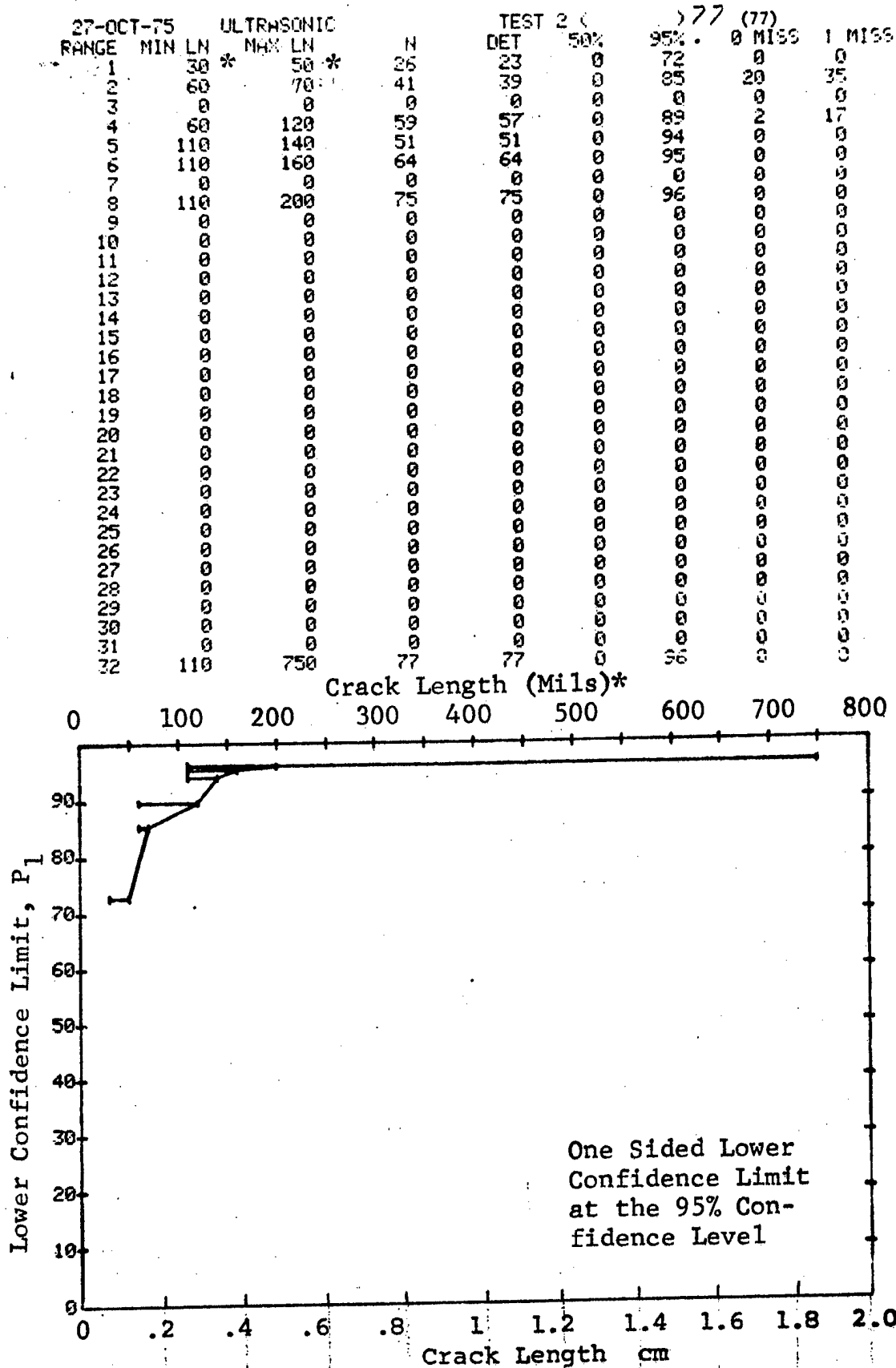


Figure D-77(Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

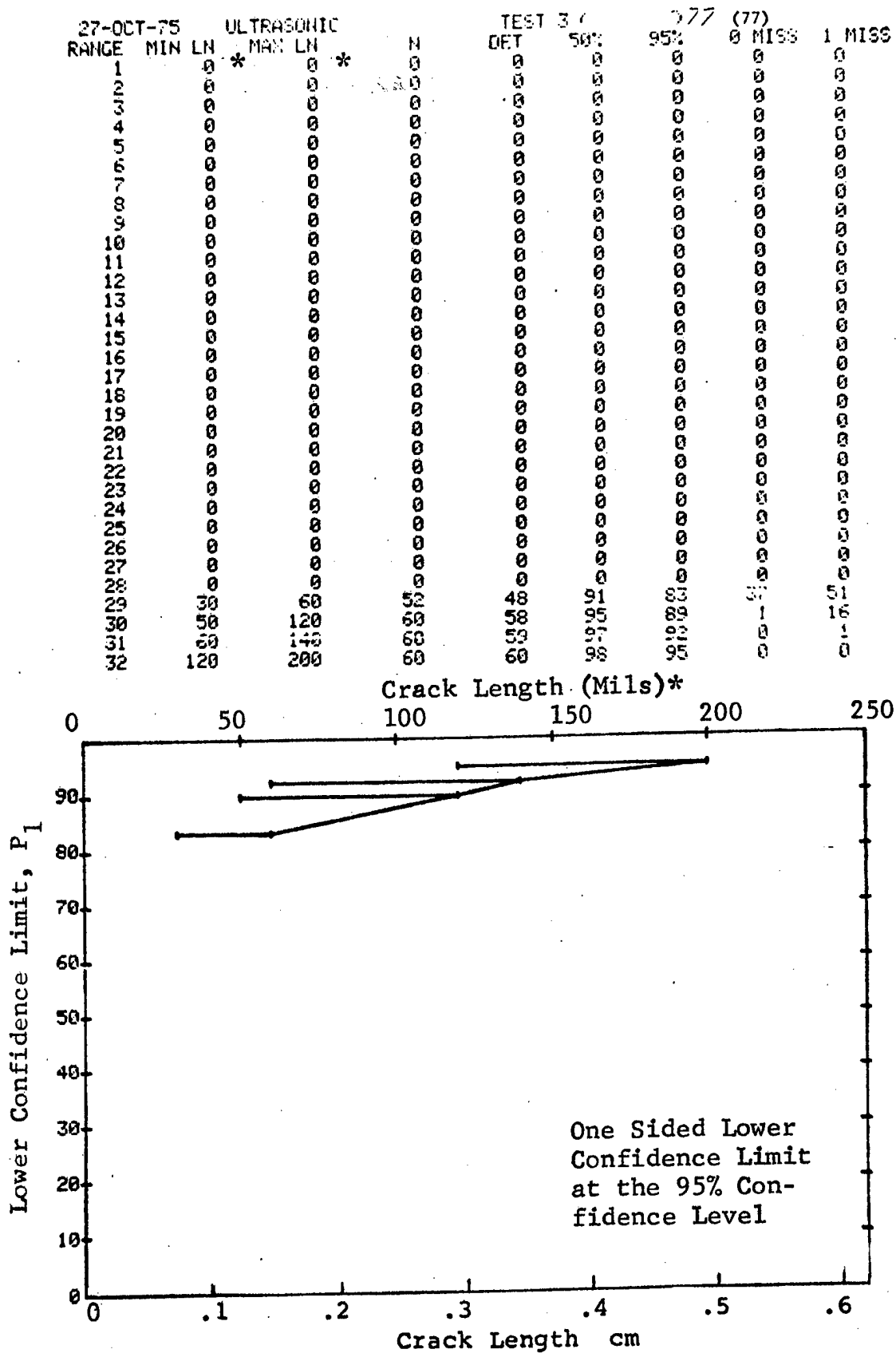


Figure D-77 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		ULTRASONIC		TEST 1			(78)		
RANGE	MIN	LN	MAX	LN	LET	50%	95%	0 MISS	1 MISS
1		20*		30 *	15	8	50	29	0
2		0		0	0	0	0	0	0
3		60		60	7	7	90	65	0
4		70		70	15	15	95	81	14
5		90		90	14	14	95	80	15
6		100		100	6	6	89	60	0
7		0		0	0	0	0	0	0
8		130		140	7	7	90	65	0
9		150		150	8	8	91	68	0
10		0		0	0	0	0	0	0
11		0		0	0	0	0	0	0
12		200		200	1	1	50	5	0
13		0		0	0	0	0	0	0
14		230		230	2	2	70	22	0
15		240		240	1	1	50	5	0
16		250		260	2	2	70	22	0
17		0		0	0	0	0	0	0
18		280		280	1	1	50	5	0
19		300		300	2	2	70	22	0
20		0		0	0	0	0	0	0
21		0		0	0	0	0	0	0
22		0		0	0	0	0	0	0
23		0		0	0	0	0	0	0
24		370		370	2	2	70	22	0
25		390		390	2	2	70	22	0
26		410		410	1	1	50	5	0
27		0		0	0	0	0	0	0
28		0		0	0	0	0	0	0
29		0		0	0	0	0	0	0
30		0		0	0	0	0	0	0
31		0		0	0	0	0	0	0
32		500		500	1	1	50	5	0

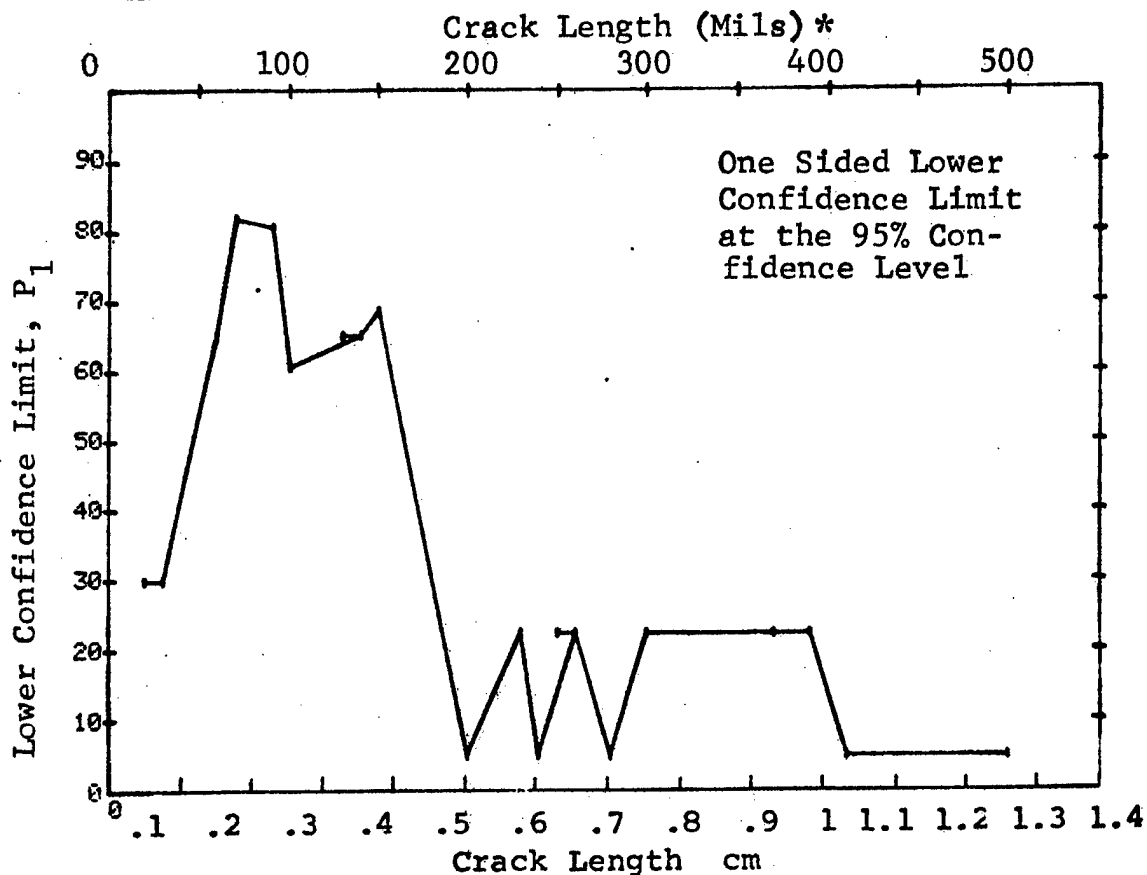


Figure D-78 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Filleted Solid Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		ULTRASONIC		N	TEST 2		95%	(78)	
RANGE	MIN	LN *	MAX LN *		DET	50%		0 MISS	1 MISS
1	20	30	30	15	8	0	29	0	0
2	0	0	0	0	0	0	0	0	0
3	60	60	60	7	7	0	65	0	0
4	60	70	70	22	22	0	87	7	24
5	60	90	90	36	36	0	92	0	10
6	60	100	100	42	42	0	93	0	4
7	0	0	0	0	0	0	0	0	0
8	60	140	140	49	49	0	94	0	0
9	60	150	150	57	57	0	94	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	60	200	200	58	58	0	94	0	0
13	0	0	0	0	0	0	0	0	0
14	60	230	230	60	60	0	95	0	0
15	60	240	240	61	61	0	95	0	0
16	60	260	260	63	63	0	95	0	0
17	0	0	0	0	0	0	0	0	0
18	60	280	280	64	64	0	95	0	0
19	60	300	300	66	66	0	95	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	60	370	370	68	68	0	95	0	0
25	60	390	390	70	70	0	95	0	0
26	60	410	410	71	71	0	95	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	60	500	500	72	72	0	95	0	0

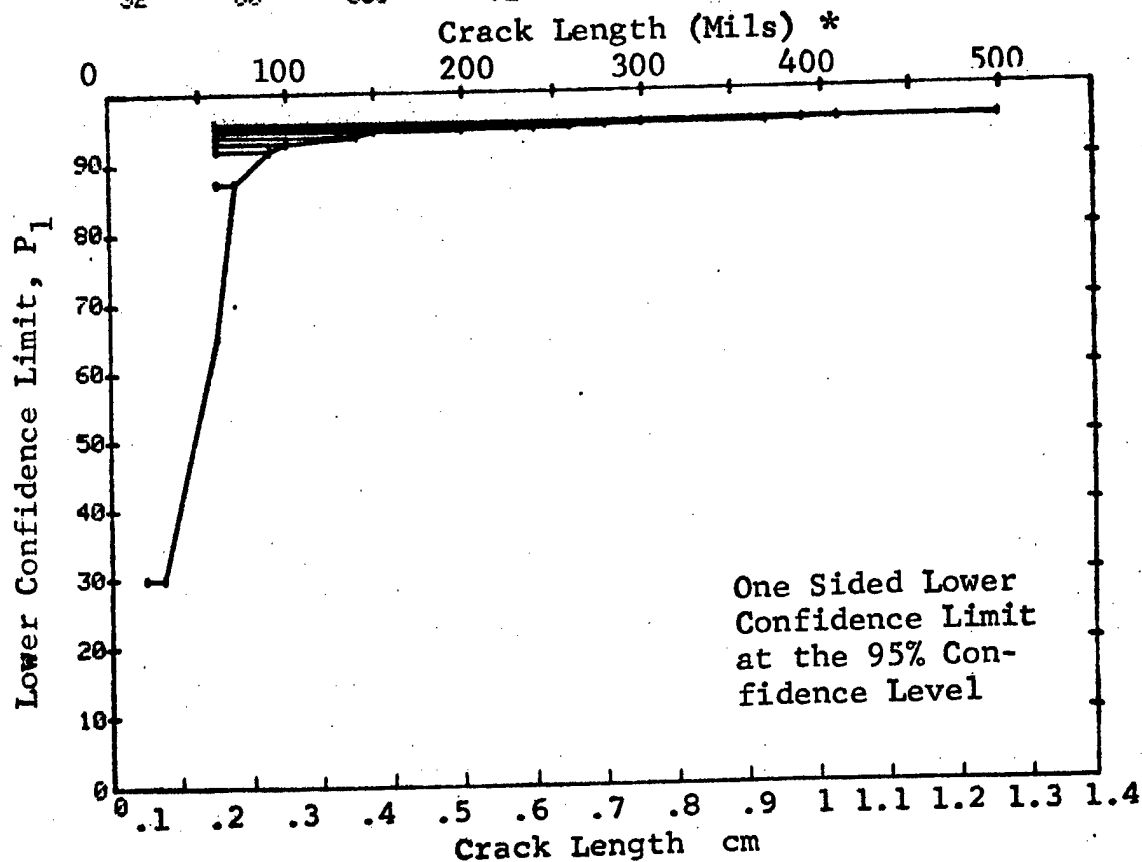


Figure D-78 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

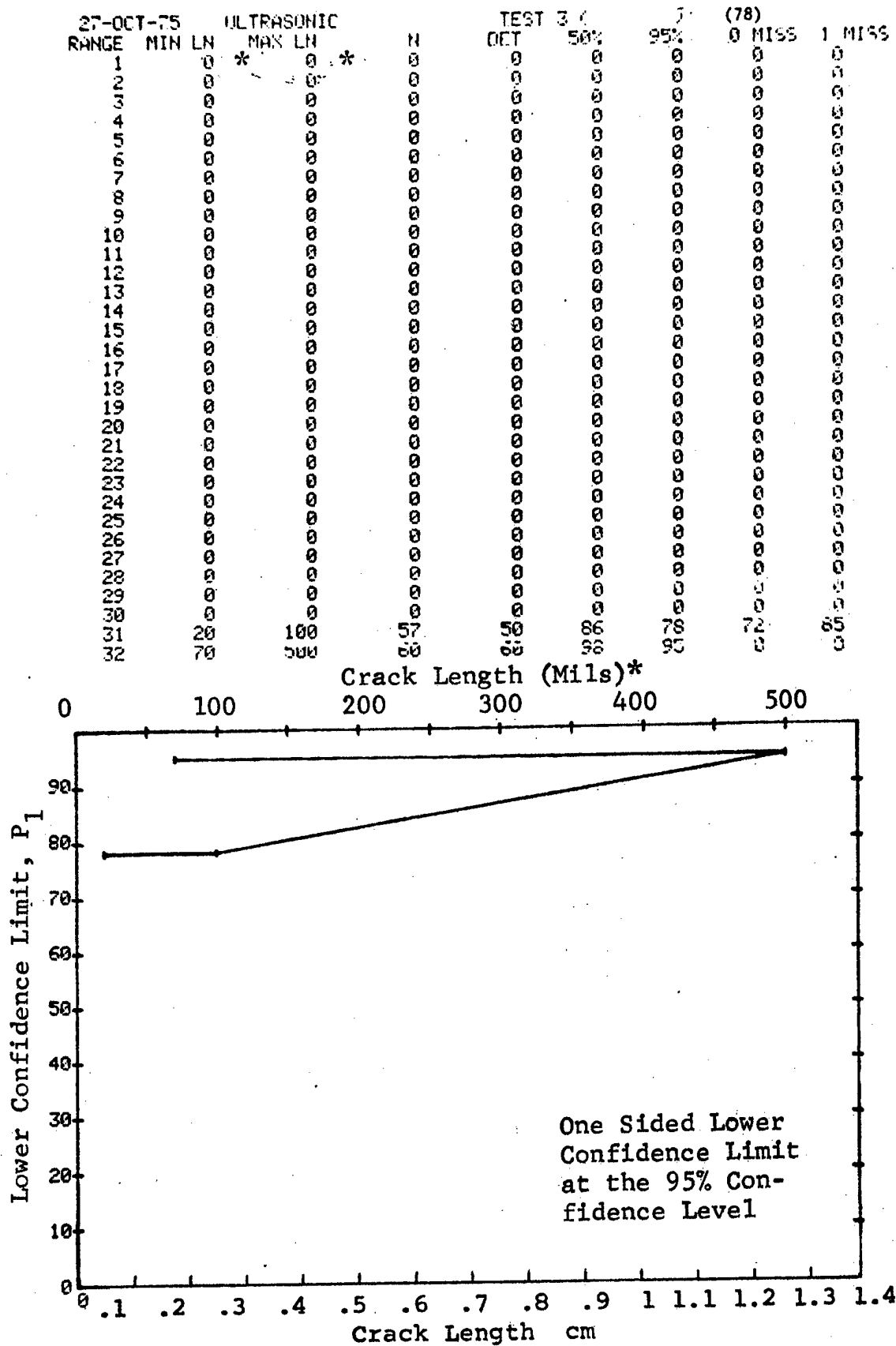


Figure D-78 (Concluded)

(a) Range Interval Method of Data Cumulation

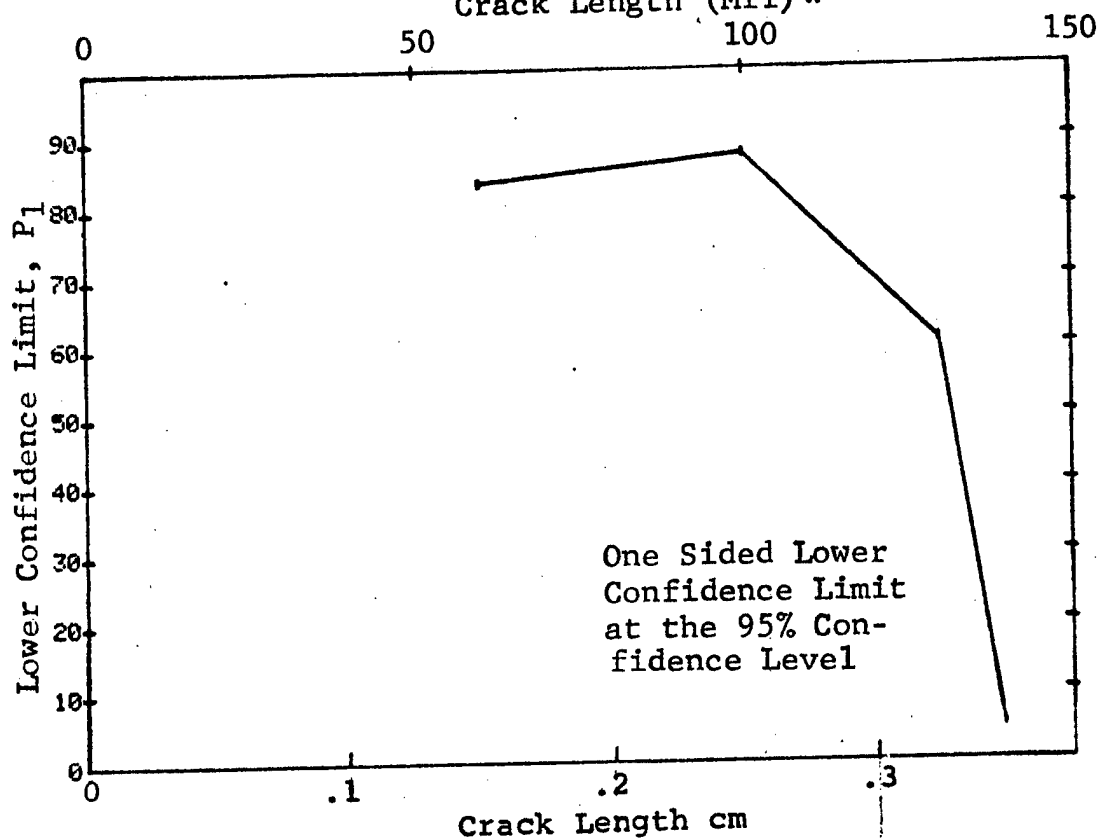
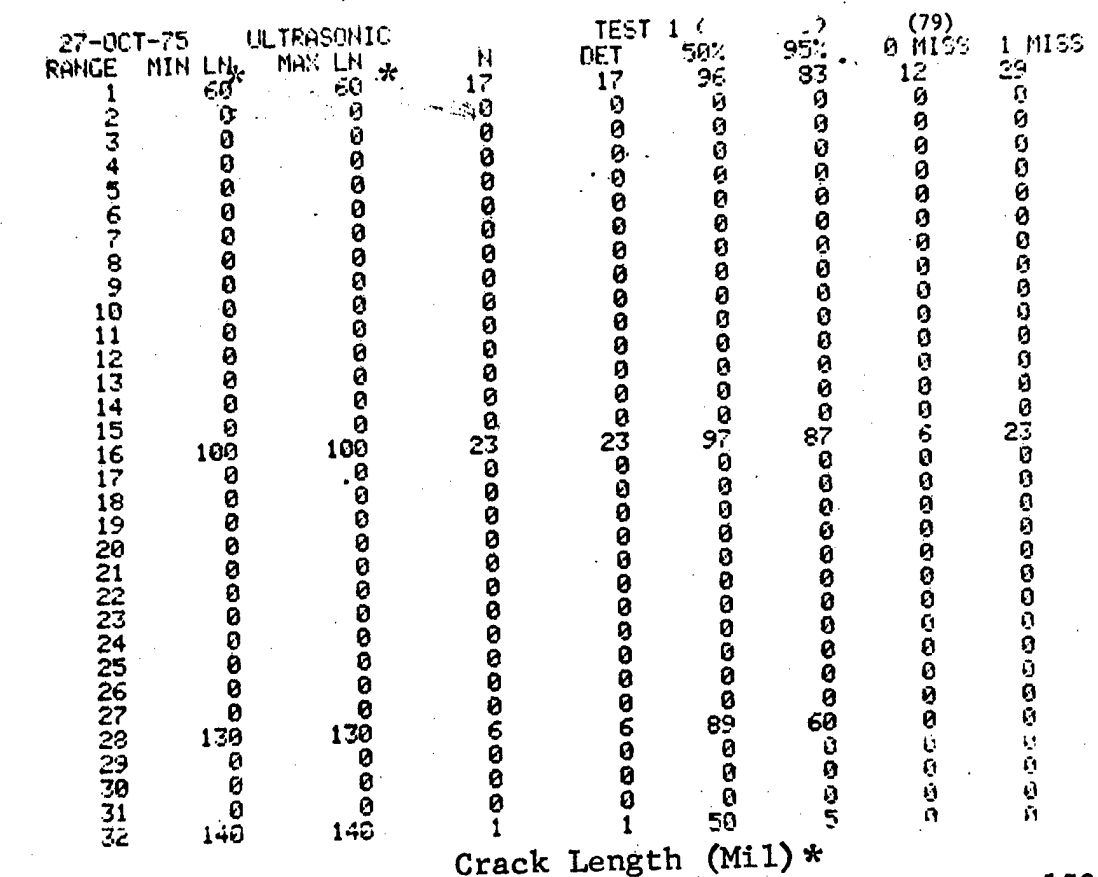


Figure D-79 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Hollow Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

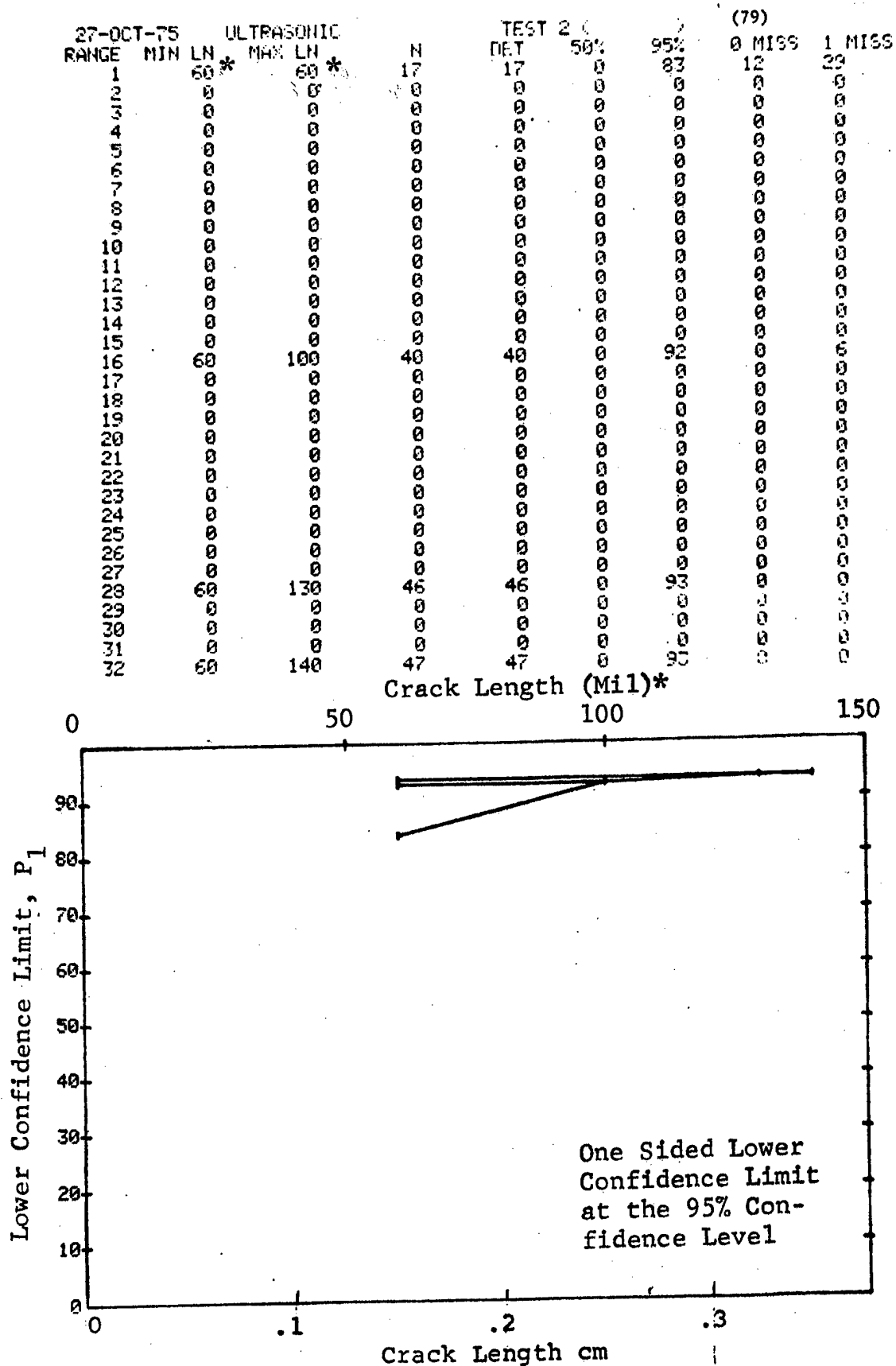


Figure D-79 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

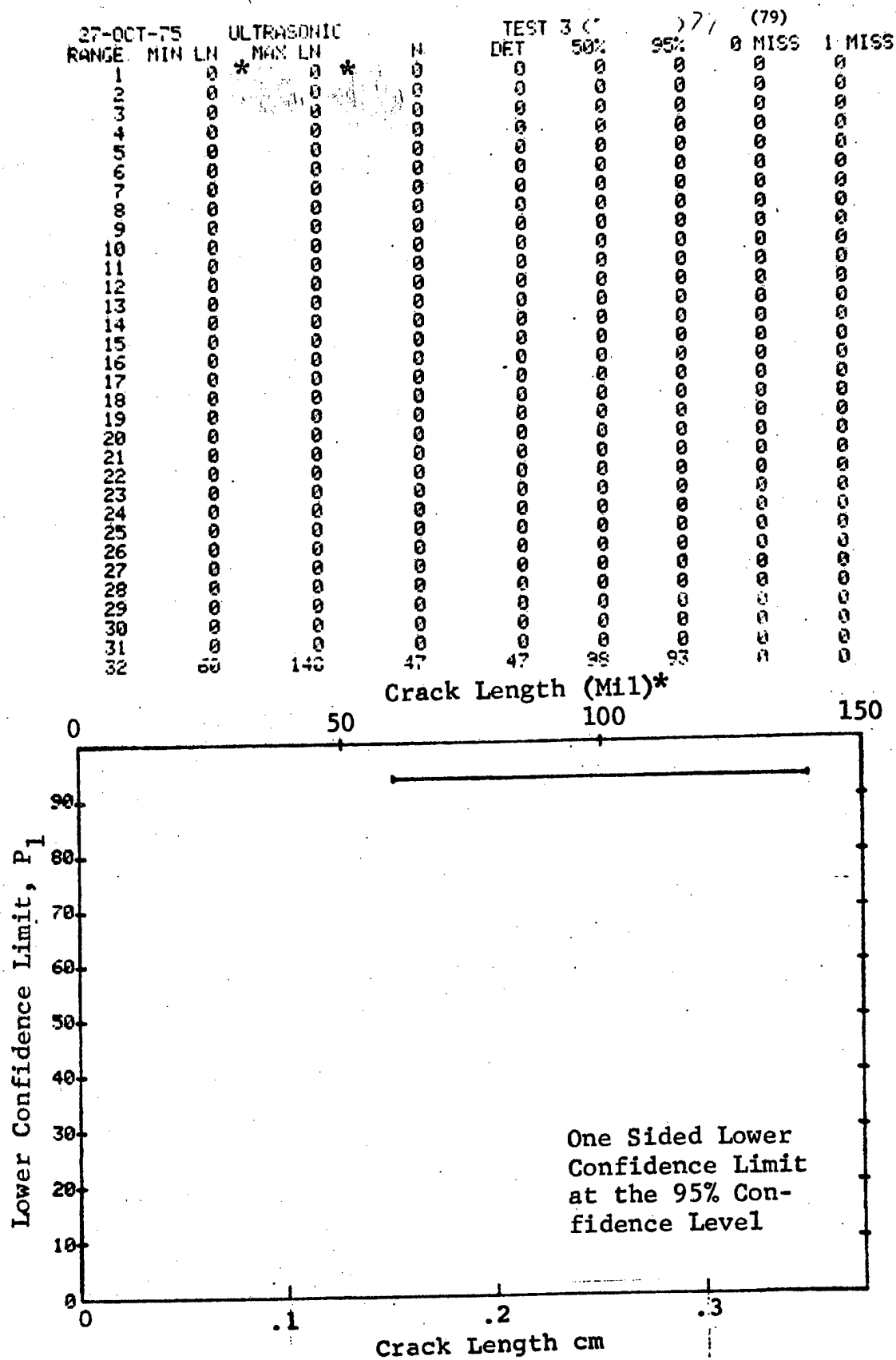


Figure D-79 (Concluded)

(a) Range Interval Method of Data Cumulation

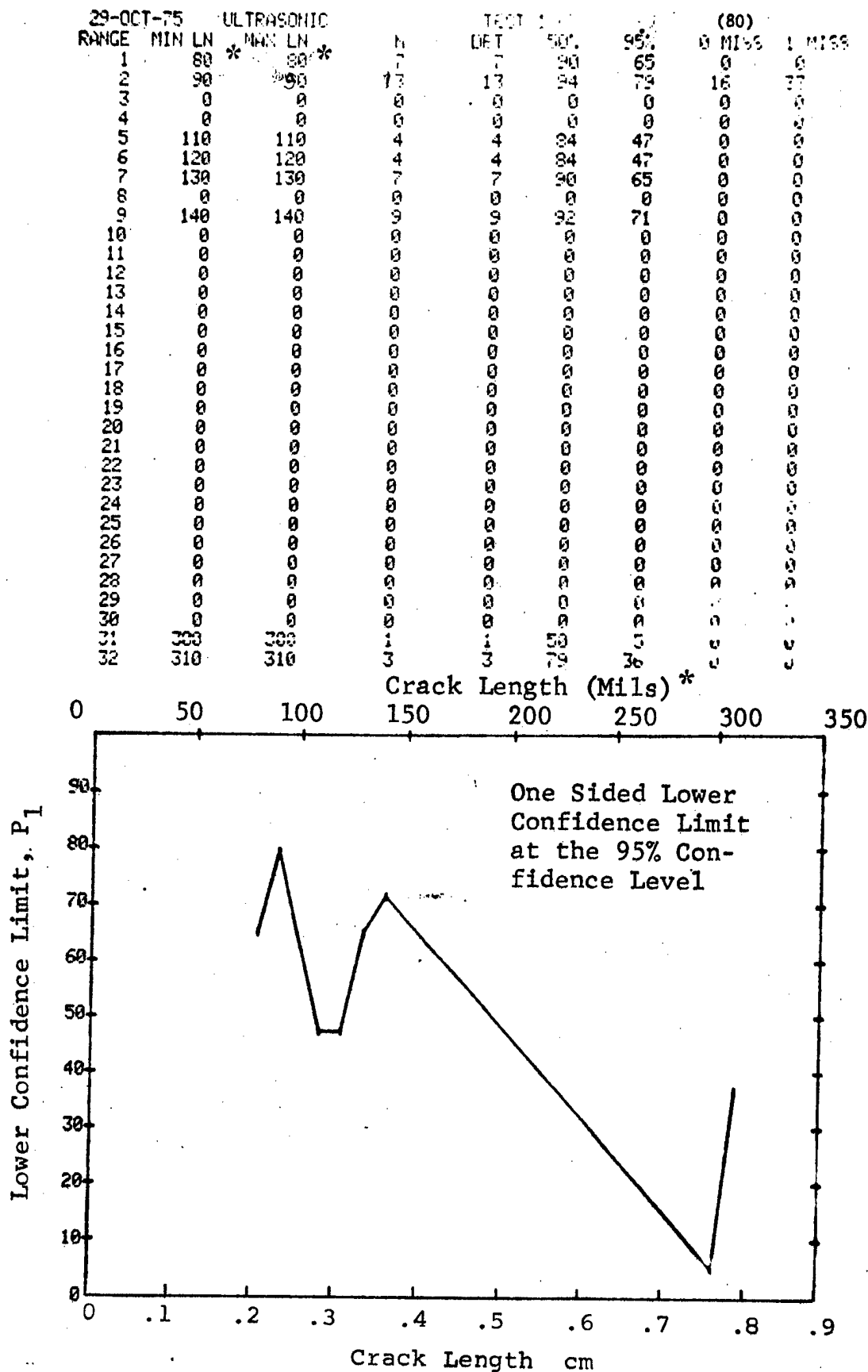


Figure D-80 Probability of Detection for 4340M Steel Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Filleted Hollow Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

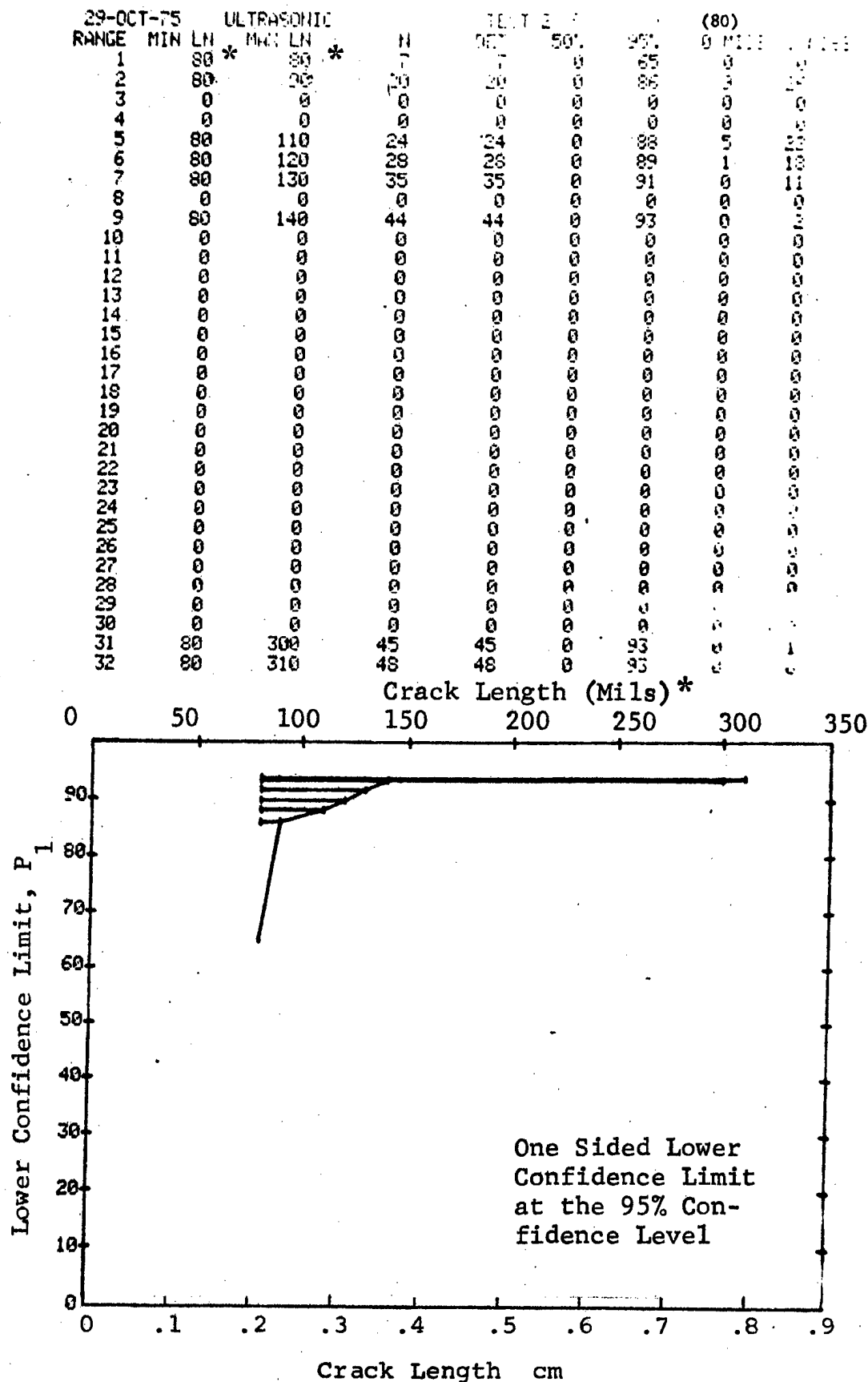


Figure D-80 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

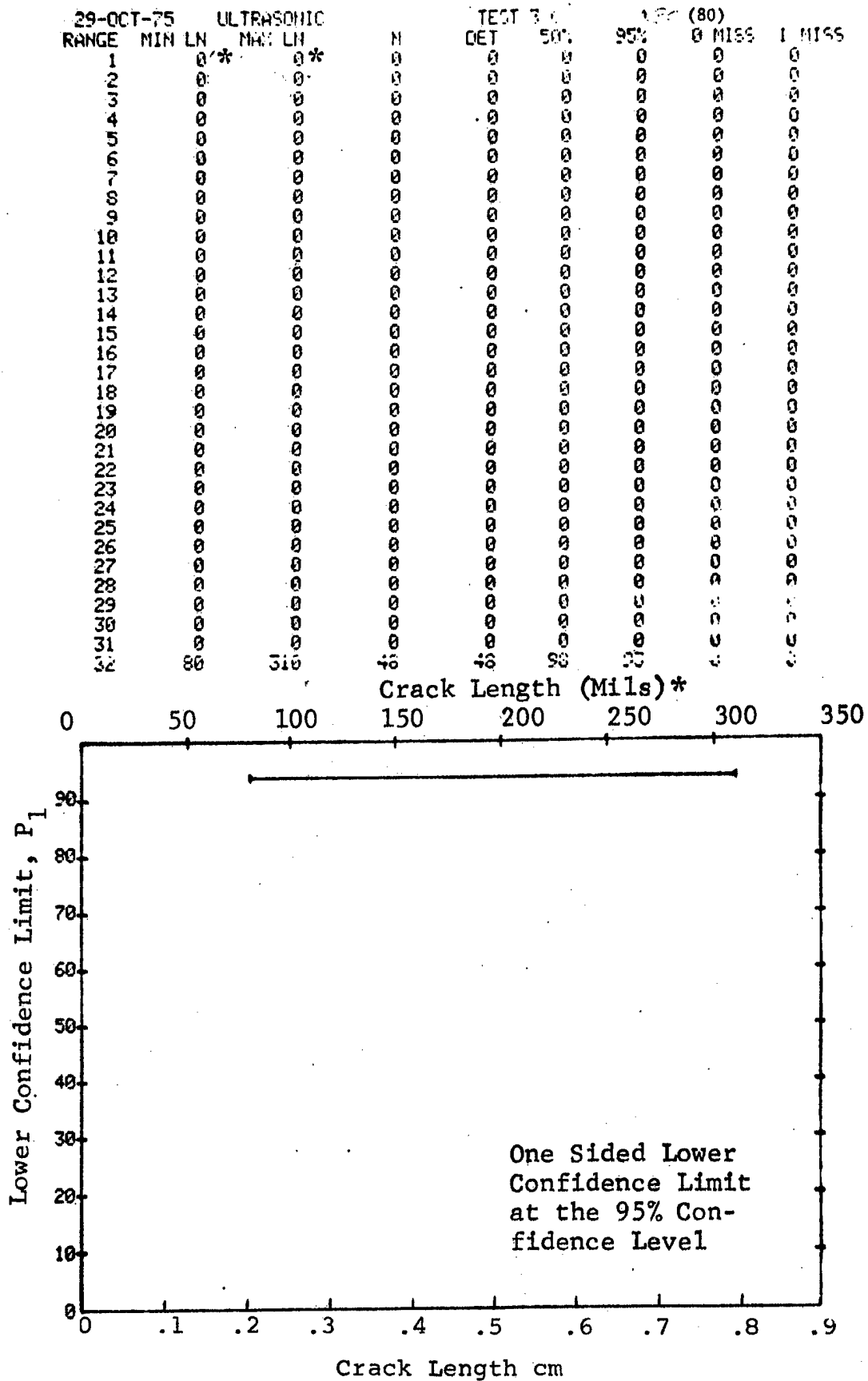


Figure D-80 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75	ULTRASONIC		TEST 1 (		) / (81)			
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	10	10*	6	4	57	27	0	0
2	0	0	0	0	0	0	0	0
3	30	30	3	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	40	40	11	8	67	43	0	0
6	50	50	21	11	50	32	0	0
7	0	0	0	0	0	0	0	0
8	60	60	11	7	58	34	0	0
9	70	70	6	6	89	60	0	0
10	0	0	0	0	0	0	0	0
11	80	80	7	7	90	65	0	0
12	90	90	13	10	72	50	0	0
13	0	0	0	0	0	0	0	0
14	100	100	9	9	92	71	0	0
15	110	110	22	19	83	68	0	0
16	120	120	2	1	29	2	0	0
17	0	0	0	0	0	0	0	0
18	130	130	9	9	92	71	0	0
19	140	140	10	8	74	49	0	0
20	0	0	0	0	0	0	0	0
21	150	150	21	21	96	86	8	25
22	160	160	4	4	84	47	0	0
23	0	0	0	0	0	0	0	0
24	170	170	8	8	91	68	0	0
25	180	180	12	12	94	77	17	34
26	0	0	0	0	0	0	0	0
27	190	190	5	5	87	54	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	210	210	1	1	50	5	0	0
31	220	220	2	2	70	22	0	0
32	230	230	11	9	76	52	0	0

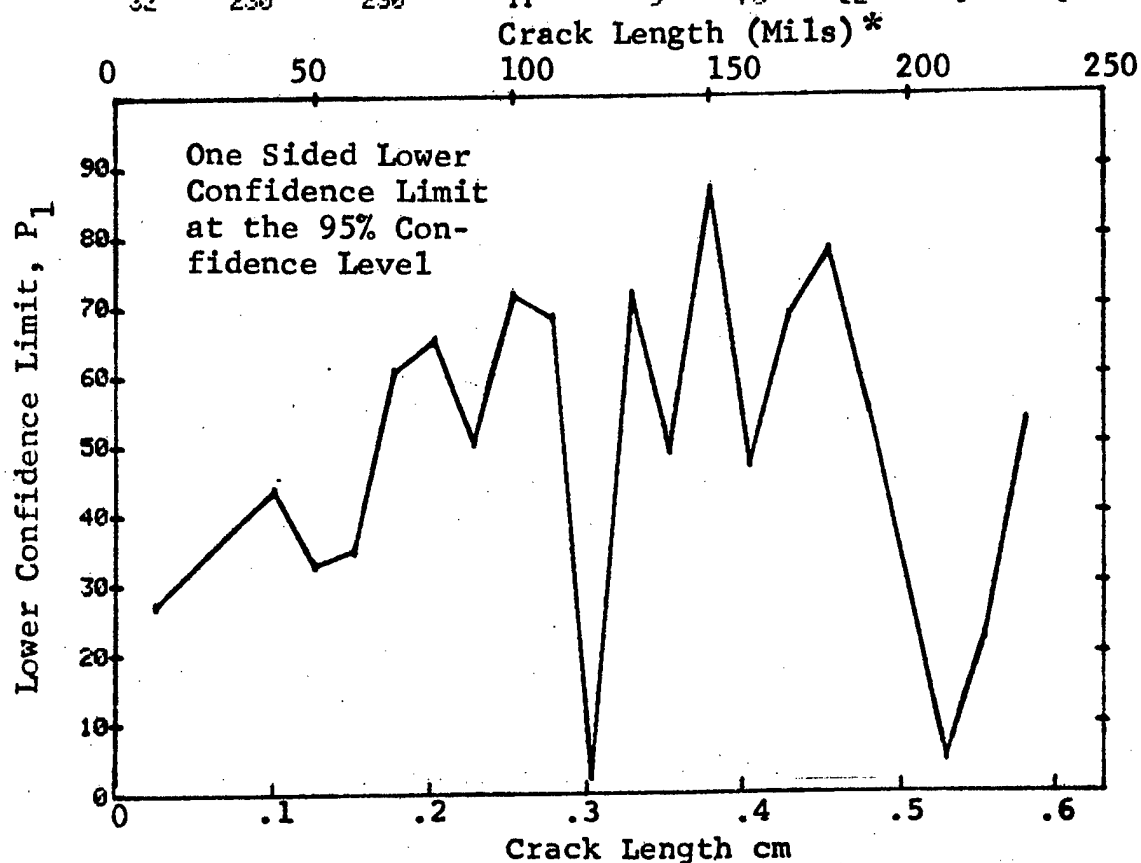


Figure D-81 Probability of Detection for 2024-T6 Al Using Ultrasonic Shear and Surface Waves. Compressed Notch Flaws in Tandem T Specimen. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		ULTRASONIC		N	TEST 2 ()		(81)		MISS
RANGE	MIN LN	MAX LN	10*--		DEF	50%	95%	0 MISS	
1	10*	10*	10*	6	4	0	27	0	0
2	0	0	0	0	0	0	0	0	0
3	10	30	0	9	4	0	16	0	0
4	0	0	0	0	0	0	0	0	0
5	40	40	0	11	8	0	43	0	0
6	40	50	0	32	19	0	43	0	0
7	0	0	0	0	0	0	0	0	0
8	40	60	0	43	26	0	46	0	0
9	70	70	0	6	6	0	60	0	0
10	0	0	0	0	0	0	0	0	0
11	70	80	0	13	13	0	79	0	0
12	70	90	0	26	23	0	72	0	0
13	0	0	0	0	0	0	0	0	0
14	70	100	0	35	32	0	79	0	0
15	70	110	0	57	51	0	80	59	72
16	70	120	0	59	52	0	78	0	0
17	0	0	0	0	0	0	0	0	0
18	70	130	0	68	61	0	81	61	74
19	70	140	0	78	69	0	80	76	89
20	0	0	0	0	0	0	0	0	0
21	150	150	0	21	21	0	86	8	25
22	150	160	0	25	25	0	88	4	21
23	0	0	0	0	0	0	0	0	0
24	150	170	0	33	33	0	91	0	13
25	150	180	0	45	45	0	93	0	1
26	0	0	0	0	0	0	0	0	0
27	150	190	0	50	50	0	94	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	150	210	0	51	51	0	94	0	0
31	150	220	0	53	53	0	94	0	0
32	150	230	0	64	62	0	90	0	12

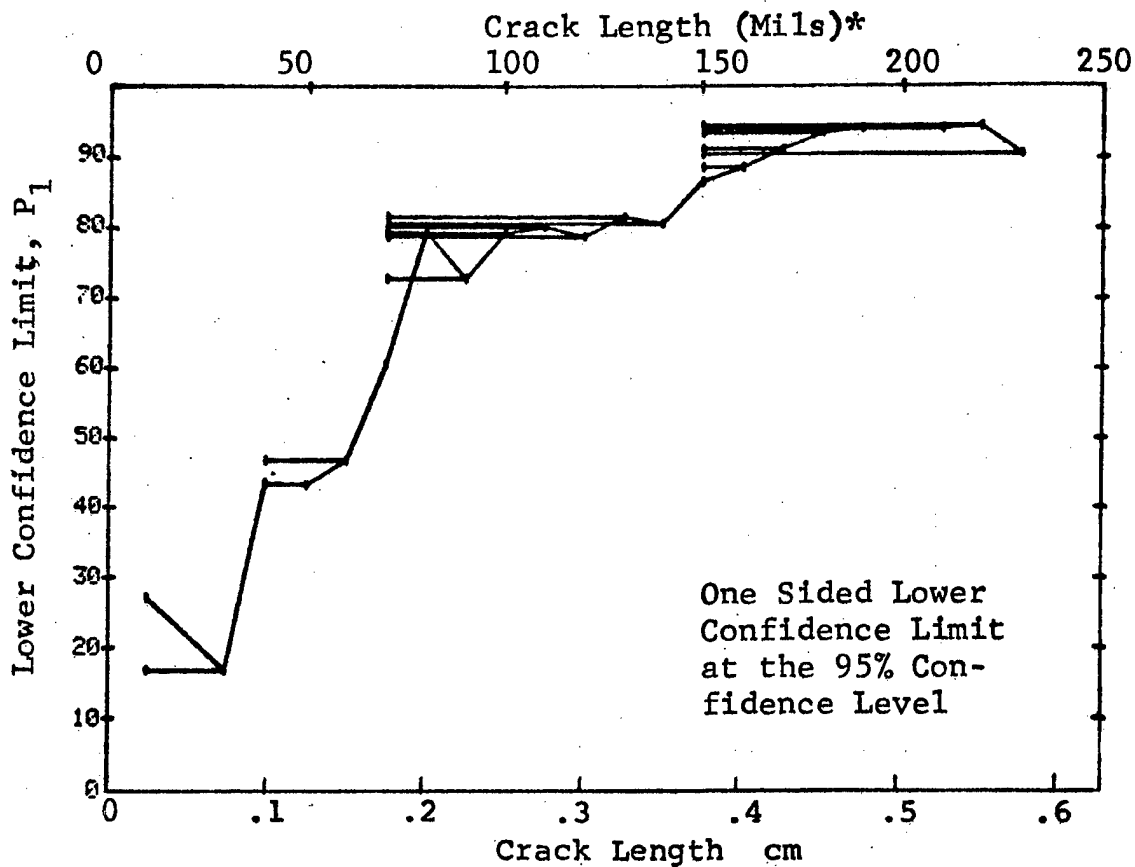


Figure D-81 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

27-OCT-75	ULTRASONIC		TEST 3 ()			(81)	
RANGE	MIN LN	MAX LN	DET	50%	95%	0 MISS	1 MISS
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	10	60	23	51	38	0	0
28	40	90	43	70	60	0	0
29	60	110	53	87	72	0	0
30	90	150	54	88	81	0	0
31	110	180	57	93	87	1	0
32	150	230	58	95	89	1	0

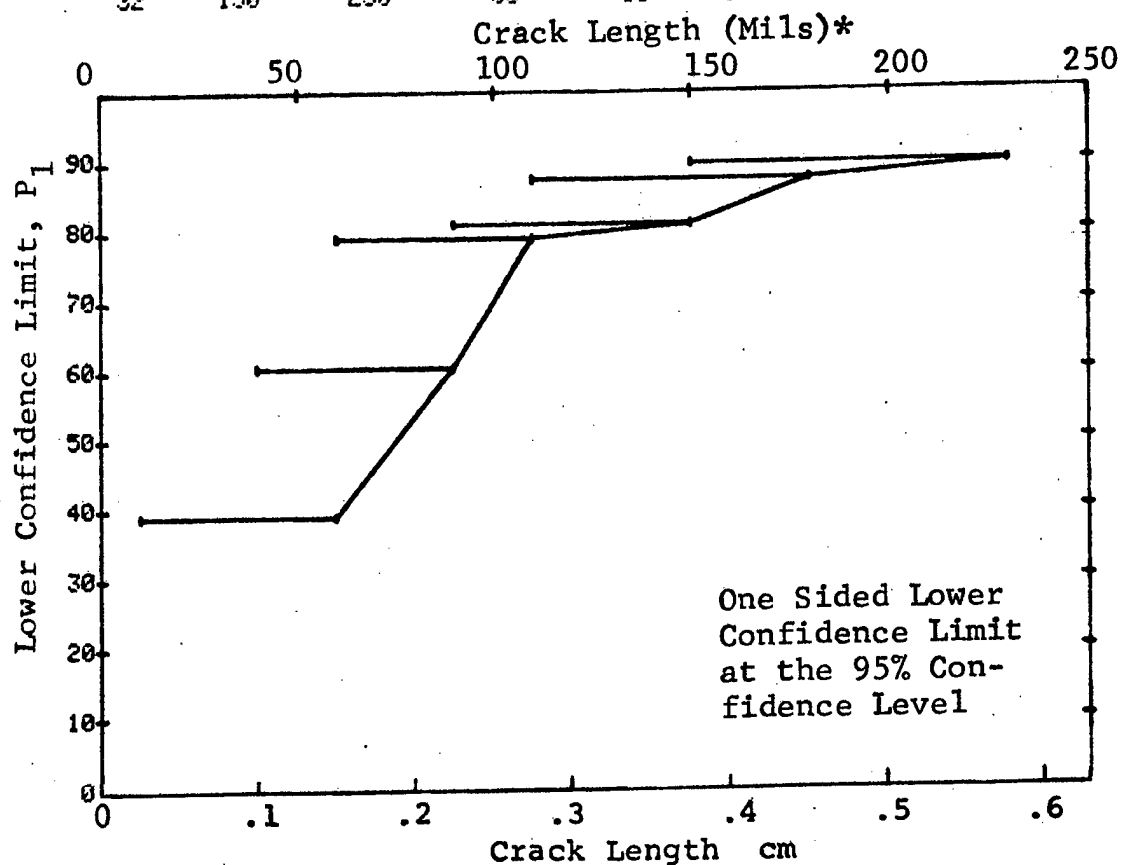


Figure D-81 (Concluded)

(a) Range Interval Method of Data Cumulation

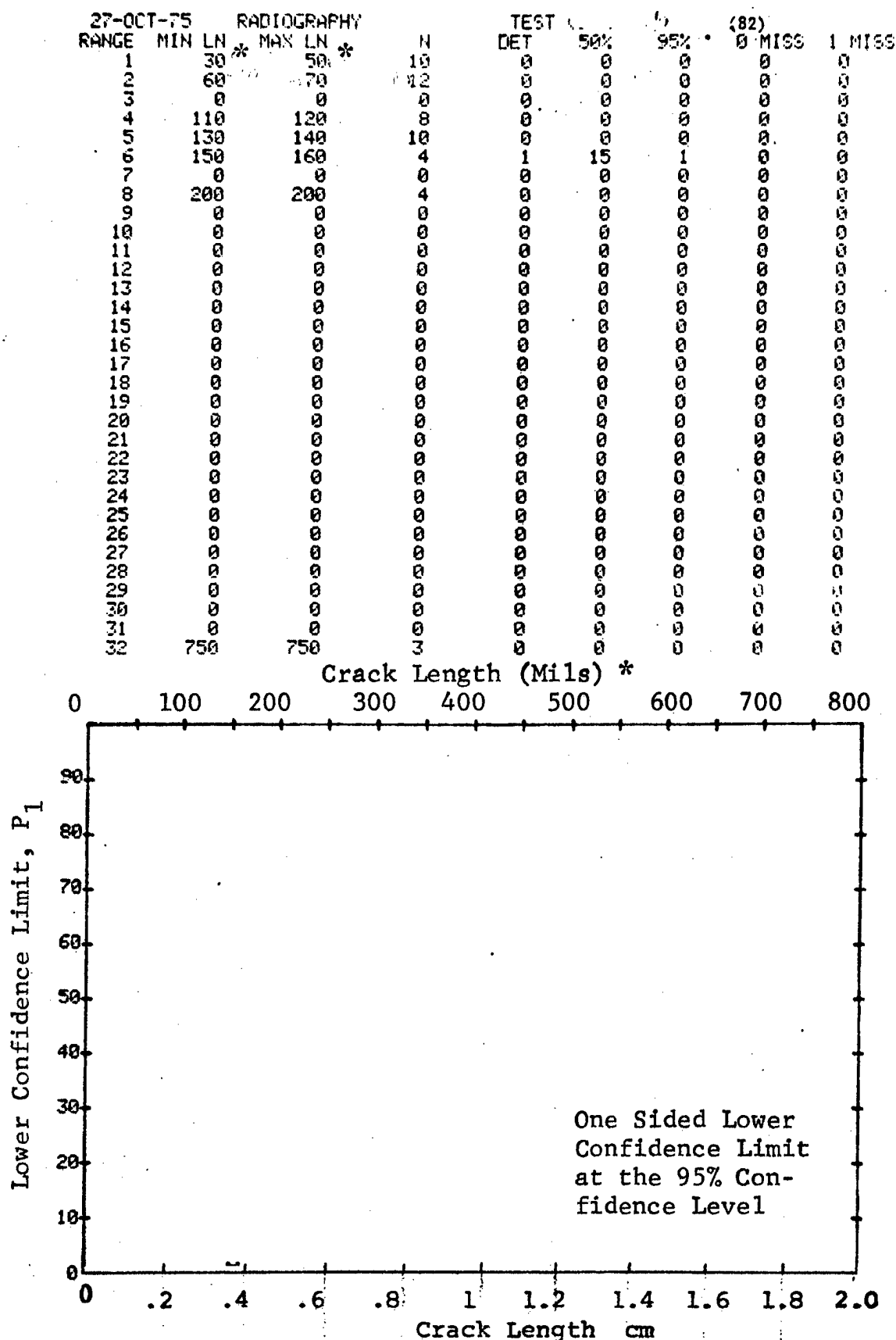


Figure D-82 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Solid Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		RADIOGRAPHY		N	TEST 2 (		) 72 (82)		0 MISS	1 MISS
RANGE	MIN LN	* MAX LN			DET	50%	95%			
1	30	50*	10	0	0	0	0	0	0	0
2	60	70	12	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	110	120	8	0	0	0	0	0	0	0
5	130	140	10	0	0	0	0	0	0	0
6	150	160	4	1	0	0	1	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	150	200	8	1	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	150	750	11	1	0	0	0	0	0	0

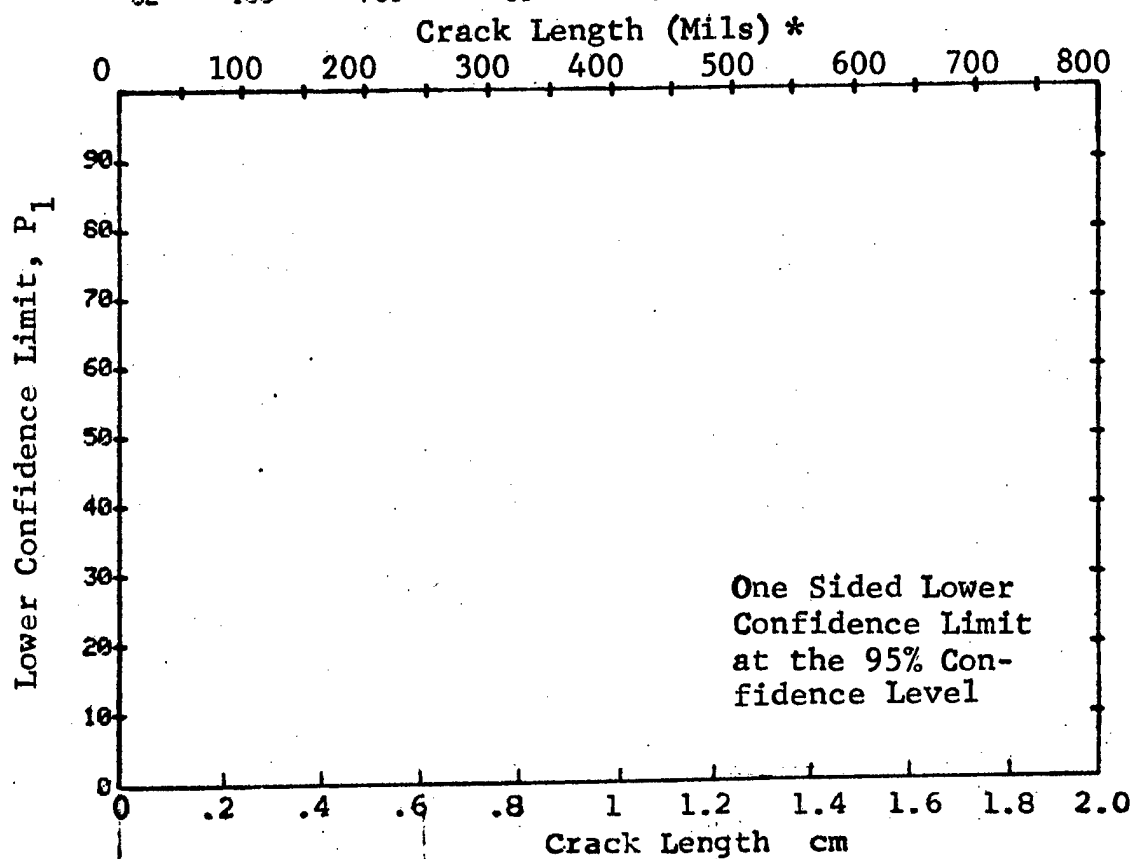


Figure D-82 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

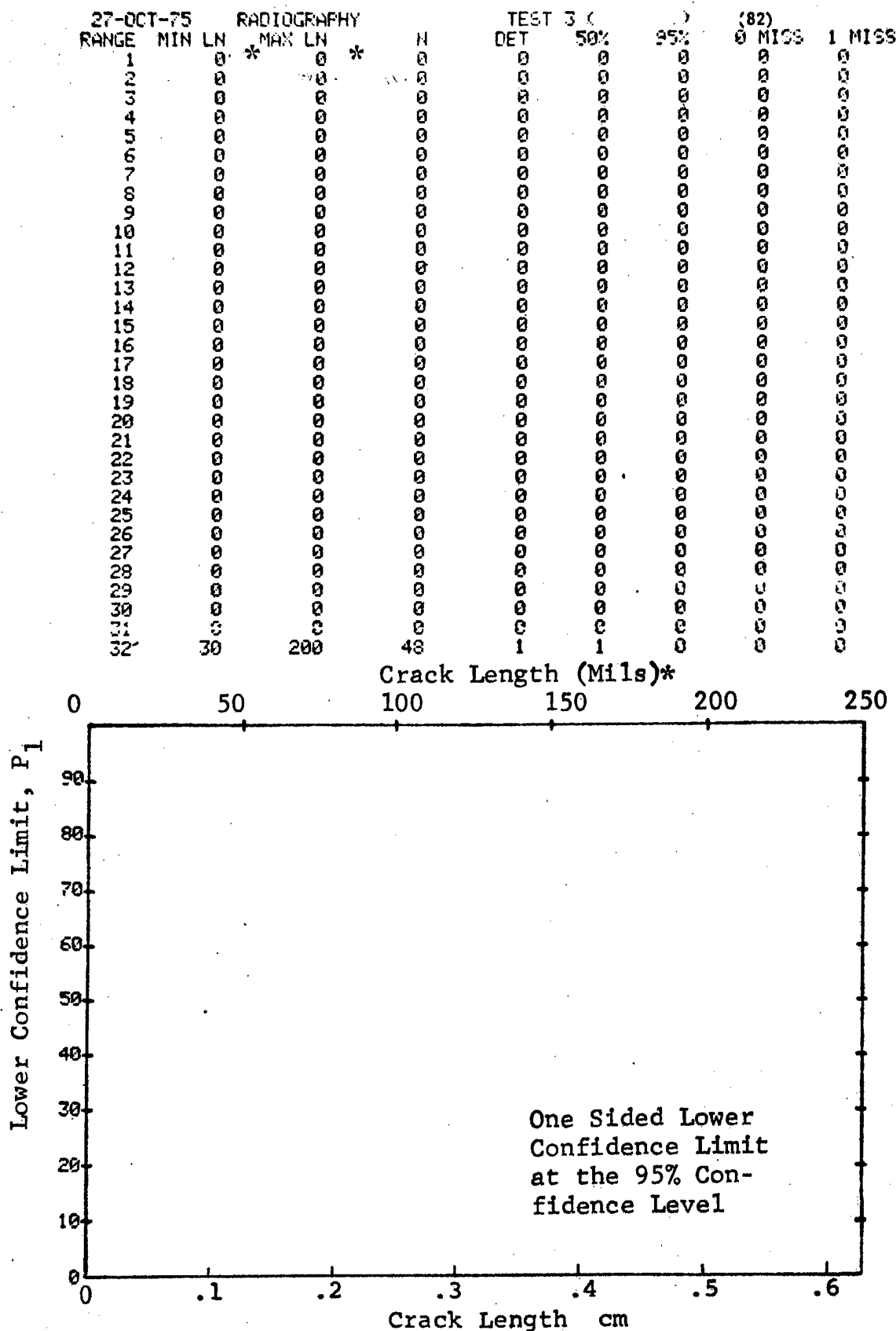


Figure D-82 (Concluded)

(a) Range Interval Method of Data Cumulation

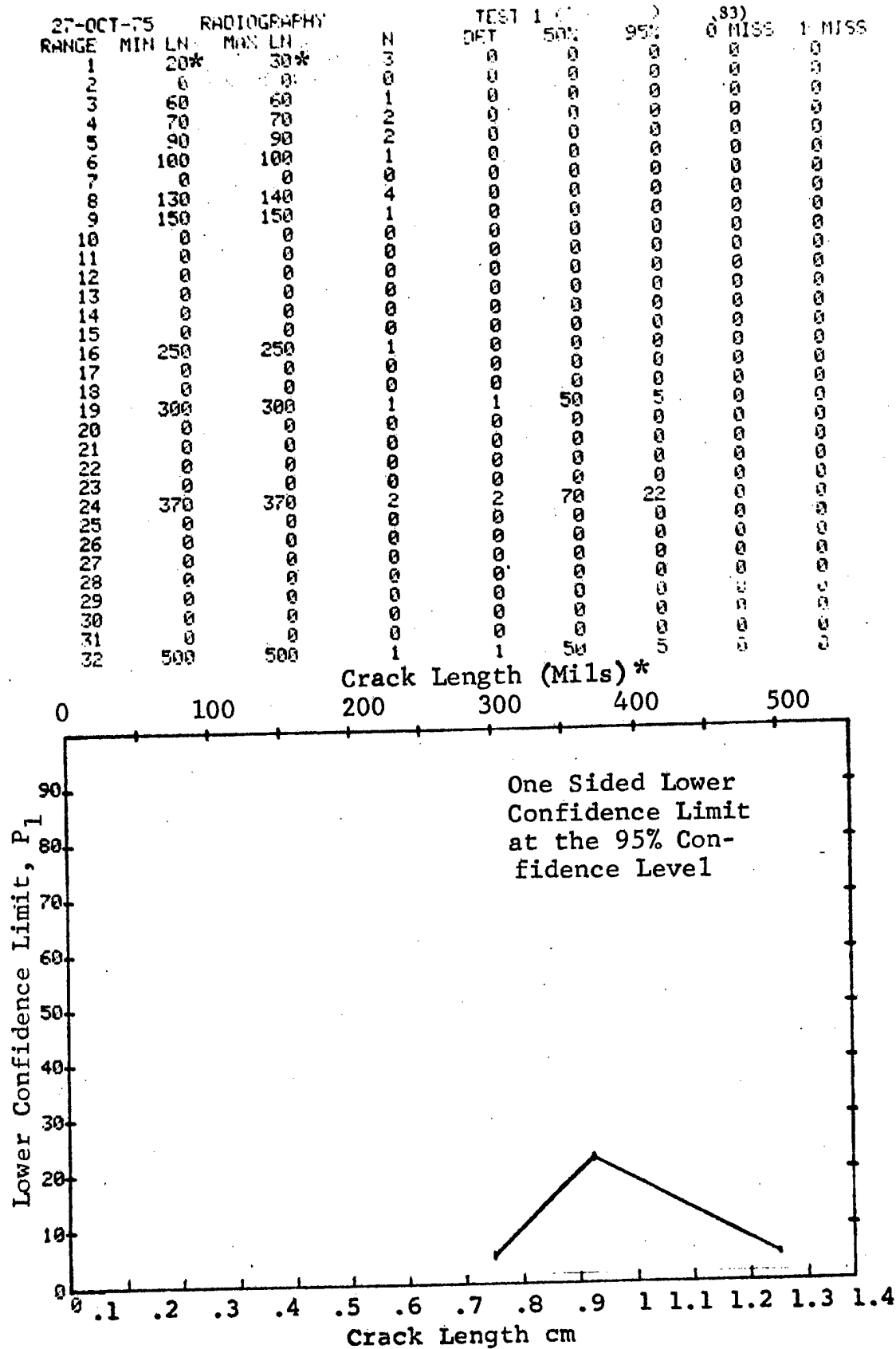


Figure D-83 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Filleted Solid Cylinder. D-255 Prod. Env.

(b) Optimum Probability Method of Data Cumulation

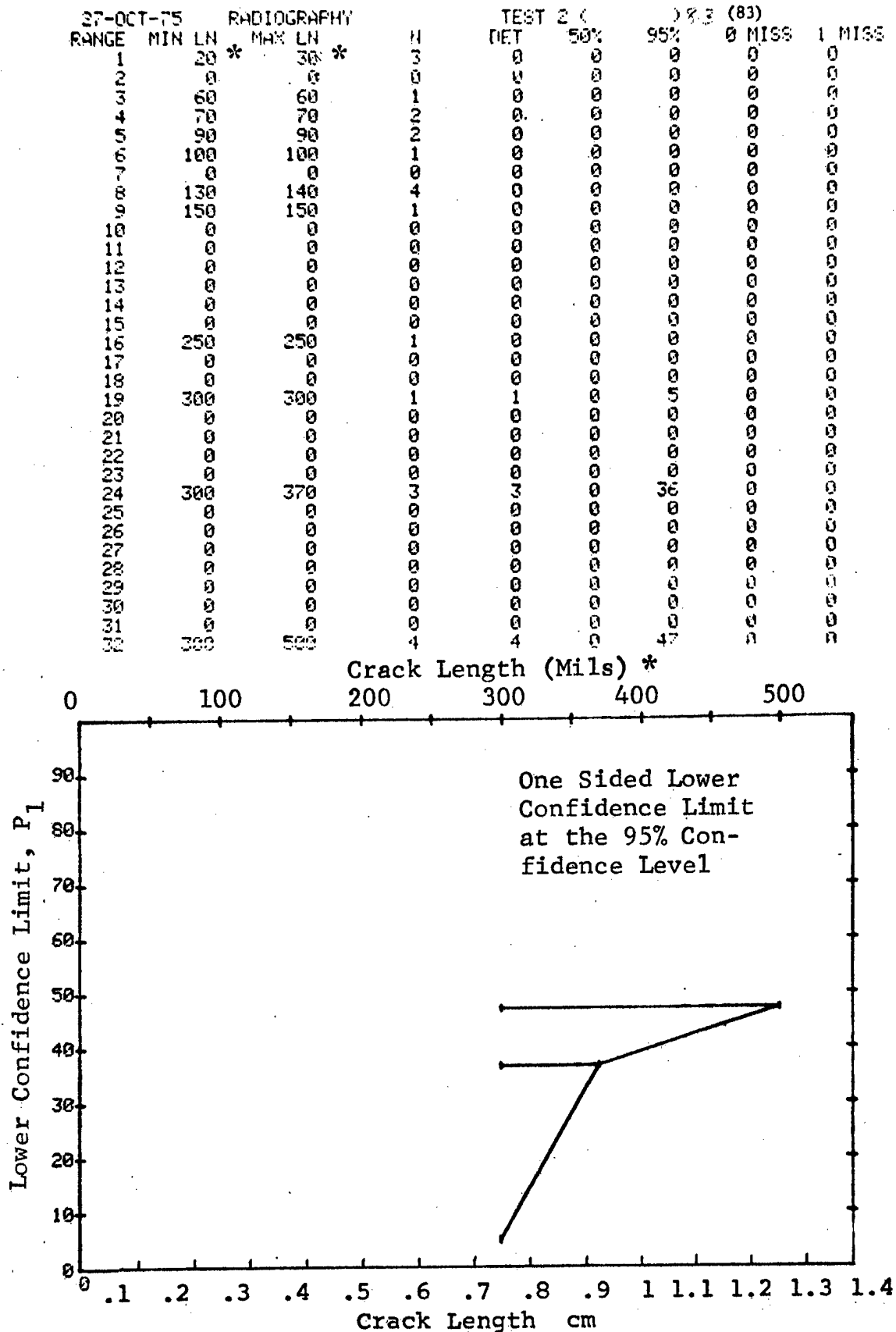


Figure D-83 (Continued)

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(c) Overlapping Sixty Point Method of Data Cumulation

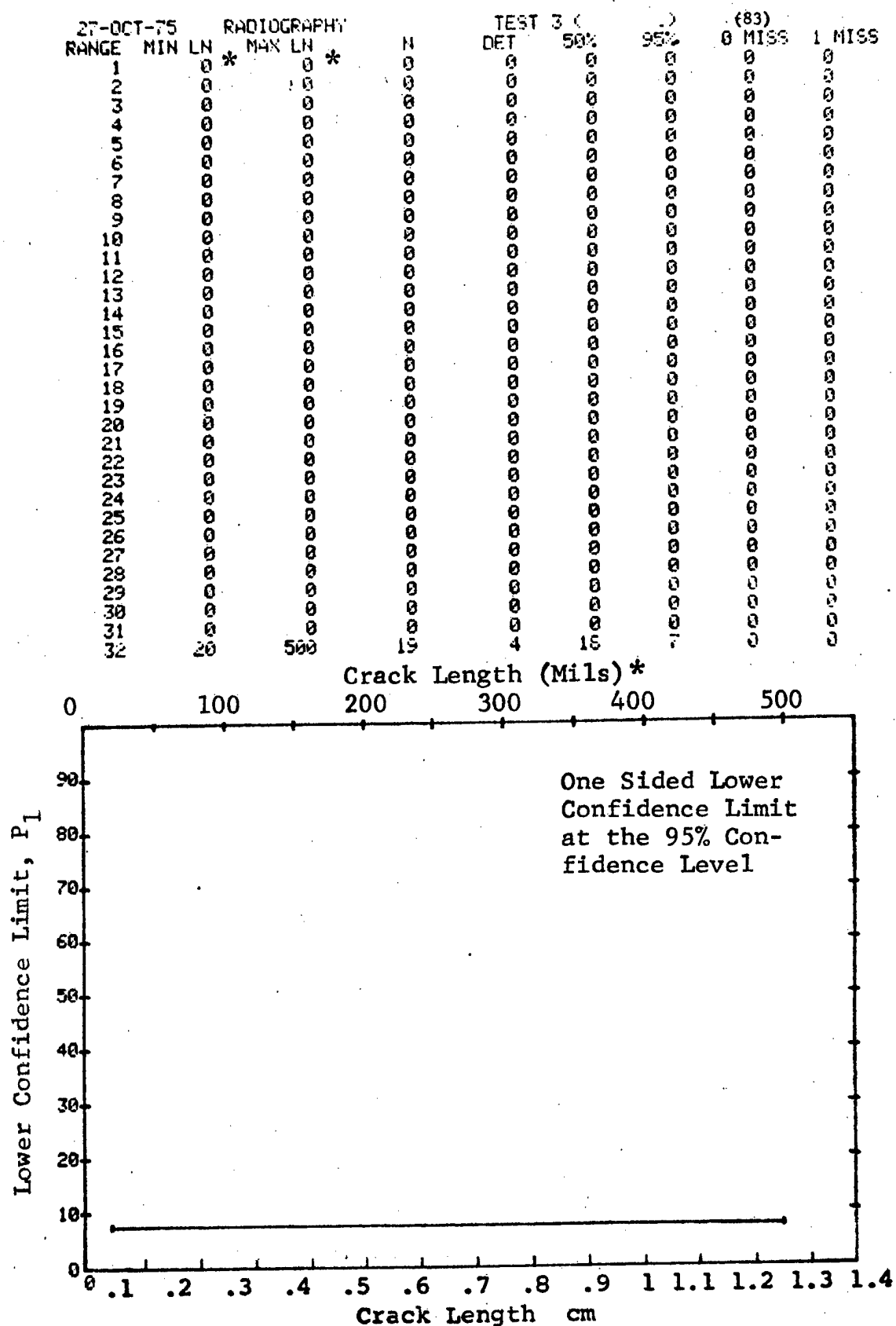


Figure D-83 (Concluded)

(a) Range Interval Method of Data Cumulation

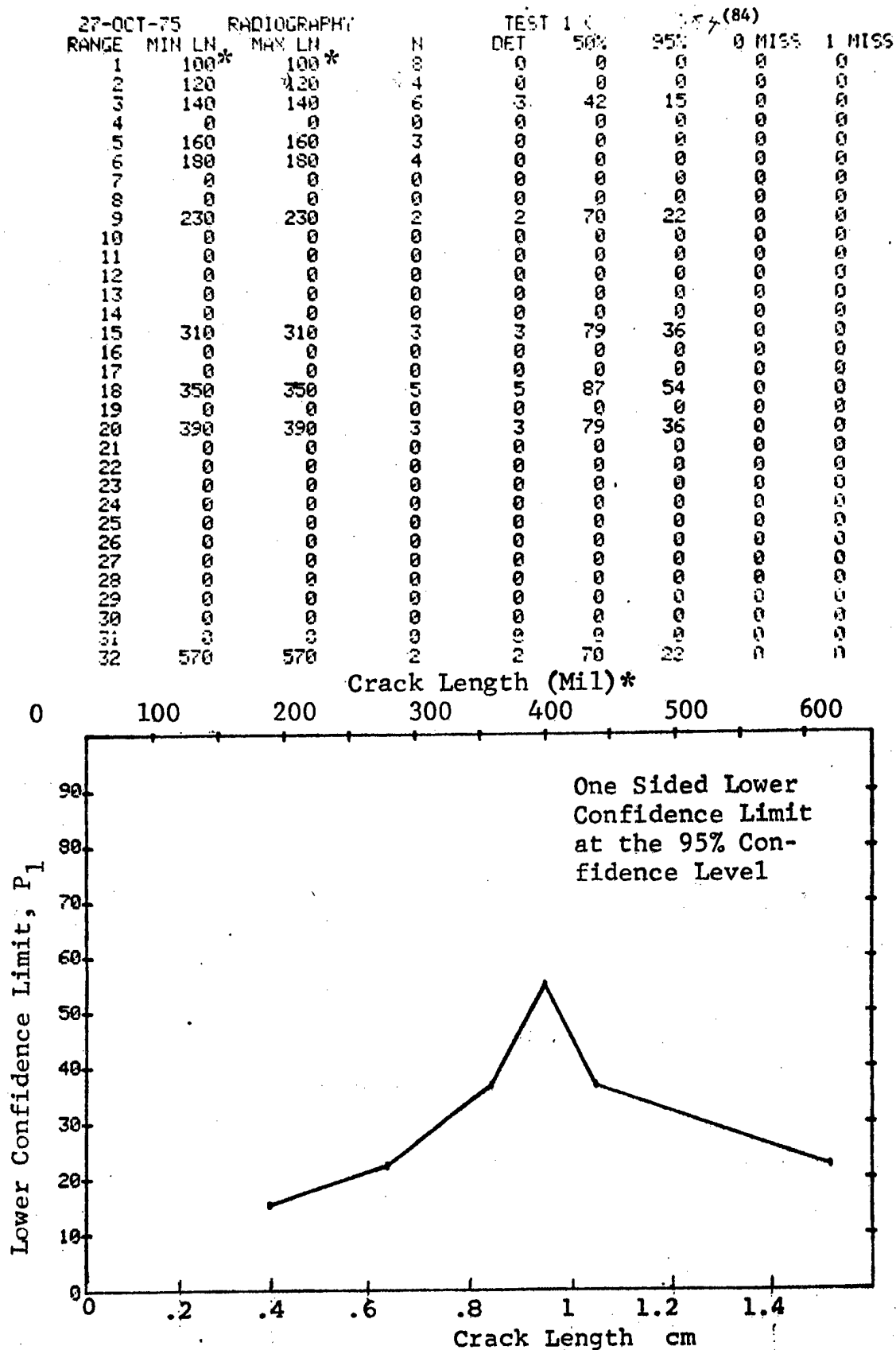


Figure D-84 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Hollow Filleted Cylinder. Prod. Env. D-258

(b) Optimum Probability Method of Data Cumulation

27-OCT-75 RADIOGRAPHY				TEST 2 (84)			
RANGE	MIN LN	MAX LN	N	DET	50%	95%	MISS
1	100	100	4	0	0	0	0
2	120	120	4	0	0	0	0
3	140	140	6	3	0	15	0
4	0	0	0	0	0	0	0
5	140	160	9	3	0	9	0
6	140	180	13	3	0	6	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	230	230	2	2	0	22	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	230	310	5	5	0	54	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	230	350	10	10	0	74	0
19	0	0	0	0	0	0	0
20	230	390	13	13	0	79	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0
32	230	570	15	15	0	81	14

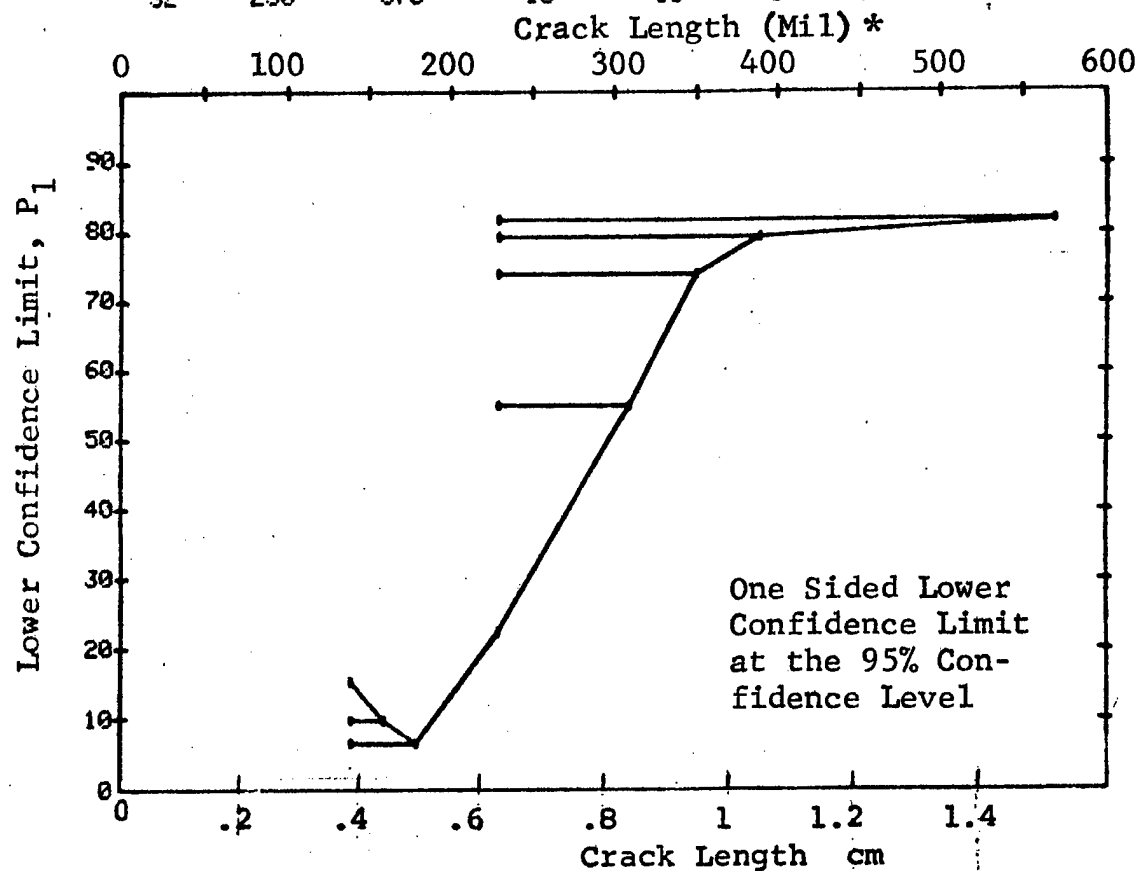


Figure D-84 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

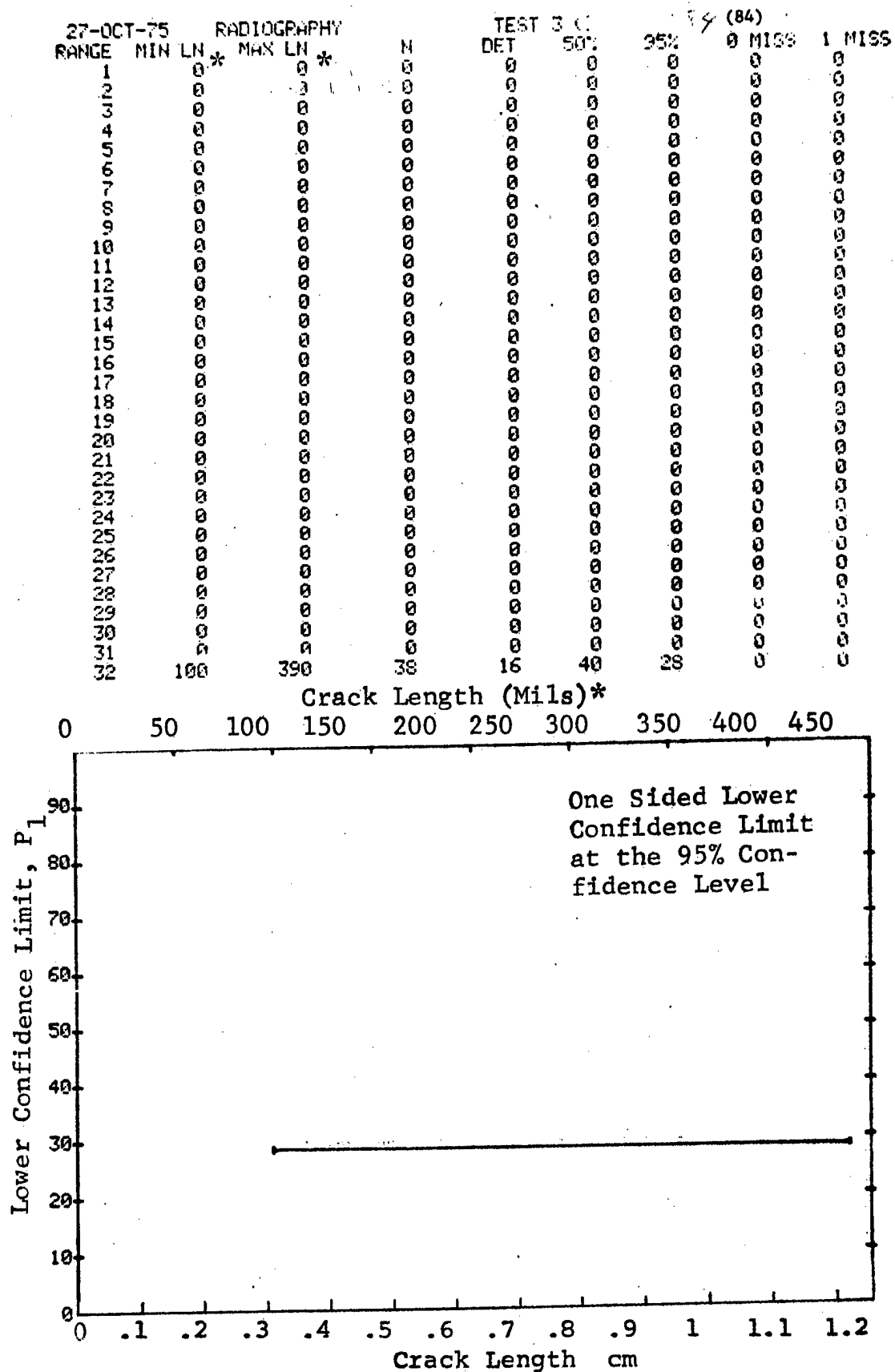


Figure D-84 (Concluded)

27-OCT-75		RADIOGRAPHY		N	TEST 1		PR5 (85)		0 MISS	1 MISS
RANGE	MIN LN	MAX LN	90 *		DET	50%	95%			
1	80	90	0	7	0	22	5	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	110	110	0	2	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	130	130	0	2	1	29	2	0	0	0
6	140	140	0	2	1	29	1	0	0	0
7	160	160	0	3	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	250	250	0	3	2	50	13	0	0	0
16	270	270	0	1	0	0	0	0	0	0
17	280	280	0	3	3	79	36	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	300	300	0	3	3	79	36	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	450	460	0	4	3	61	24	0	0	0

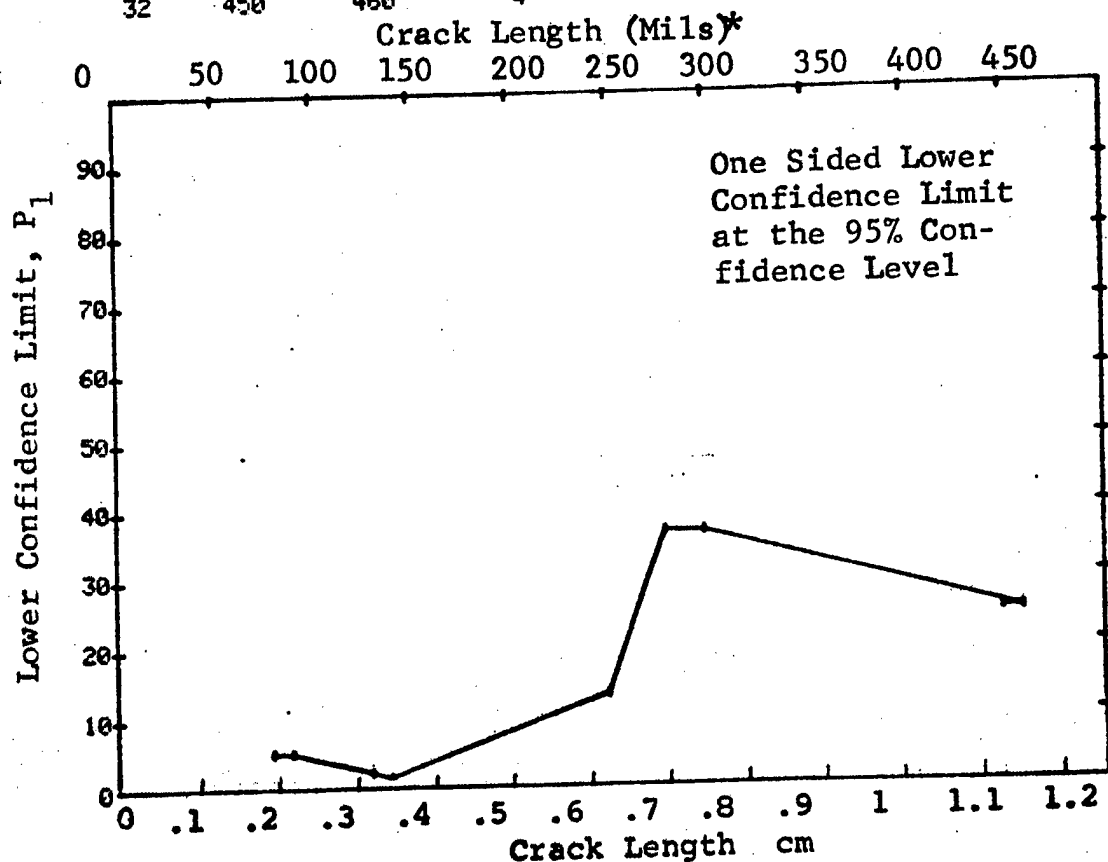


Figure D-85 Probability of Detection for 4340M Steel Using X-ray.
Compressed Notch Flaws in Hollow Filleted Cylinder.
Prod. Env.

(b) Optimum Probability Method of Data Cumulation

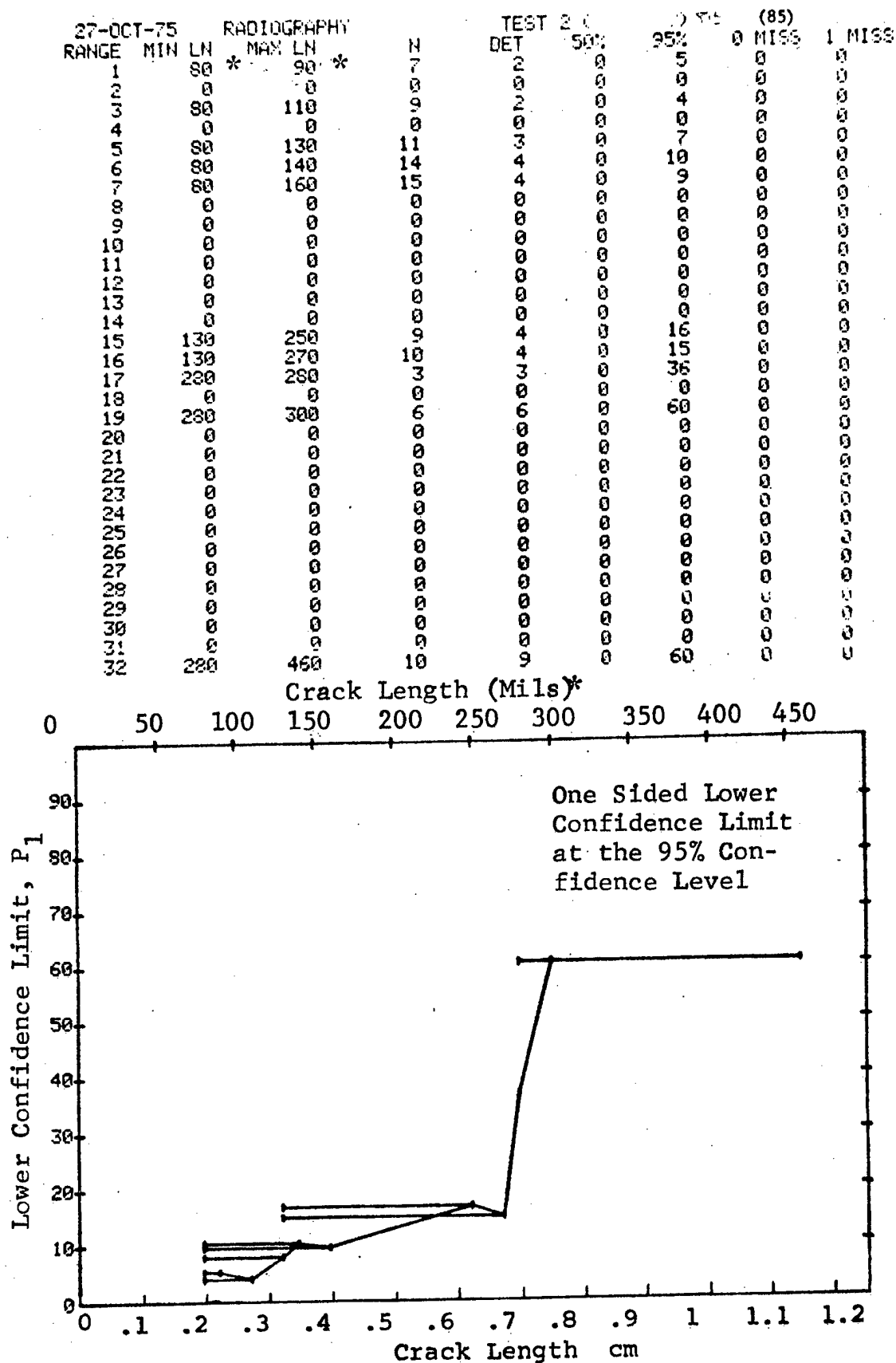


Figure D-85 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

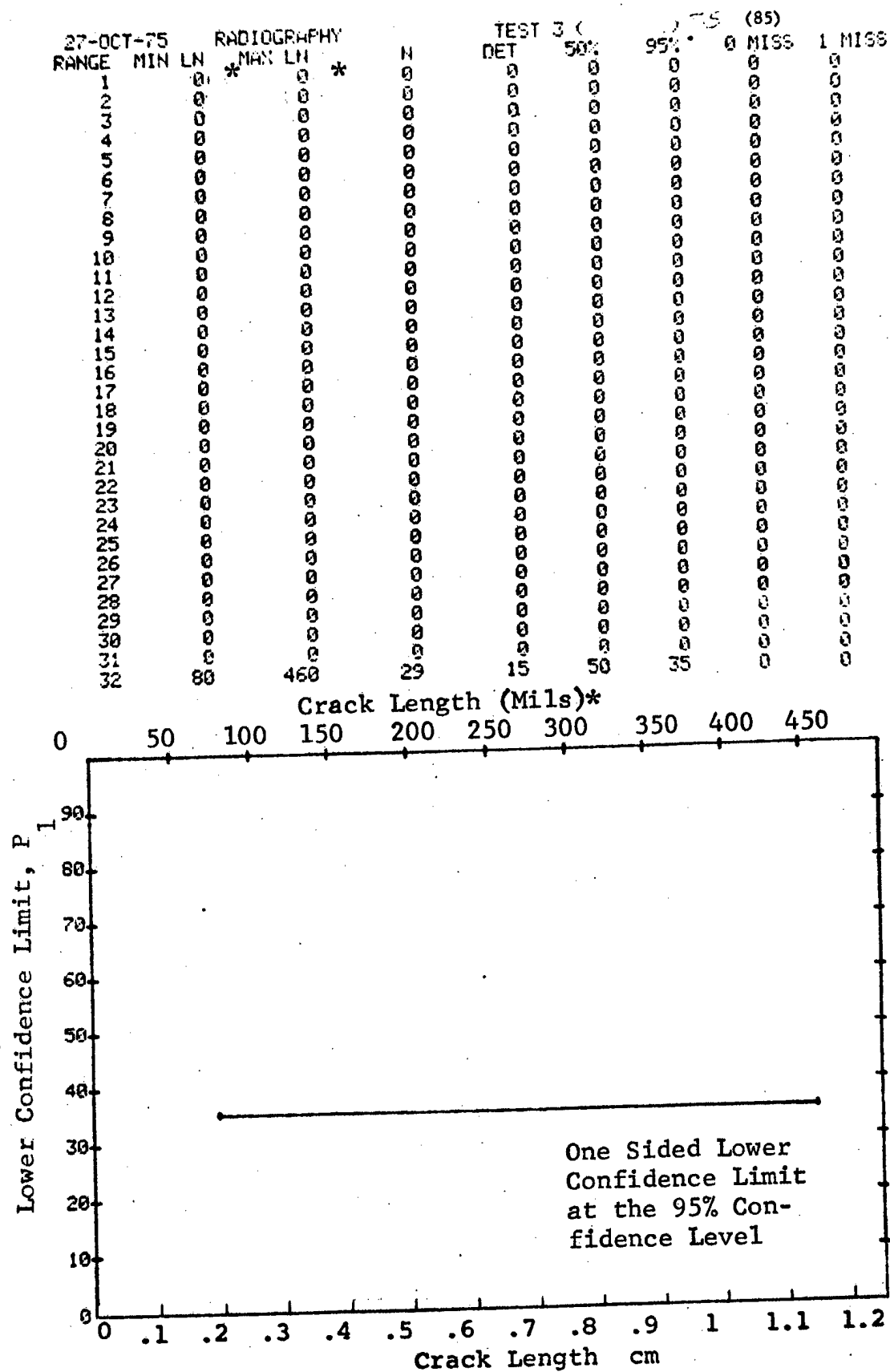


Figure D-85 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		RADIOGRAPHY		N	TEST 1 (		) 76 (86)		0 MISS	1 MISS
RANGE	MIN LN	MAX LN			DET	50%	95%			
1	100 *	110 *		3	1	20	1		0	0
2	0	0		0	0	0	0		0	0
3	0	0		0	0	0	0		0	0
4	0	0		0	0	0	0		0	0
5	0	0		0	0	0	0		0	0
6	190	190		1	1	50	5		0	0
7	0	0		0	0	0	0		0	0
8	230	230		1	0	0	0		0	0
9	250	250		1	0	0	0		0	0
10	0	0		0	0	0	0		0	0
11	0	0		0	0	0	0		0	0
12	0	0		0	0	0	0		0	0
13	0	0		0	0	0	0		0	0
14	0	0		0	0	0	0		0	0
15	350	350		1	0	0	0		0	0
16	0	0		0	0	0	0		0	0
17	380	380		1	1	50	5		0	0
18	0	0		0	0	0	0		0	0
19	0	0		0	0	0	0		0	0
20	0	0		0	0	0	0		0	0
21	450	460		2	1	29	2		0	0
22	0	0		0	0	0	0		0	0
23	0	0		0	0	0	0		0	0
24	0	0		0	0	0	0		0	0
25	0	0		0	0	0	0		0	0
26	0	0		0	0	0	0		0	0
27	0	0		0	0	0	0		0	0
28	0	0		0	0	0	0		0	0
29	0	0		0	0	0	0		0	0
30	0	0		0	0	0	0		0	0
31	0	0		0	0	0	0		0	0
32	650	650		1	1	50	5		0	0

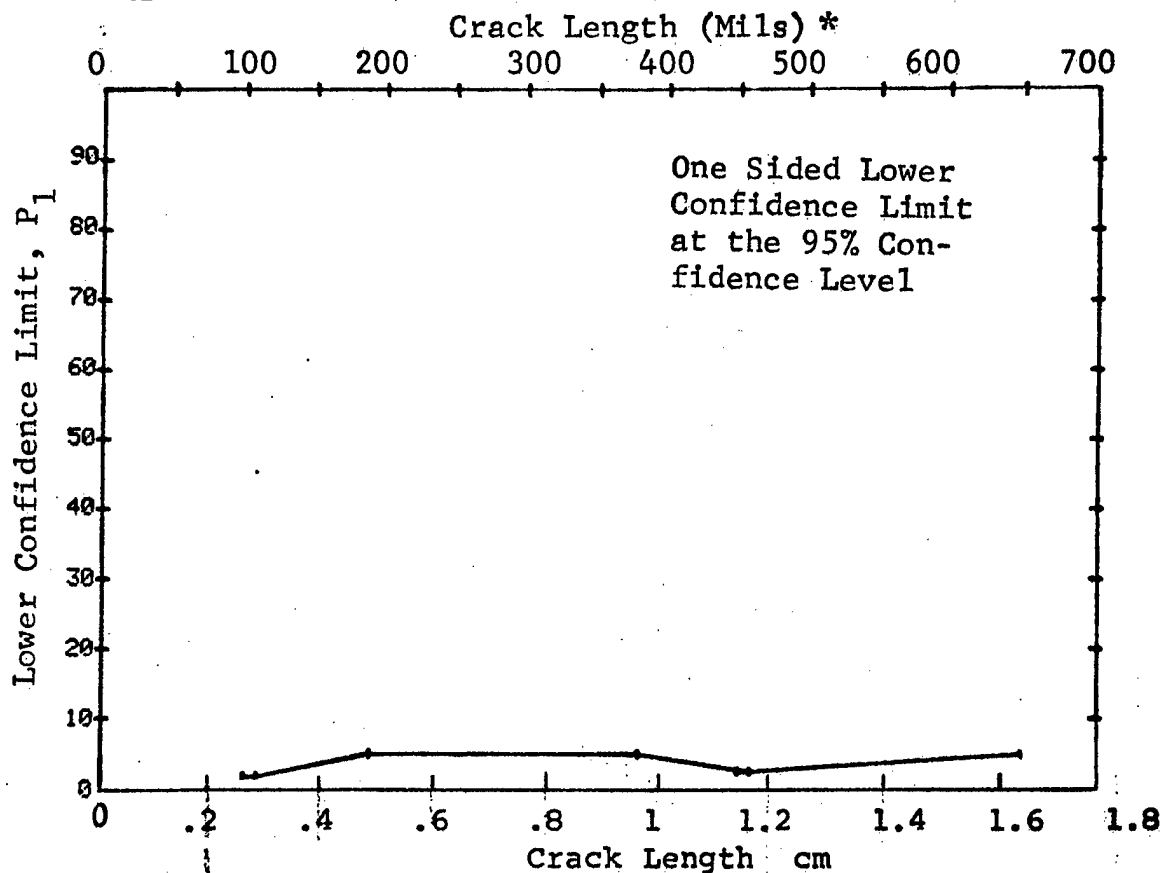


Figure D-86 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Solid Threaded Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

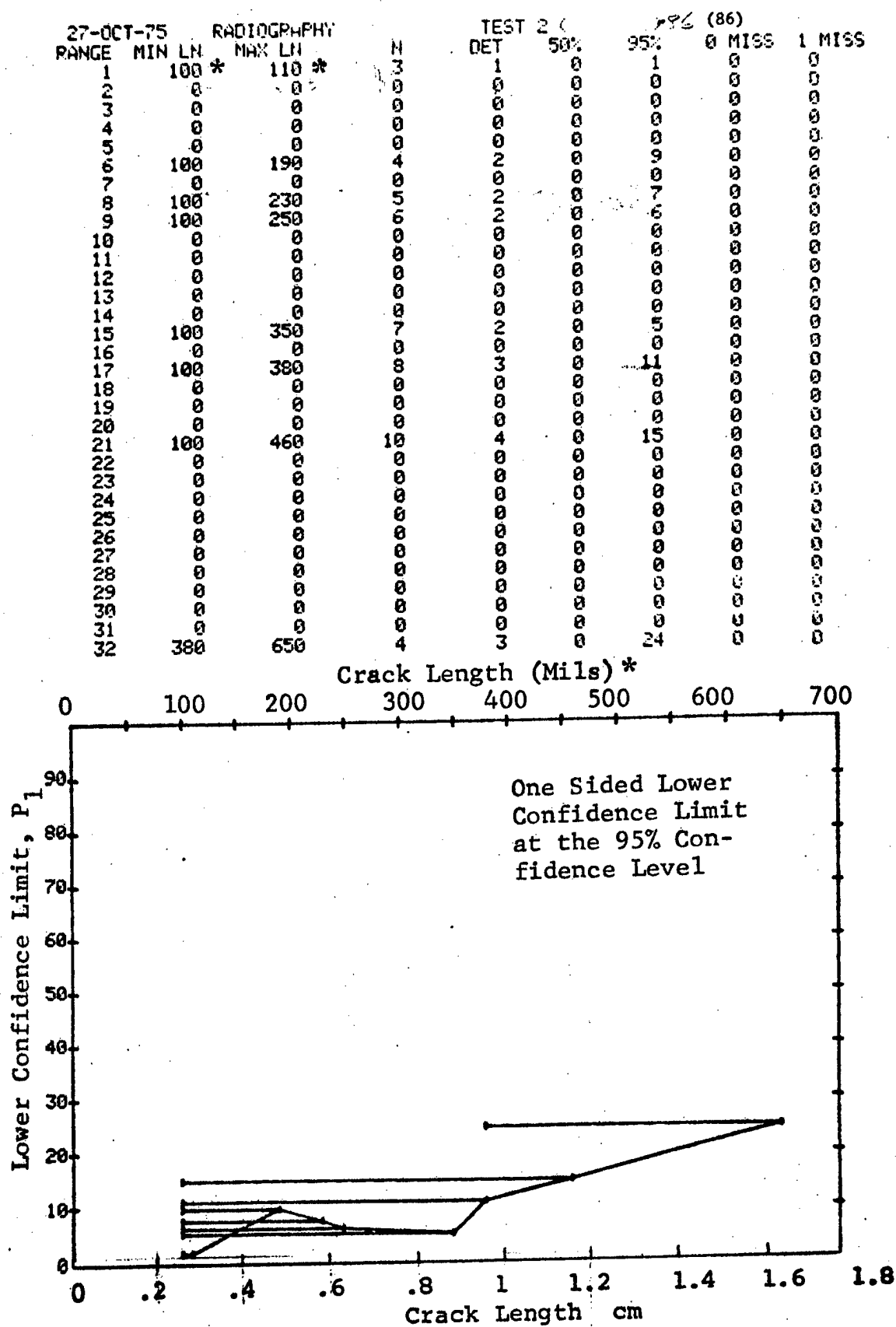


Figure D-86 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

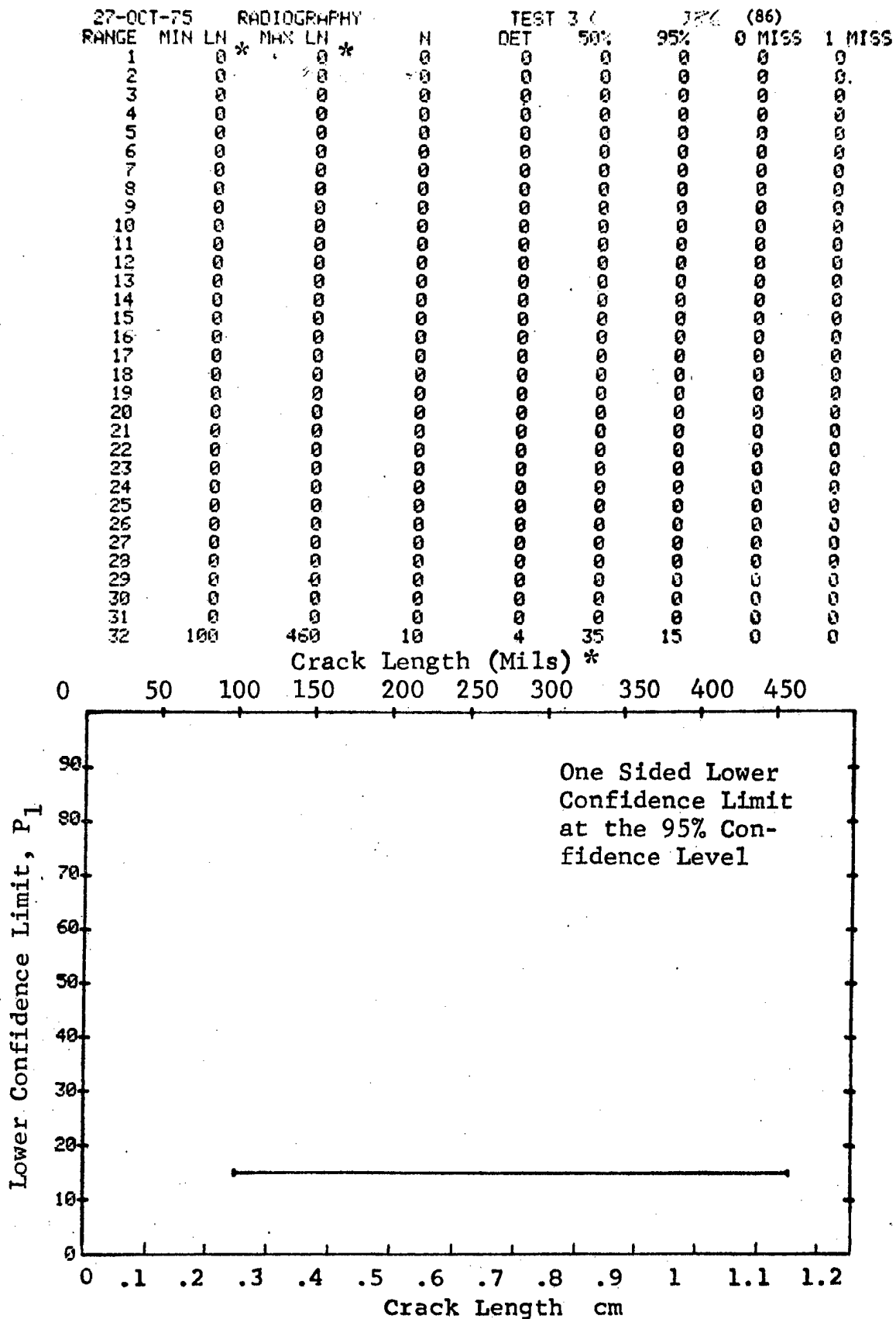


Figure D-86 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		RADIOGRAPHY		N	TEST 1		77-77 (87)		1 MISS
RANGE	MIN LN	MAX LN	*		DET	50%	95%	0 MISS	
1	10	10	*	5	0	0	0	0	0
2	0	0		0	0	0	0	0	0
3	30	30		3	3	79	36	0	0
4	0	0		0	0	0	0	0	0
5	40	40		9	6	60	34	0	0
6	50	50		19	17	86	70	0	0
7	0	0		0	0	0	0	0	0
8	60	60		8	8	91	68	0	0
9	70	70		1	1	50	5	0	0
10	0	0		0	0	0	0	0	0
11	80	80		6	4	57	27	0	0
12	90	90		5	4	68	34	0	0
13	0	0		0	0	0	0	0	0
14	100	100		4	2	38	9	0	0
15	110	110		7	6	77	47	0	0
16	120	120		3	3	79	36	0	0
17	0	0		0	0	0	0	0	0
18	130	130		4	4	84	47	0	0
19	140	140		2	1	29	2	0	0
20	0	0		0	0	0	0	0	0
21	150	150		9	9	92	71	0	0
22	160	160		1	0	0	0	0	0
23	0	0		0	0	0	0	0	0
24	170	170		5	5	87	54	0	0
25	180	180		9	8	82	57	0	0
26	0	0		0	0	0	0	0	0
27	190	190		1	0	0	0	0	0
28	0	0		0	0	0	0	0	0
29	0	0		0	0	0	0	0	0
30	0	0		0	0	0	0	0	0
31	220	220		3	3	79	36	0	0
32	230	230		5	4	68	34	0	0

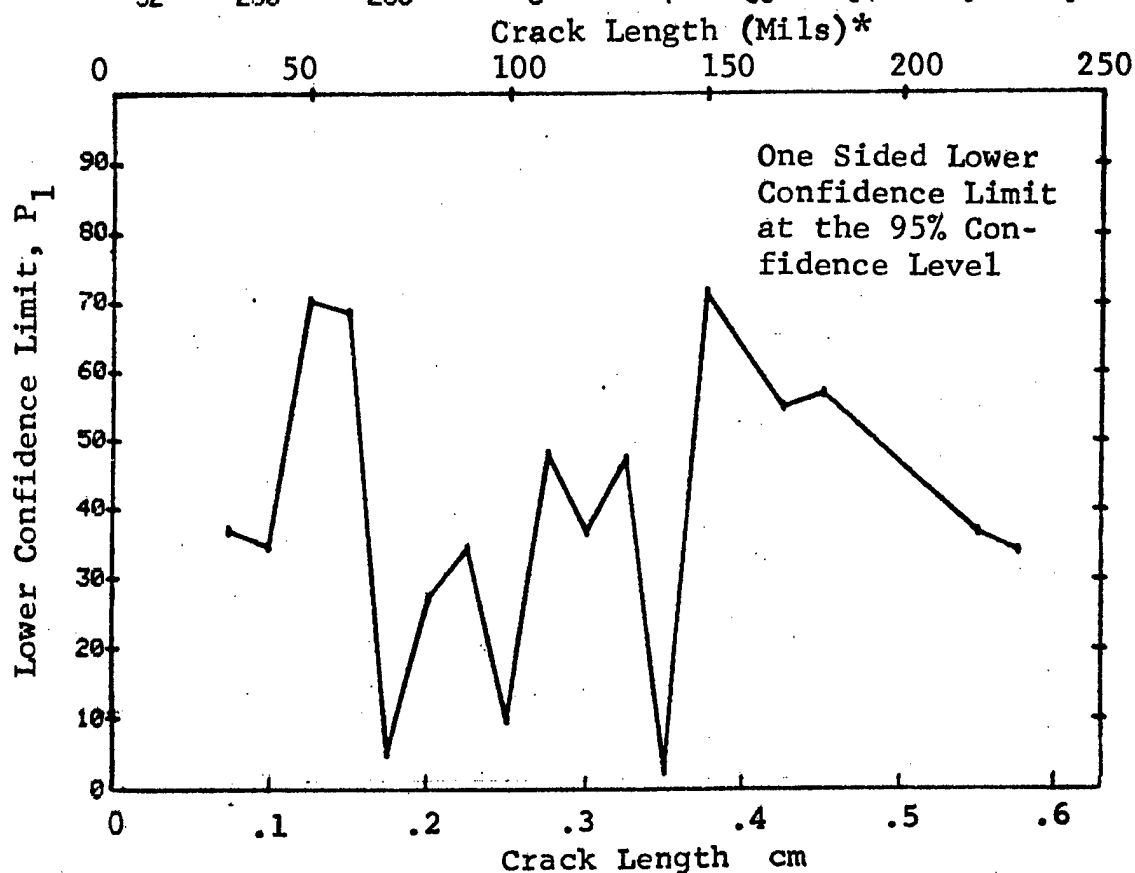


Figure D-87 Probability of Detection for 2024-T6 Al Using X-ray. Compressed Notch Flaws in Tandem-T Specimen. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		RADIOGRAPHY		TEST 2 (		TEST 2 (87)			
RANGE	MIN	LN	* MAX LN *	DET	50%	95%	0 MISS	1 MISS	
1	10	10	10	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	30	30	30	3	0	36	0	0	
4	0	0	0	0	0	0	0	0	
5	30	40	12	9	0	47	0	0	
6	50	50	19	17	0	70	0	0	
7	0	0	0	0	0	0	0	0	
8	50	60	27	25	0	73	0	0	
9	50	70	28	26	0	79	0	0	
10	0	0	0	0	0	0	0	0	
11	50	80	34	30	0	75	0	0	
12	50	90	39	34	0	74	0	0	
13	0	0	0	0	0	0	0	0	
14	50	100	43	36	0	71	0	0	
15	50	110	50	42	0	72	0	0	
16	50	120	53	45	0	74	0	0	
17	0	0	0	0	0	0	0	0	
18	50	130	57	49	0	76	0	0	
19	50	140	59	50	0	74	0	0	
20	0	0	0	0	0	0	0	0	
21	50	150	68	59	0	78	0	0	
22	50	160	69	59	0	76	0	0	
23	0	0	0	0	0	0	0	0	
24	50	170	74	64	0	78	0	0	
25	50	180	83	72	0	79	0	0	
26	0	0	0	0	0	0	0	0	
27	50	190	84	72	0	77	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	50	220	87	75	0	76	0	0	
32	50	230	92	79	0	76	0	0	

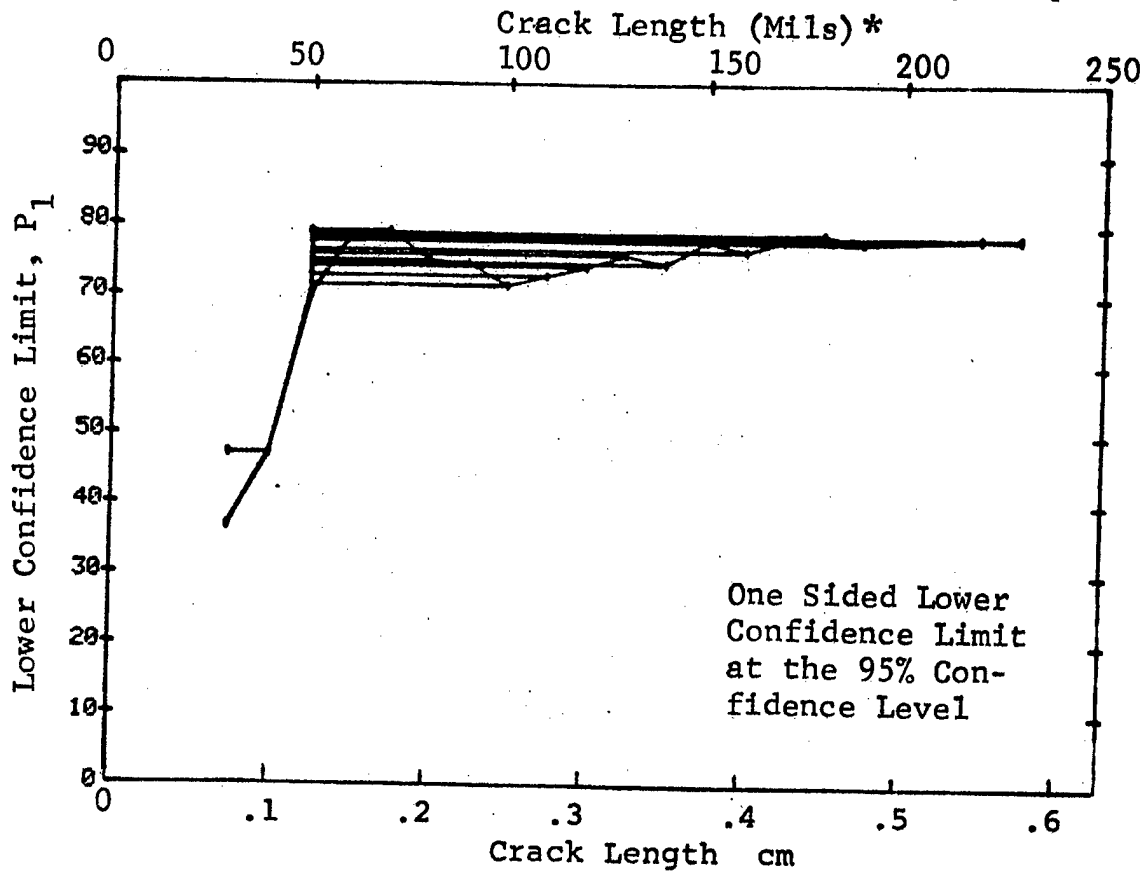


Figure D-87 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

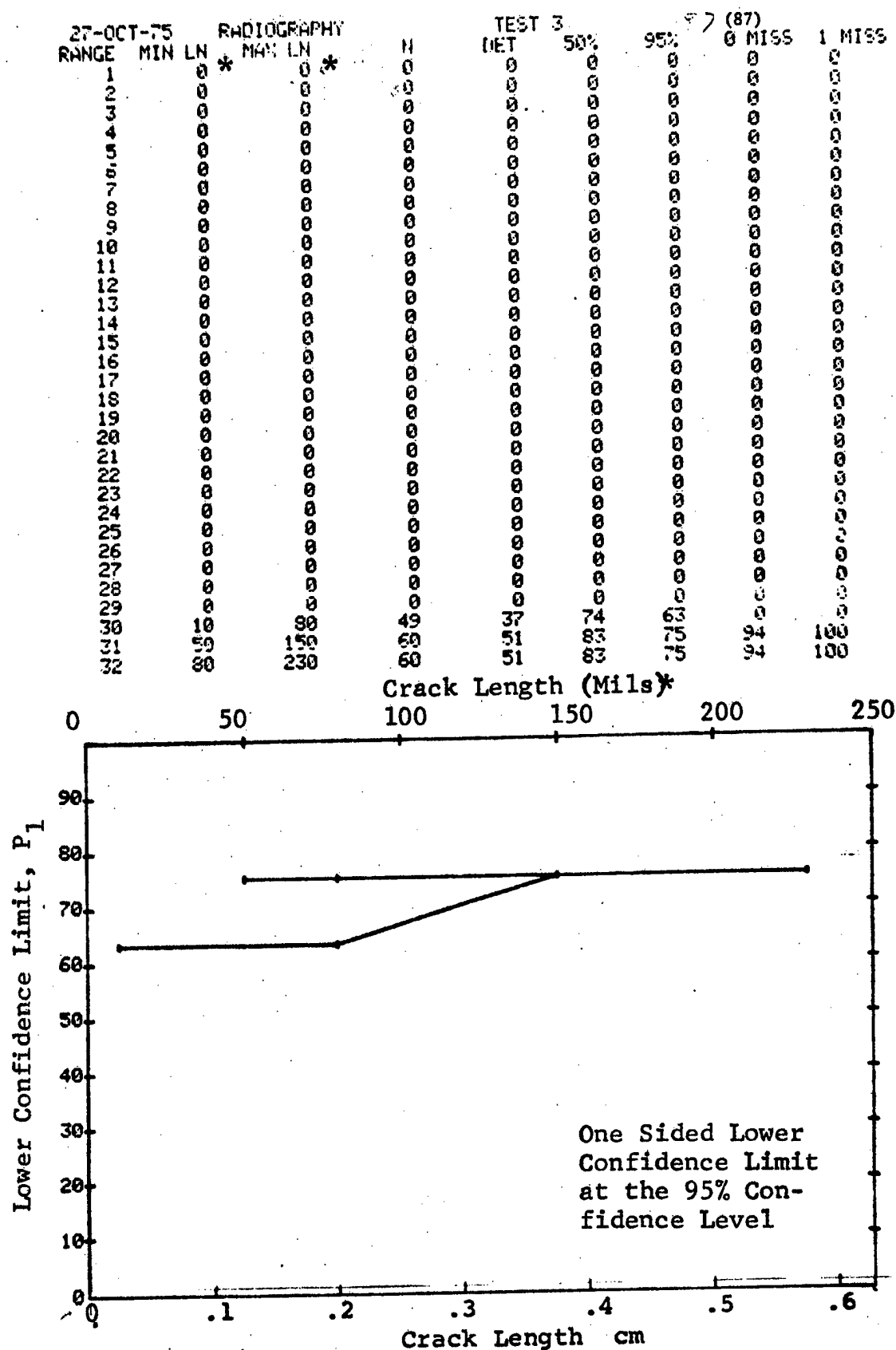


Figure D-87 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		RADIOGRAPHY		N	TEST 1 (88)				
RANGE	MIN LN	* MAX LN			DET	50%	95%	0 MISS	1 MISS
1	50	* 70*	6	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	110	110	1	0	0	0	0	0	0
4	120	120	2	0	0	0	0	0	0
5	140	150	5	2	31	7	0	0	0
6	160	160	1	1	50	5	0	0	0
7	200	200	1	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	750	750	2	2	70	22	0	0	0

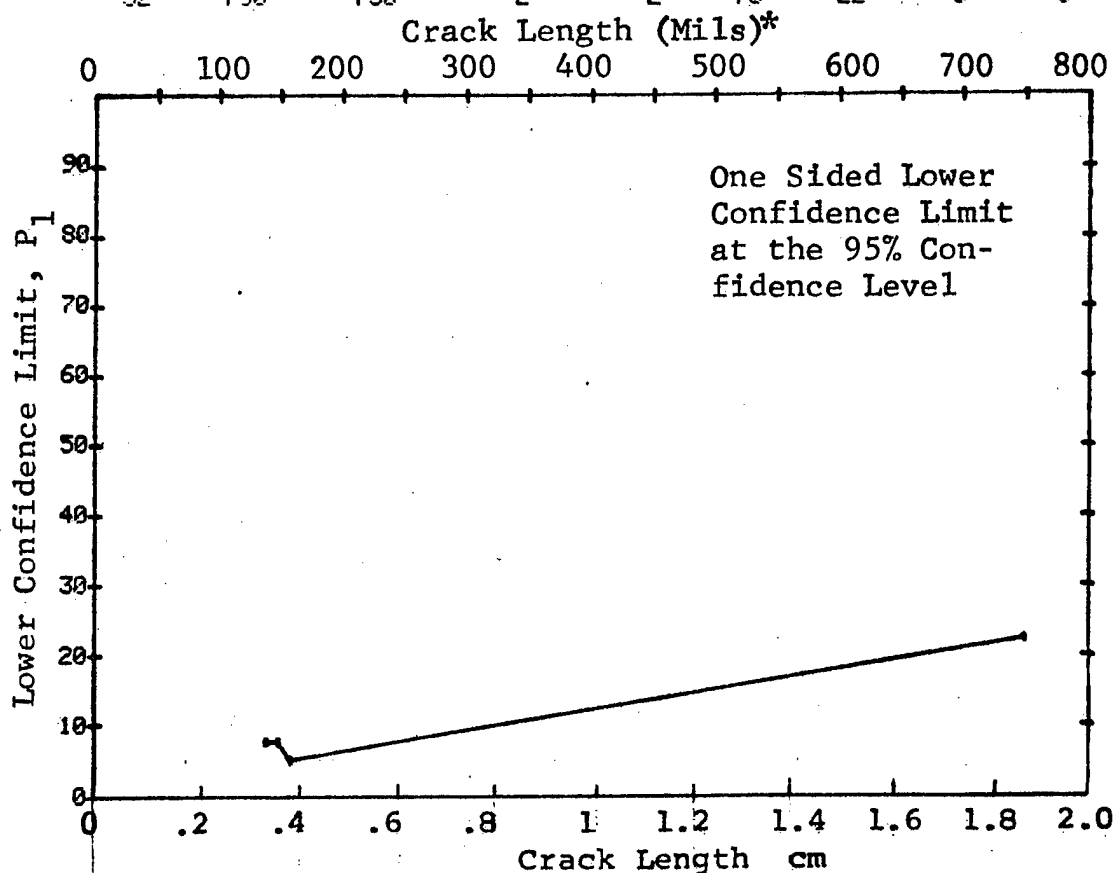


Figure D-88 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Solid Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

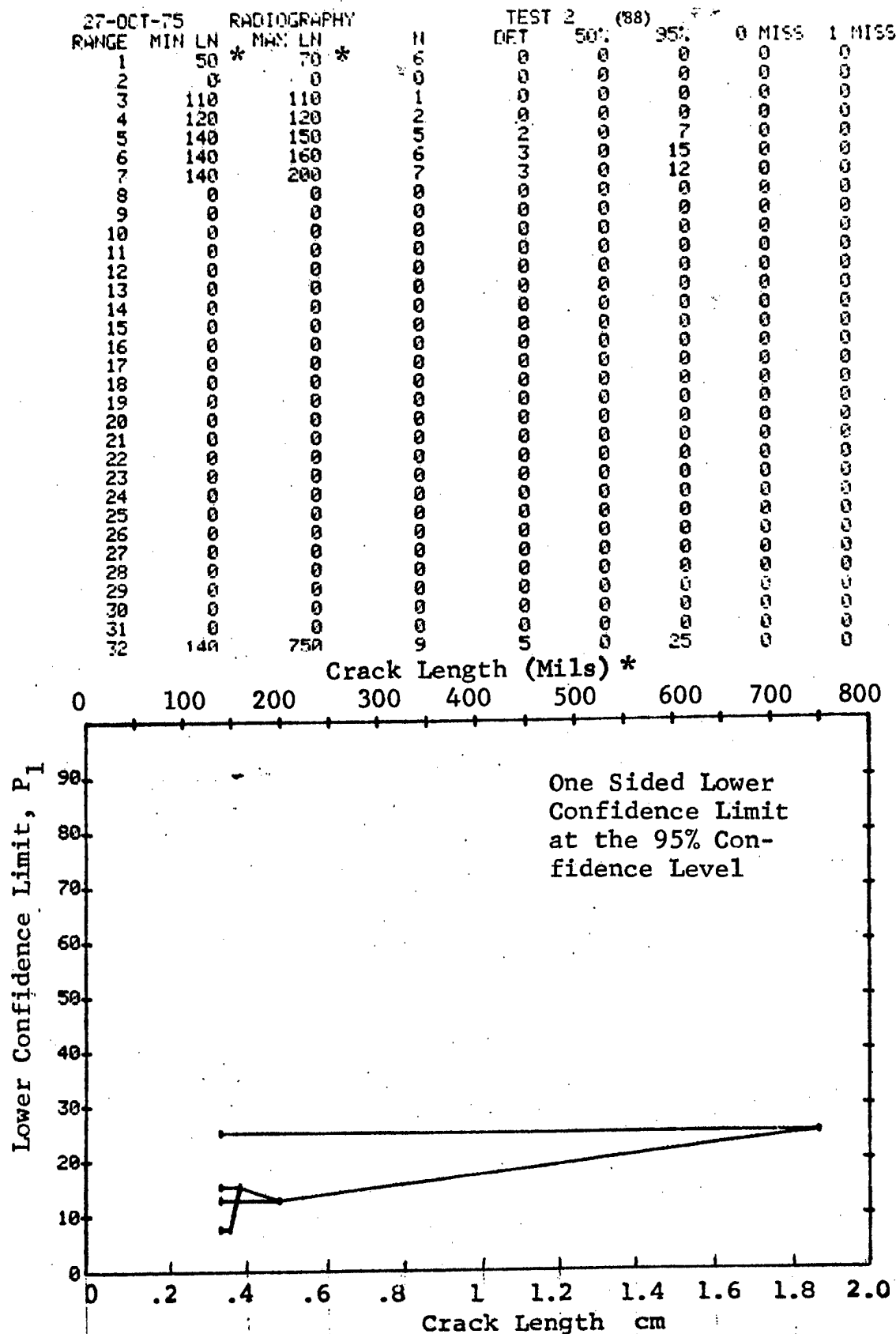


Figure D-88 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

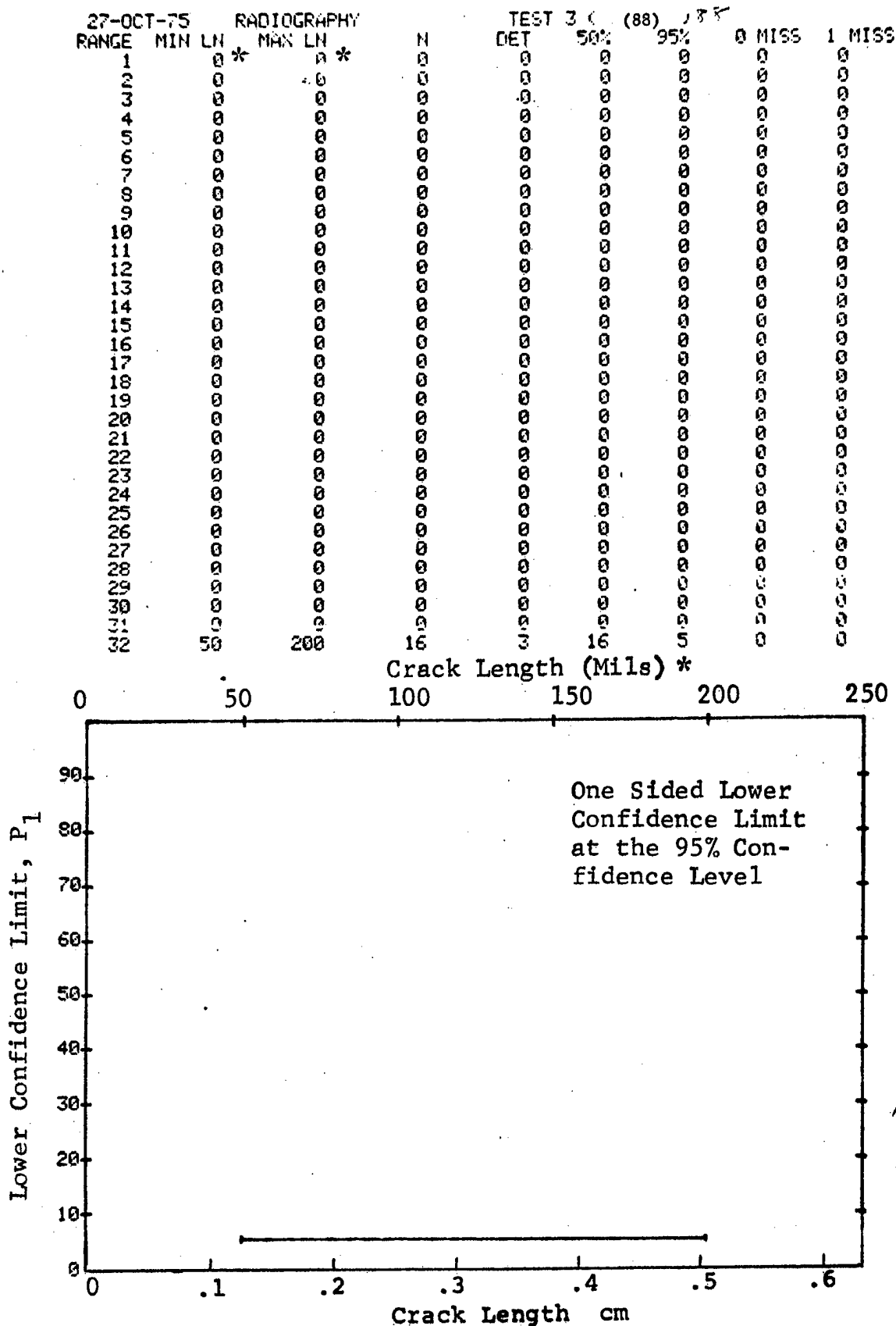


Figure D-88 (Concluded)

(a) Range Interval Method of Data Cumulation

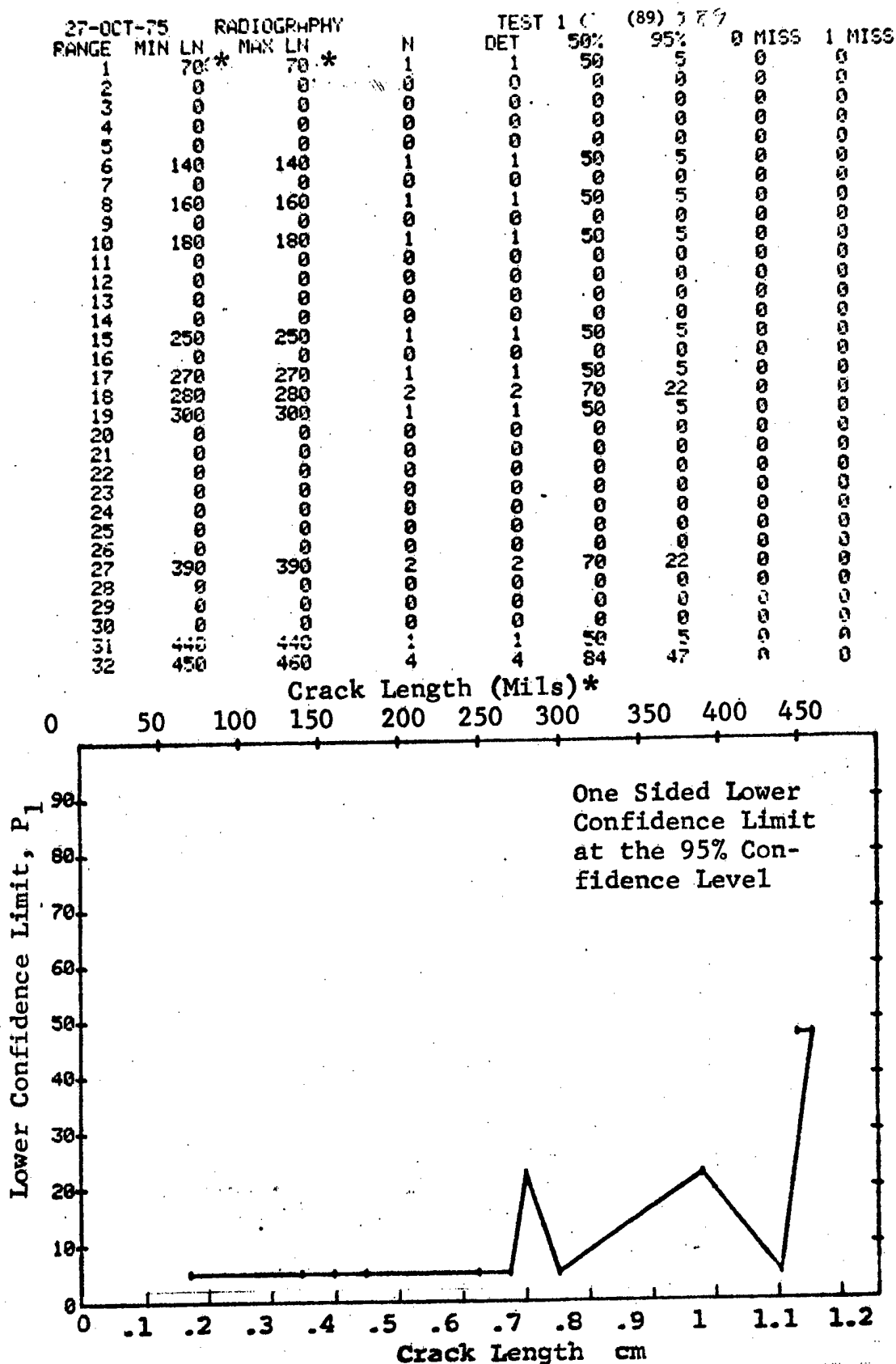


Figure D-89 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Hollow Filleted Cylinder. Lab. Env. D-273

(b) Optimum Probability Method of Data Cumulation

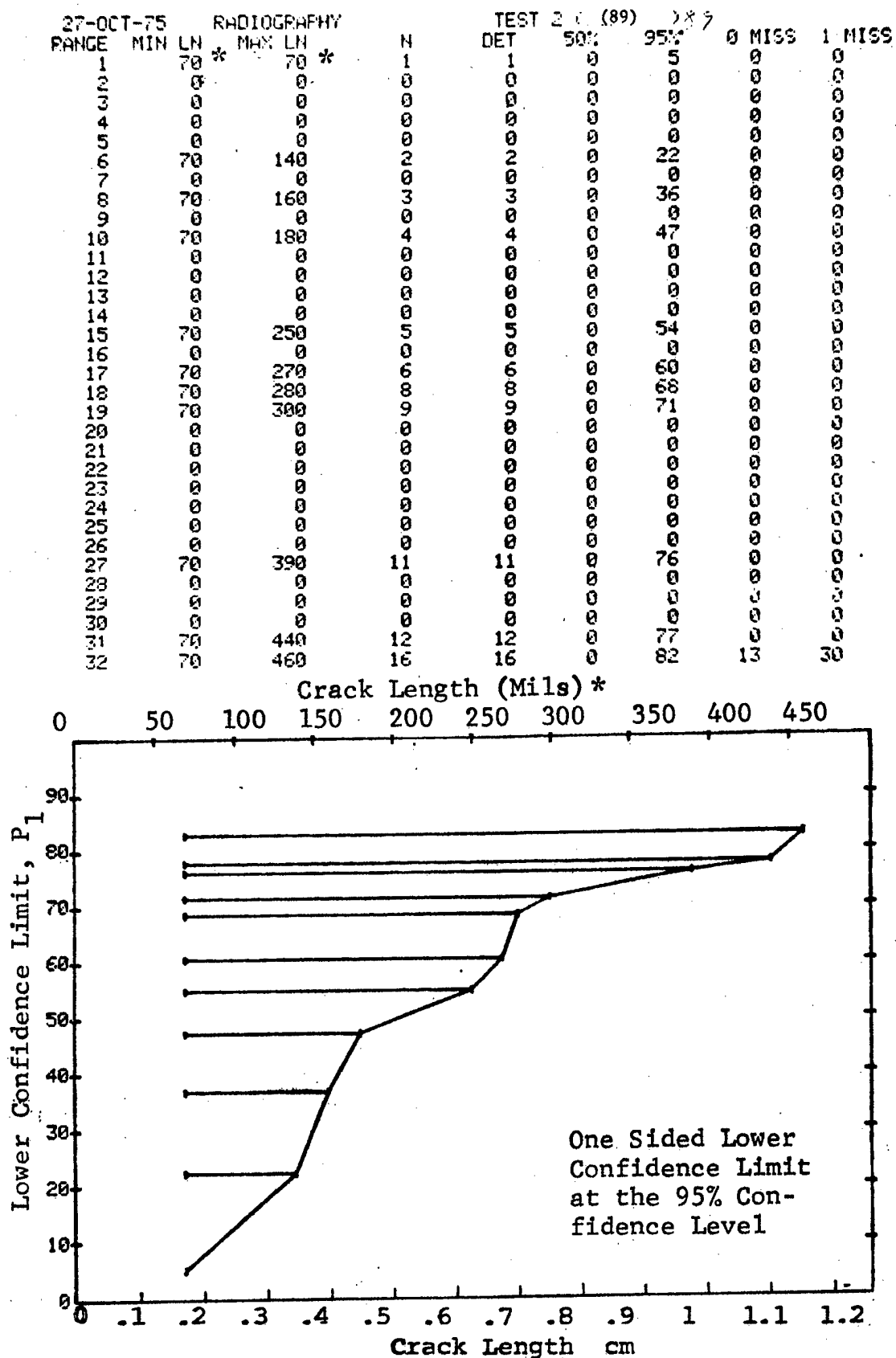


Figure D-89 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

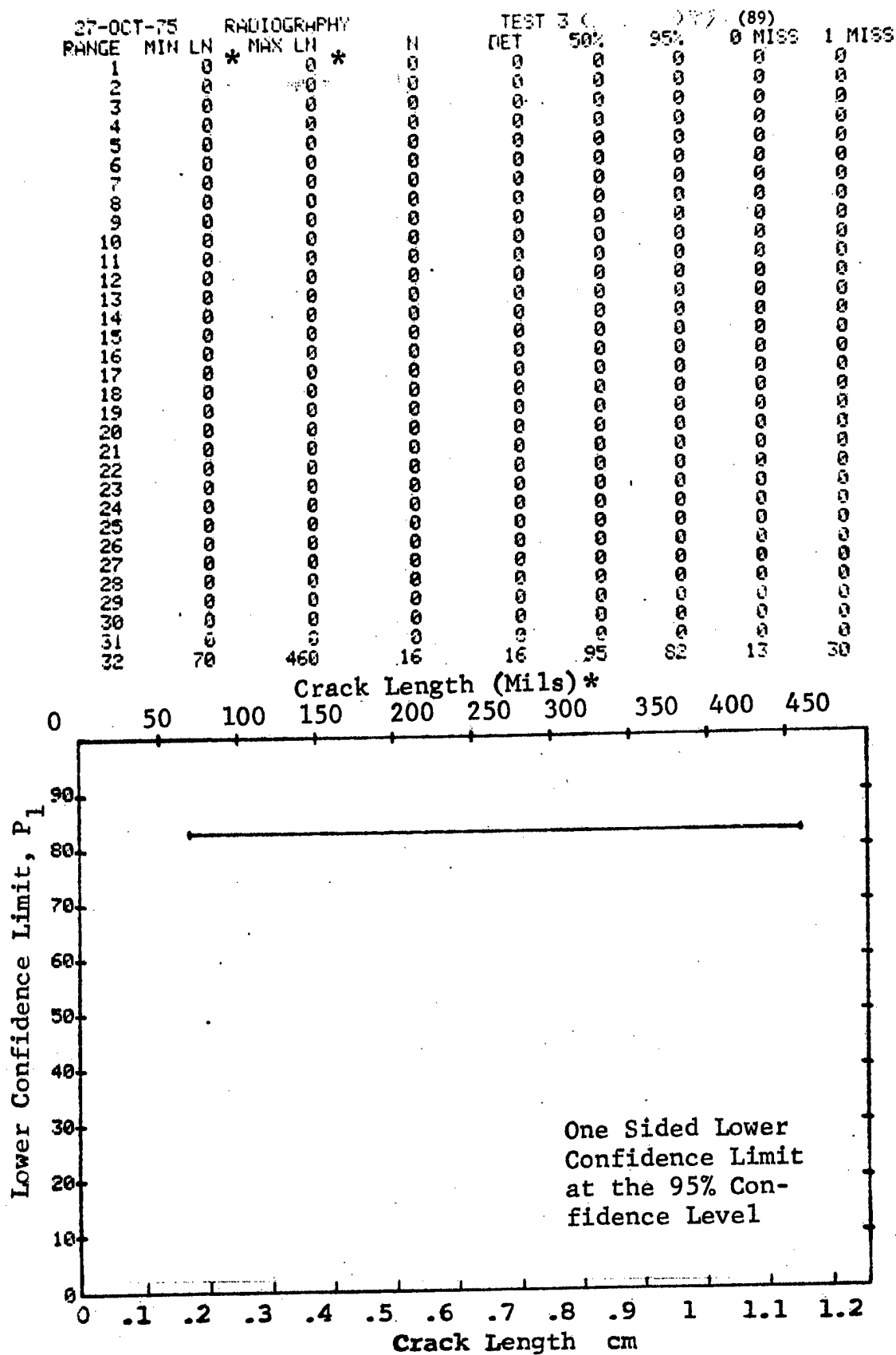


Figure D-89 (Concluded)

(a) Range Interval Method of Data Cumulation

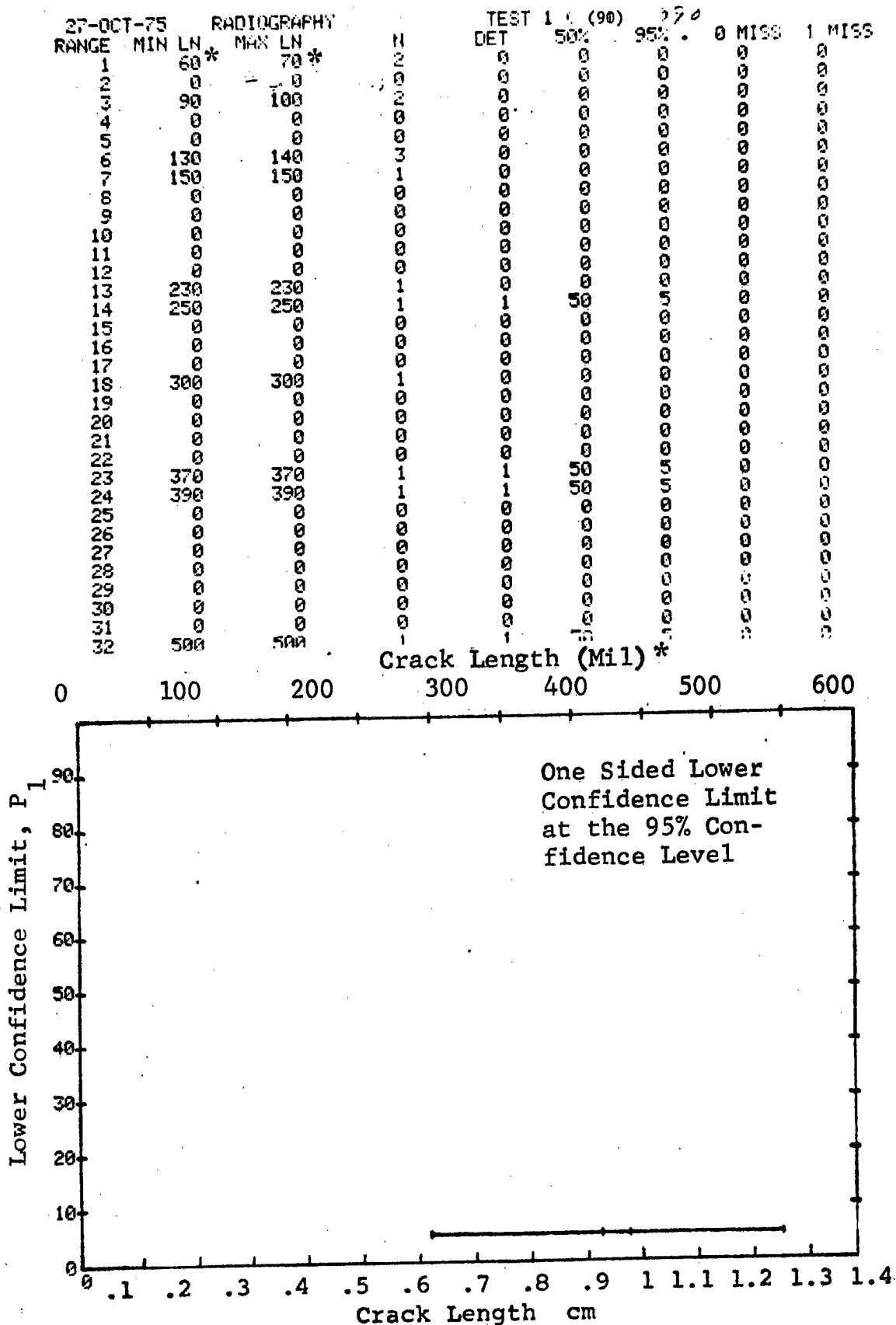


Figure D-90 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Solid Filleted Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

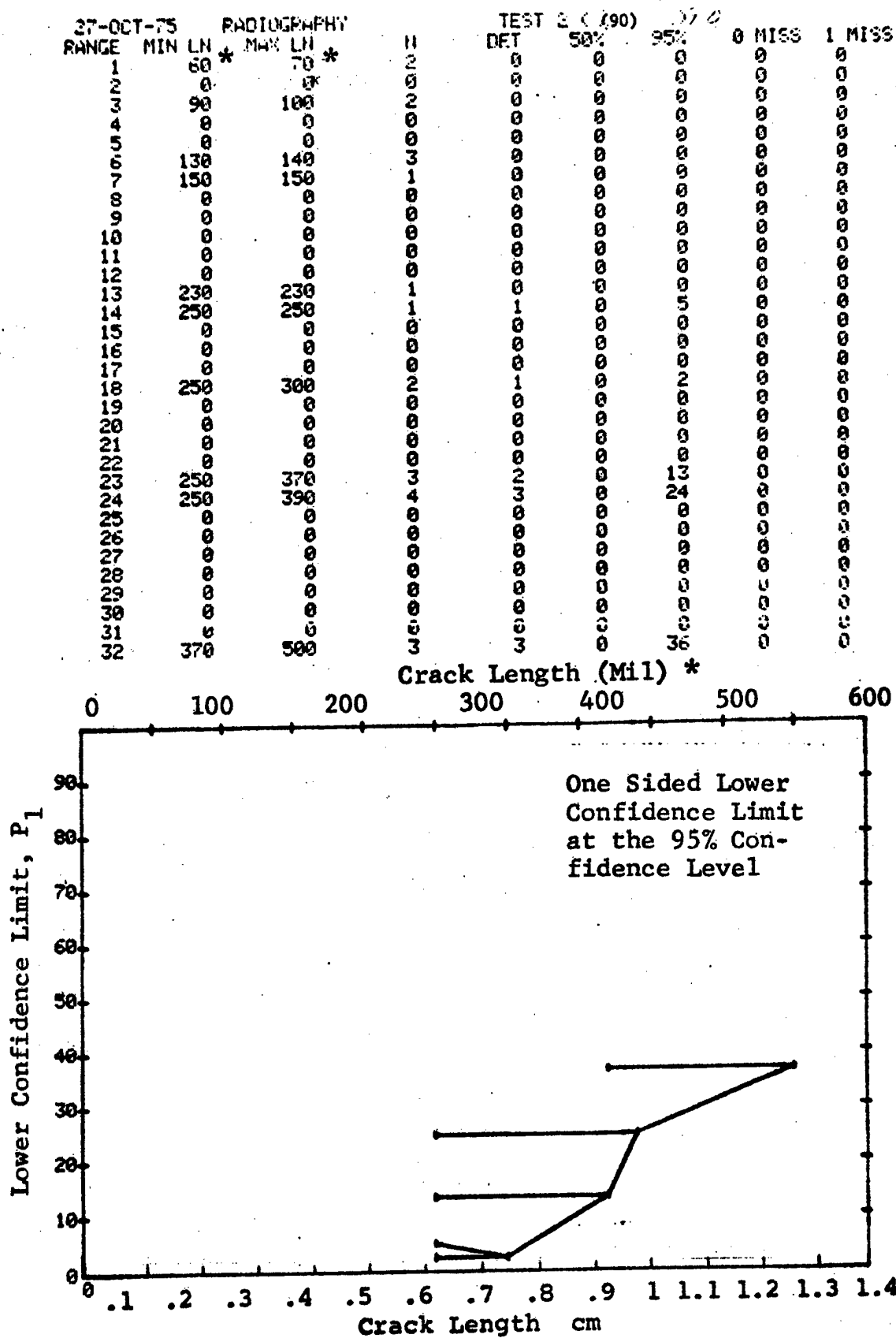


Figure D-90 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

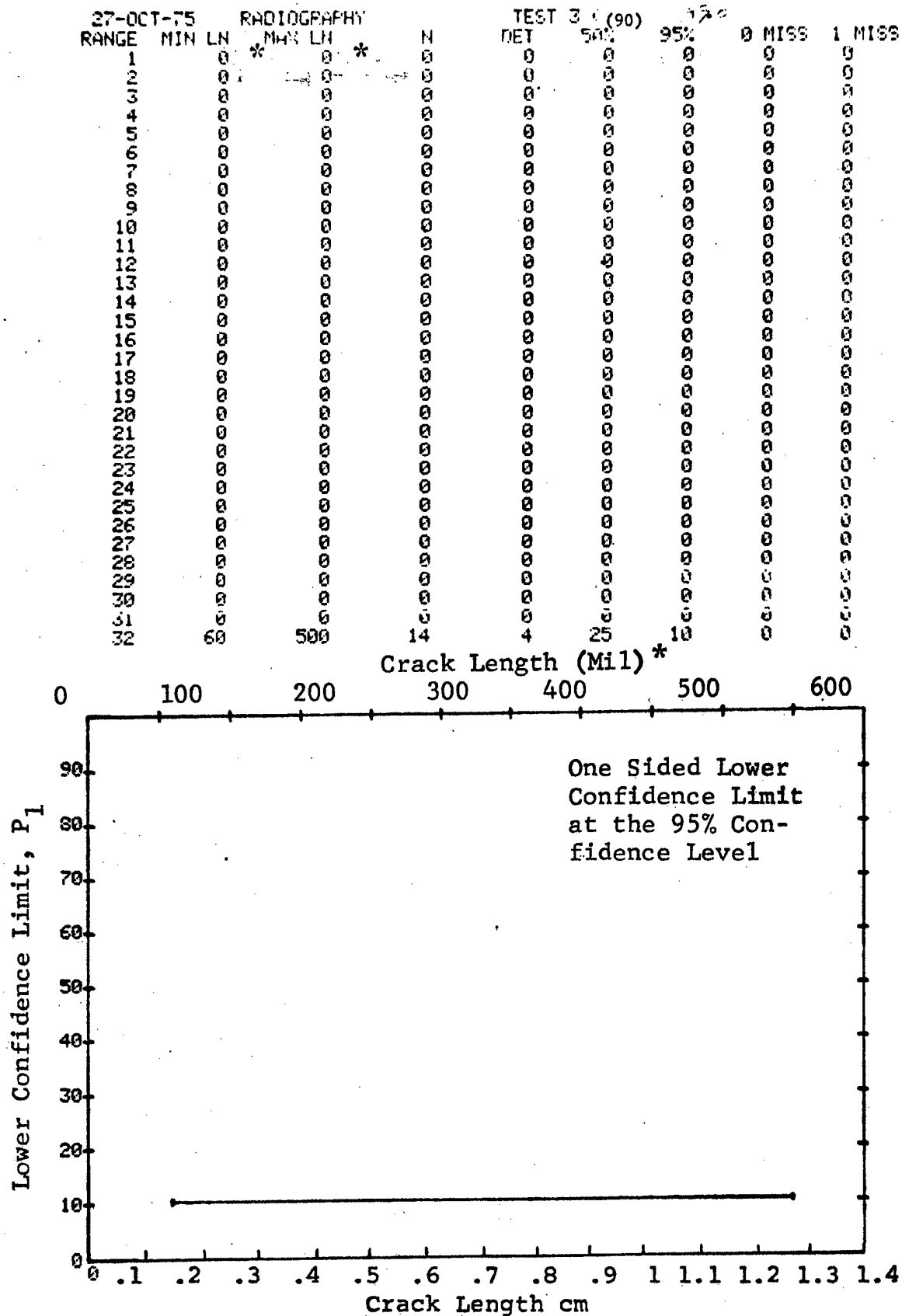


Figure D-90 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		RADIOGRAPHY		N	TEST 1 (91)		95%	0 MISS	1 MISS
RANGE	MIN LN	MAX LN		DET	50%				
1	100*	100*	4	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	120	120	1	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	140	140	2	1	29	2	0	0	0
6	0	0	0	0	0	0	0	0	0
7	160	160	1	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	180	180	1	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	230	230	1	1	50	5	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	310	310	1	1	50	5	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	350	350	2	2	70	22	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	390	390	1	1	50	5	0	0	0

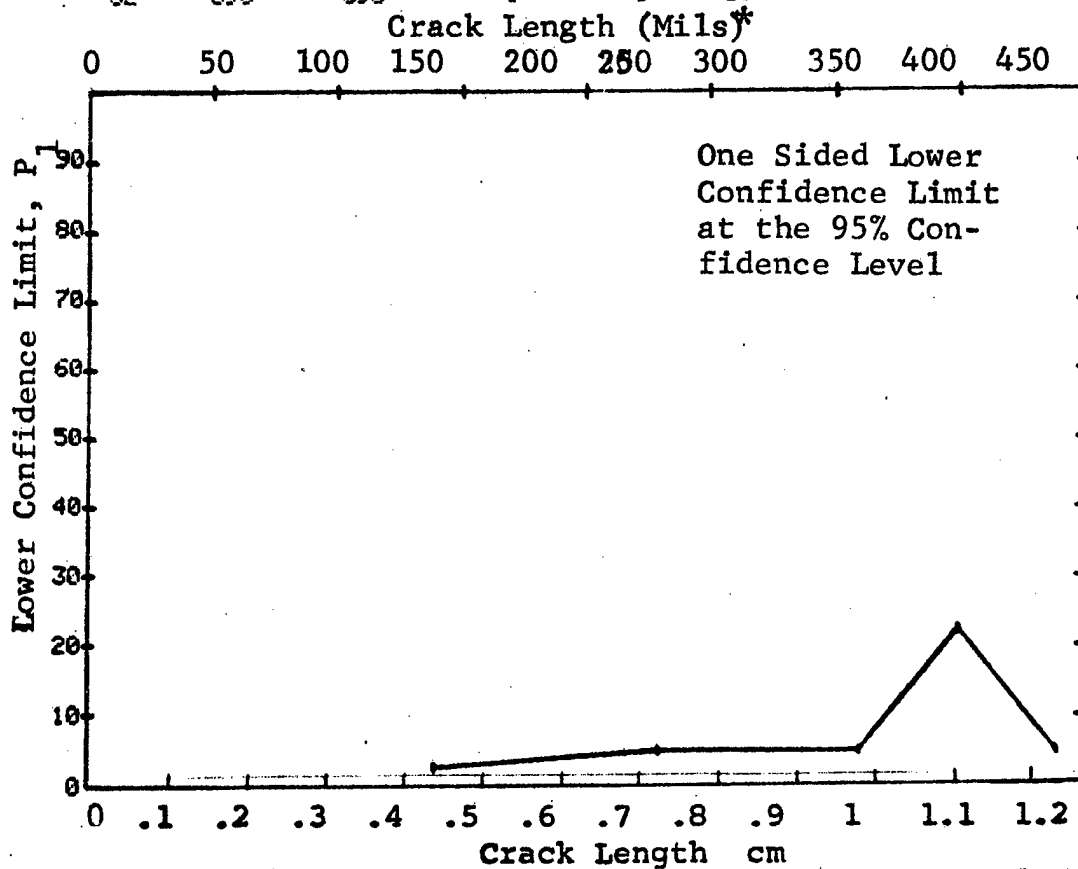


Figure D-91 Probability of Detection for 4340M Steel Using X-ray. Compressed Notch Flaws in Hollow Filleted Cylinder. Lab. Inv.

(b) Optimum Probability Method of Data Cumulation

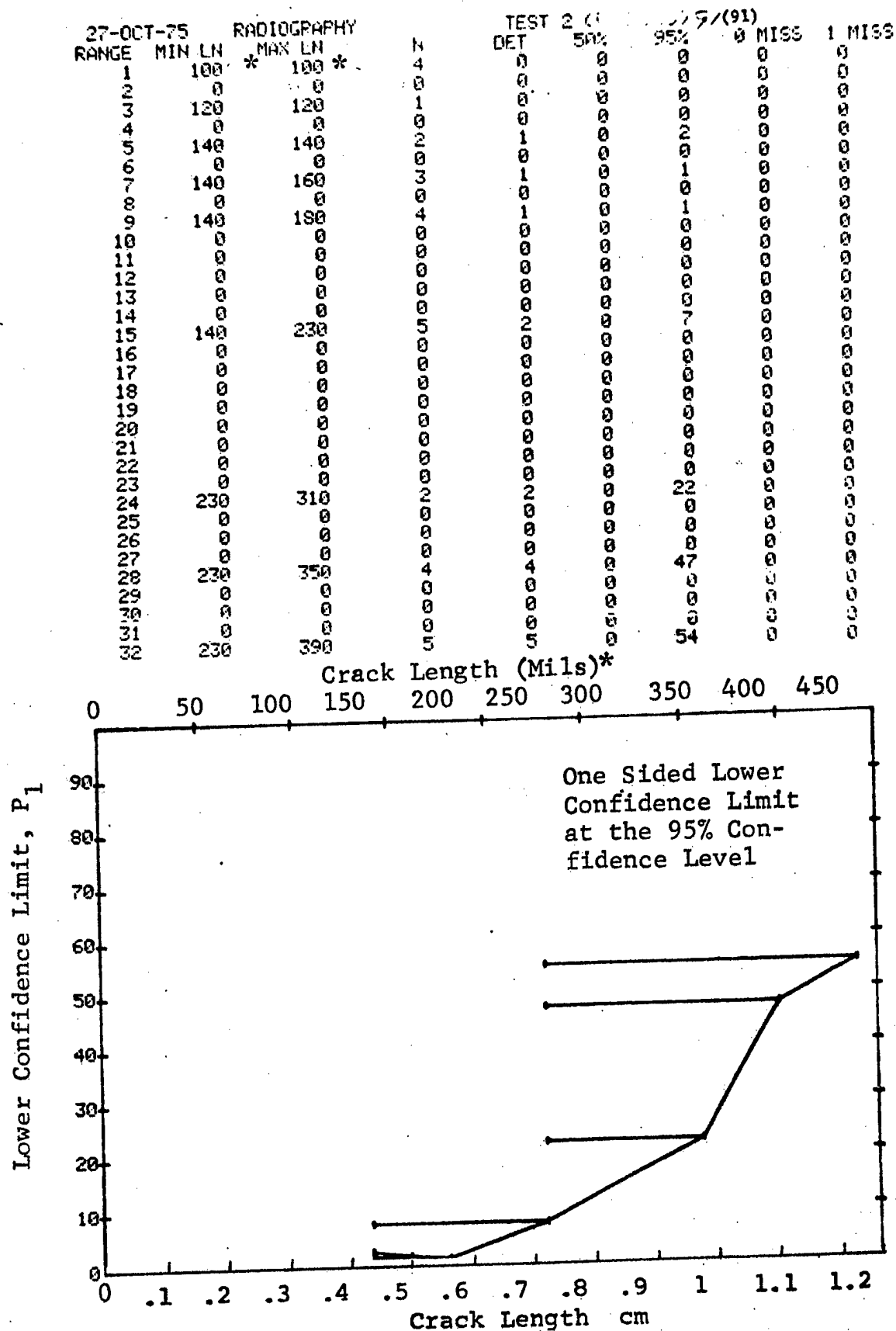


Figure D-91. (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

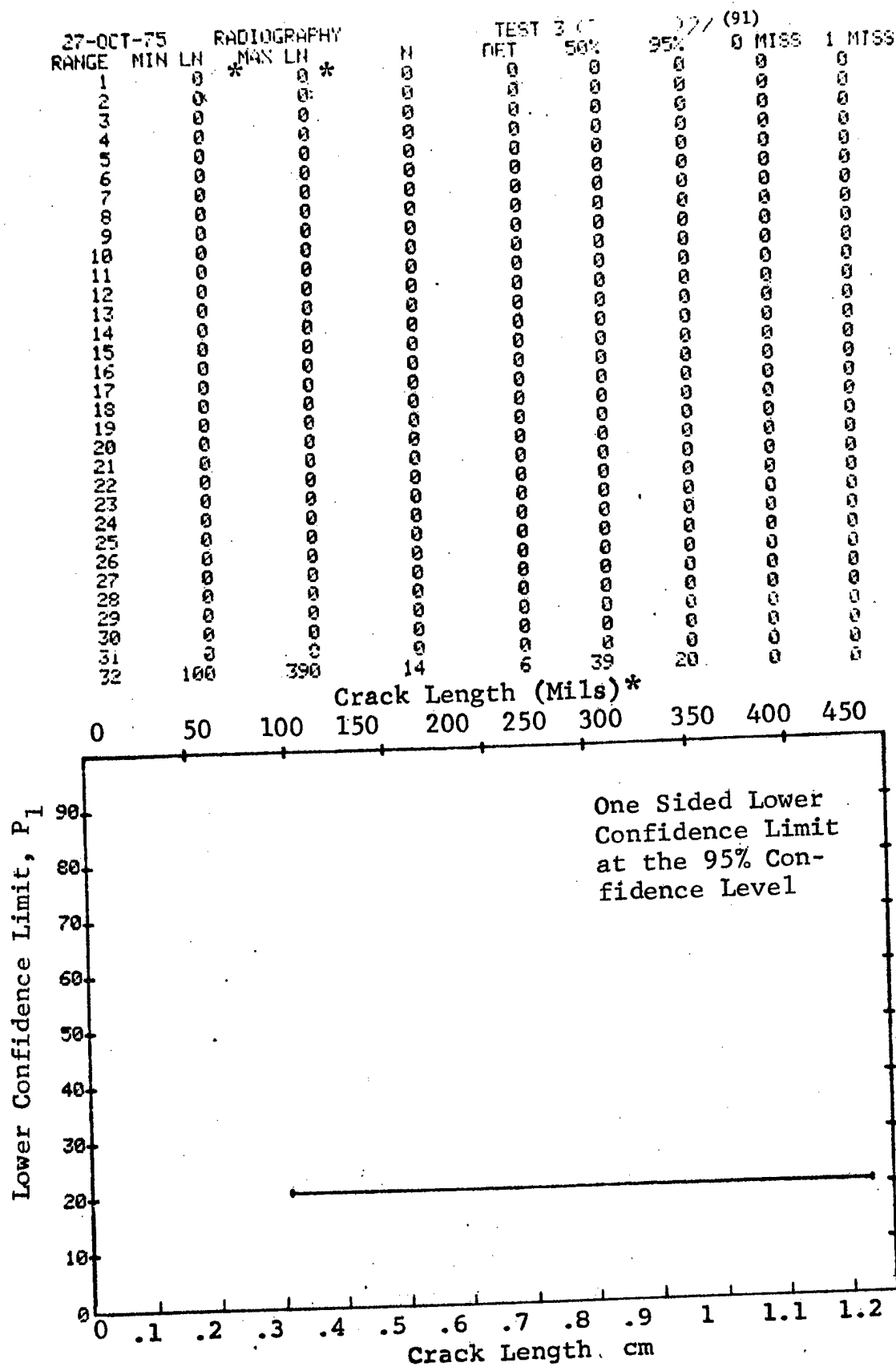


Figure D-91 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		RADIOGRAPHY			N	TEST 1		79.2 (92)		1 MISS
RANGE	MIN LN	* MAX LN	*	*		DET	50%	95%	0 MISS	
1	10	10	*	*	3	0	0	0	0	0
2	0	0			0	0	0	0	0	0
3	30	30			2	1	29	2	0	0
4	0	0			0	0	0	0	0	0
5	40	40			11	8	67	43	0	0
6	50	50			24	23	93	81	22	37
7	0	0			0	0	0	0	0	0
8	60	60			8	8	91	68	0	0
9	70	70			1	1	50	5	0	0
10	0	0			0	0	0	0	0	0
11	80	80			6	6	89	60	0	0
12	90	90			11	10	85	63	0	0
13	0	0			0	0	0	0	0	0
14	100	100			4	4	84	47	0	0
15	110	110			12	12	94	77	17	34
16	120	120			1	1	50	5	0	0
17	0	0			0	0	0	0	0	0
18	130	130			3	3	79	36	0	0
19	140	140			6	6	89	60	0	0
20	0	0			0	0	0	0	0	0
21	150	150			11	11	93	76	18	35
22	160	160			2	2	70	22	0	0
23	0	0			0	0	0	0	0	0
24	170	170			5	5	87	54	0	0
25	180	180			11	10	85	63	0	0
26	0	0			0	0	0	0	0	0
27	190	190			3	3	79	36	0	0
28	0	0			0	0	0	0	0	0
29	0	0			0	0	0	0	0	0
30	210	210			1	1	50	5	0	0
31	220	220			1	1	50	5	0	0
32	230	230			6	6	89	60	0	0

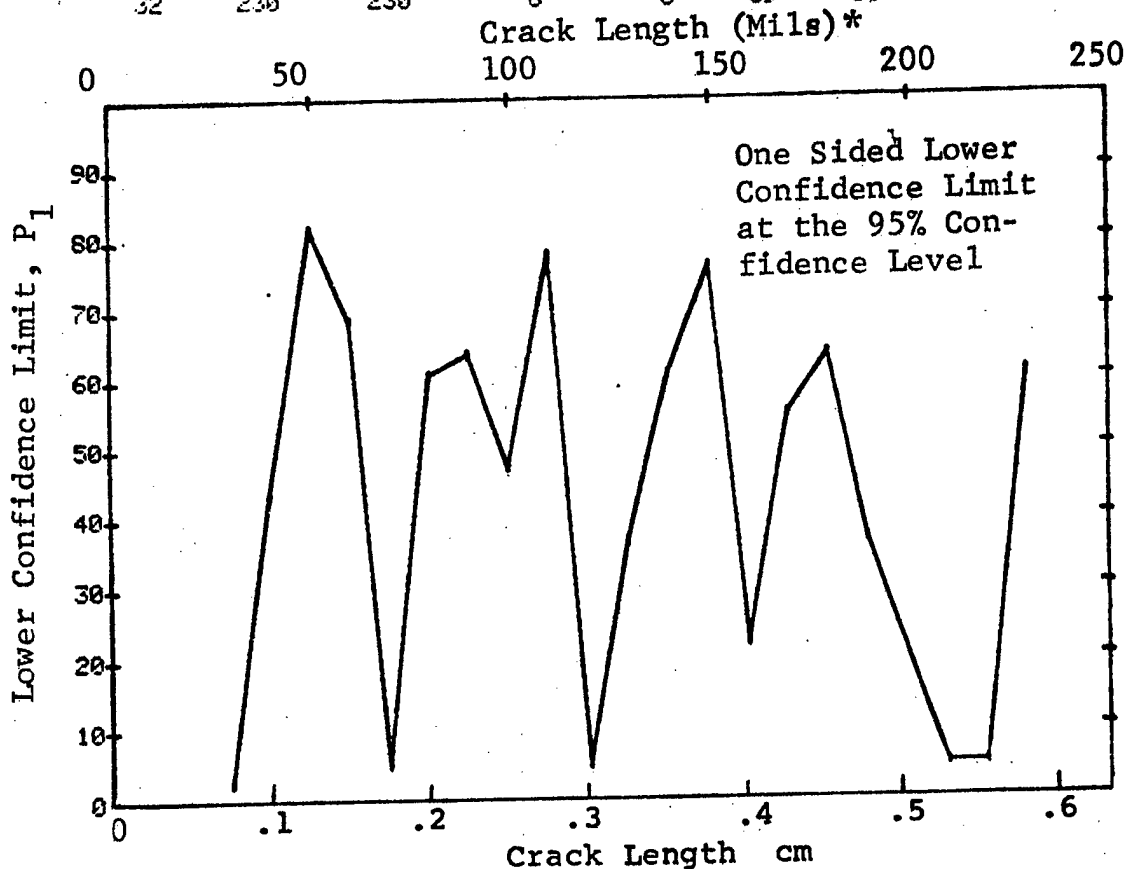


Figure D-92 Probability of Detection for 2024-T6 Al Using X-ray. Compressed Notch Flaws in Tandem T Specimen. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75		RADIOGRAPHY			TEST 2 X			92 - (92)		
RANGE	MIN	LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1		10	* 10 *	3	0	0	0	0	0	
2		0	0	0	0	0	0	0	0	
3		30	30	2	1	0	2	0	0	
4		0	0	0	0	0	0	0	0	
5		40	40	11	8	0	43	0	0	
6		50	50	24	23	0	81	22	37	
7		0	0	0	0	0	0	0	0	
8		50	60	32	31	0	86	14	29	
9		50	70	33	32	0	86	13	28	
10		0	0	0	0	0	0	0	0	
11		50	80	39	38	0	88	7	23	
12		50	90	50	48	0	87	11	26	
13		0	0	0	0	0	0	0	0	
14		50	100	54	52	0	88	7	23	
15		50	110	66	64	0	90	0	10	
16		50	120	67	65	0	90	0	9	
17		0	0	0	0	0	0	0	0	
18		50	130	70	68	0	91	0	0	
19		50	140	76	74	0	91	0	0	
20		0	0	0	0	0	0	0	0	
21		50	150	87	85	0	92	0	0	
22		50	160	89	87	0	93	0	0	
23		0	0	0	0	0	0	0	0	
24		50	170	94	92	0	93	0	0	
25		50	180	105	102	0	92	0	0	
26		0	0	0	0	0	0	0	0	
27		50	190	108	105	0	92	0	0	
28		0	0	0	0	0	0	0	0	
29		0	0	0	0	0	0	0	0	
30		50	210	109	106	0	93	0	0	
31		50	220	110	107	0	93	0	0	
32		50	230	116	113	0	93	0	0	

Crack Length (Mils)*

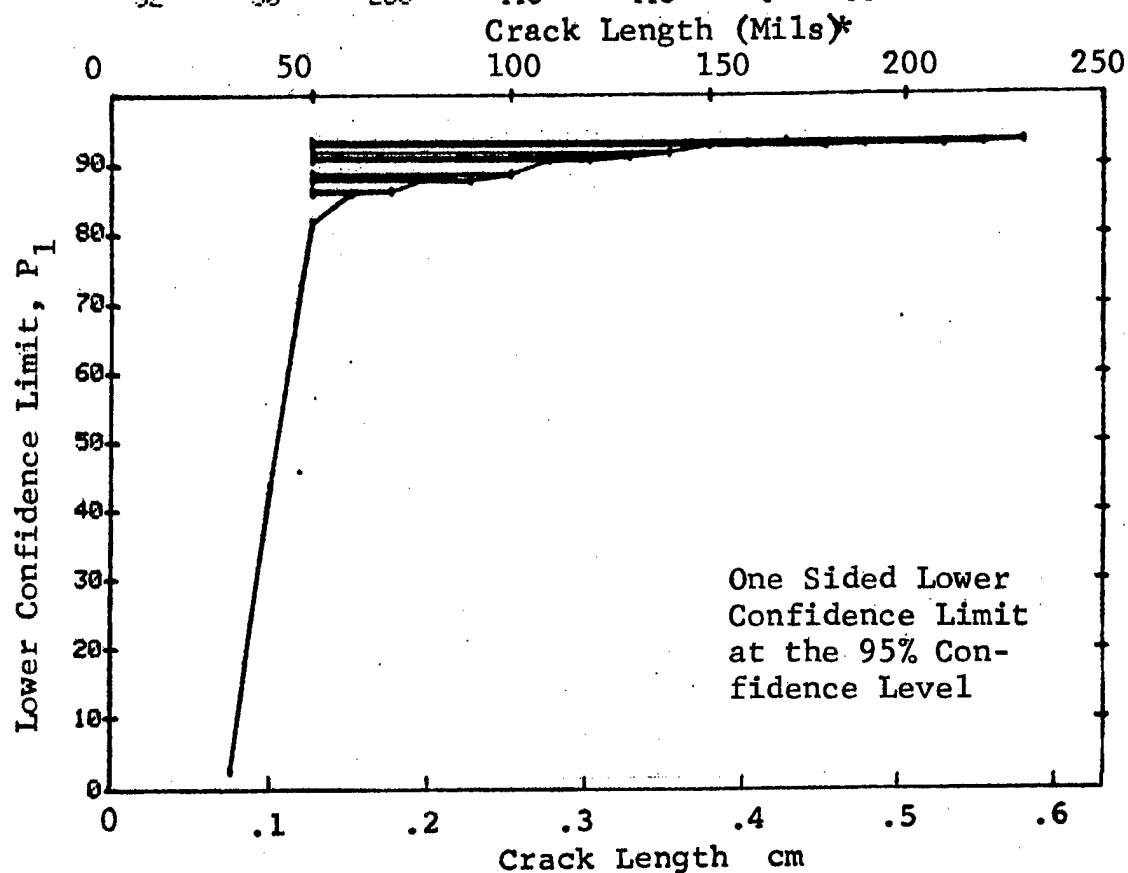


Figure D-92 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

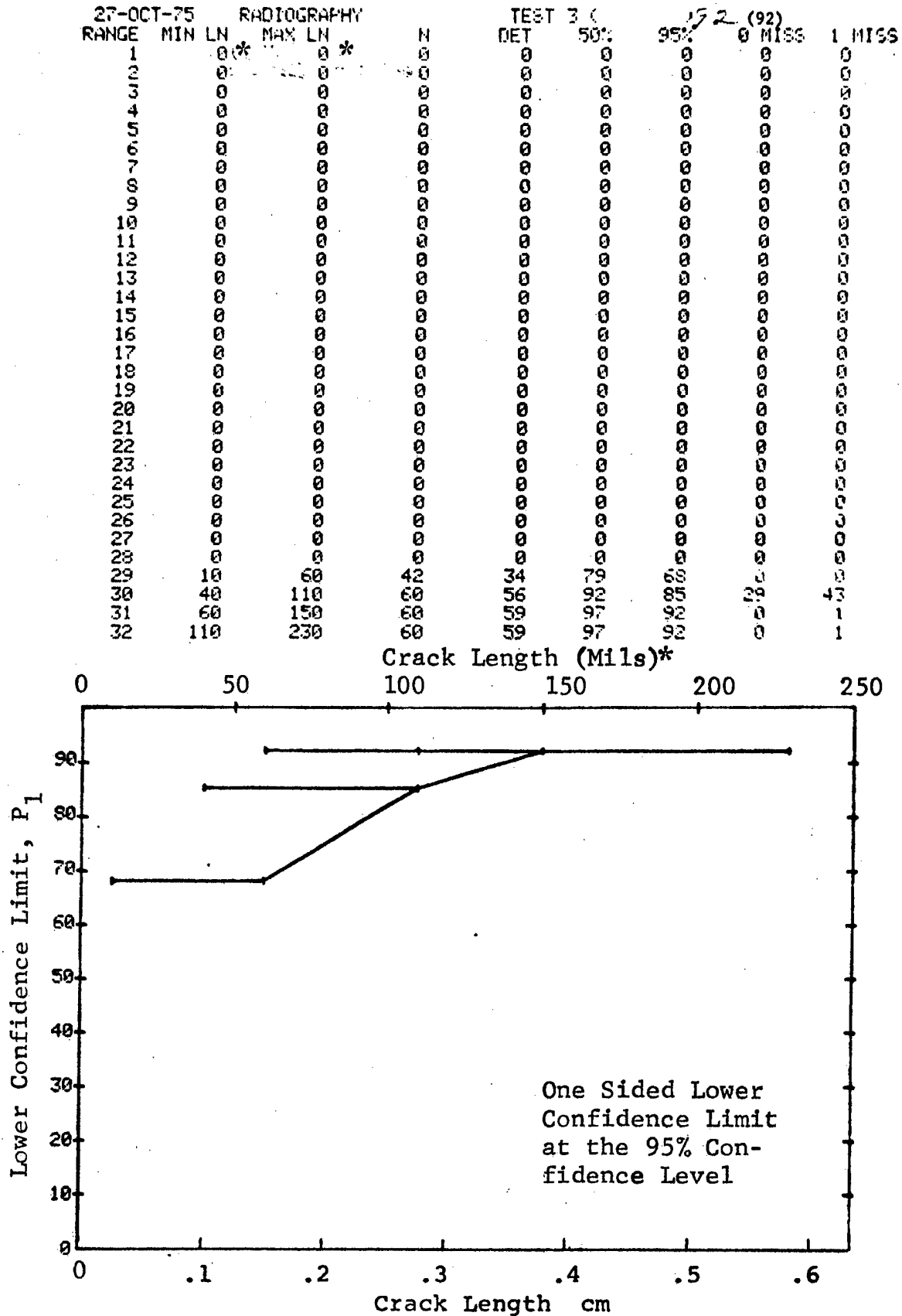


Figure D-92 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75			MAGNETIC PARTICLE			TEST/C			(93)		
RANGE	MIN	LN	* LN	* LN	N	DET	50%	95%	0 MISS	1 MISS	
1		30	*	50	20	15	72	54	0	0	
2		60		70	27	26	93	83	19	34	
3		0		0	0	0	0	0	0	0	
4		0		0	23	23	97	87	6	23	
5	110			120	34	34	97	91	0	12	
6	150			160	23	23	97	87	6	23	
7	0			0	0	0	0	0	0	0	
8	0			0	5	5	87	54	0	0	
9	200			200	0	0	0	0	0	0	
10	0			0	0	0	0	0	0	0	
11	0			0	0	0	0	0	0	0	
12	0			0	0	0	0	0	0	0	
13	0			0	0	0	0	0	0	0	
14	0			0	0	0	0	0	0	0	
15	0			0	0	0	0	0	0	0	
16	0			0	0	0	0	0	0	0	
17	0			0	0	0	0	0	0	0	
18	0			0	0	0	0	0	0	0	
19	0			0	0	0	0	0	0	0	
20	0			0	0	0	0	0	0	0	
21	0			0	0	0	0	0	0	0	
22	0			0	0	0	0	0	0	0	
23	0			0	0	0	0	0	0	0	
24	0			0	0	0	0	0	0	0	
25	0			0	0	0	0	0	0	0	
26	0			0	0	0	0	0	0	0	
27	0			0	0	0	0	0	0	0	
28	0			0	0	0	0	0	0	0	
29	0			0	0	0	0	0	0	0	
30	0			0	0	0	0	0	0	0	
31	0			0	0	0	0	0	0	0	
32	750			750	3	3	79	36	0	0	

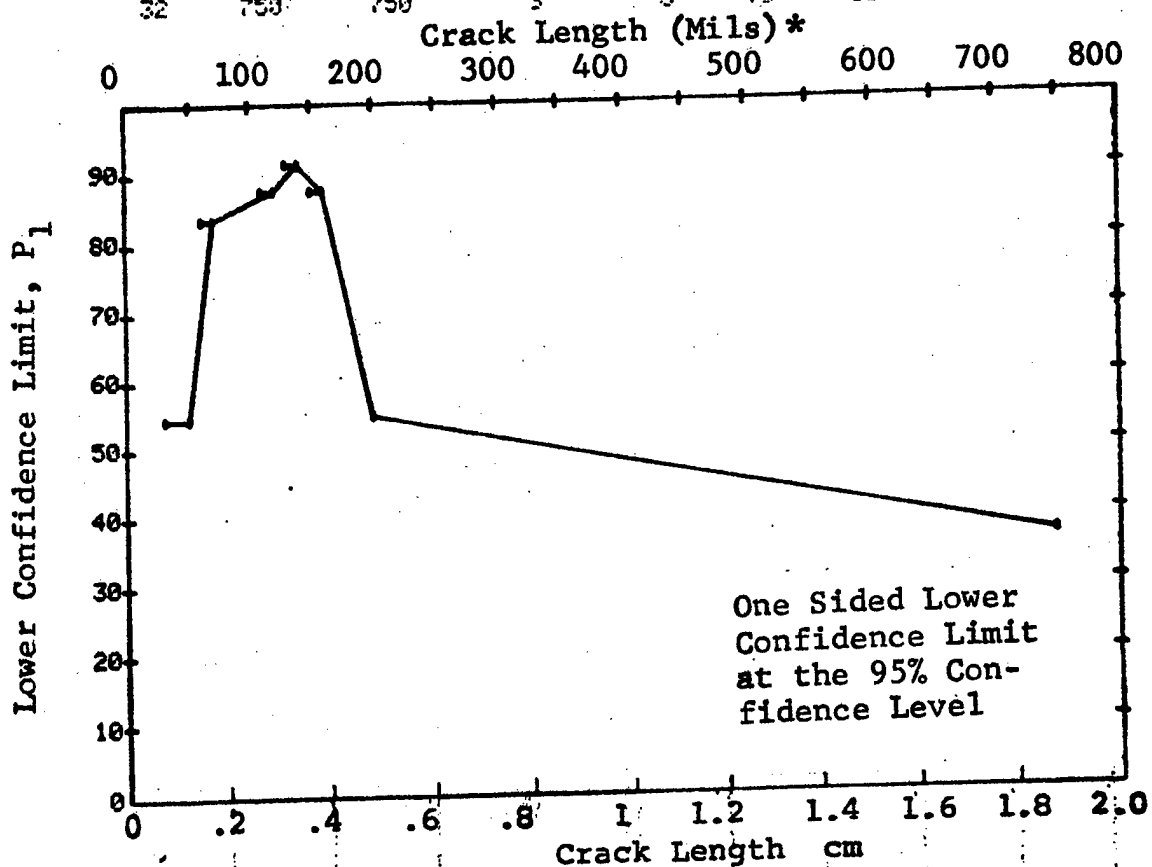


Figure D-93 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Solid Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

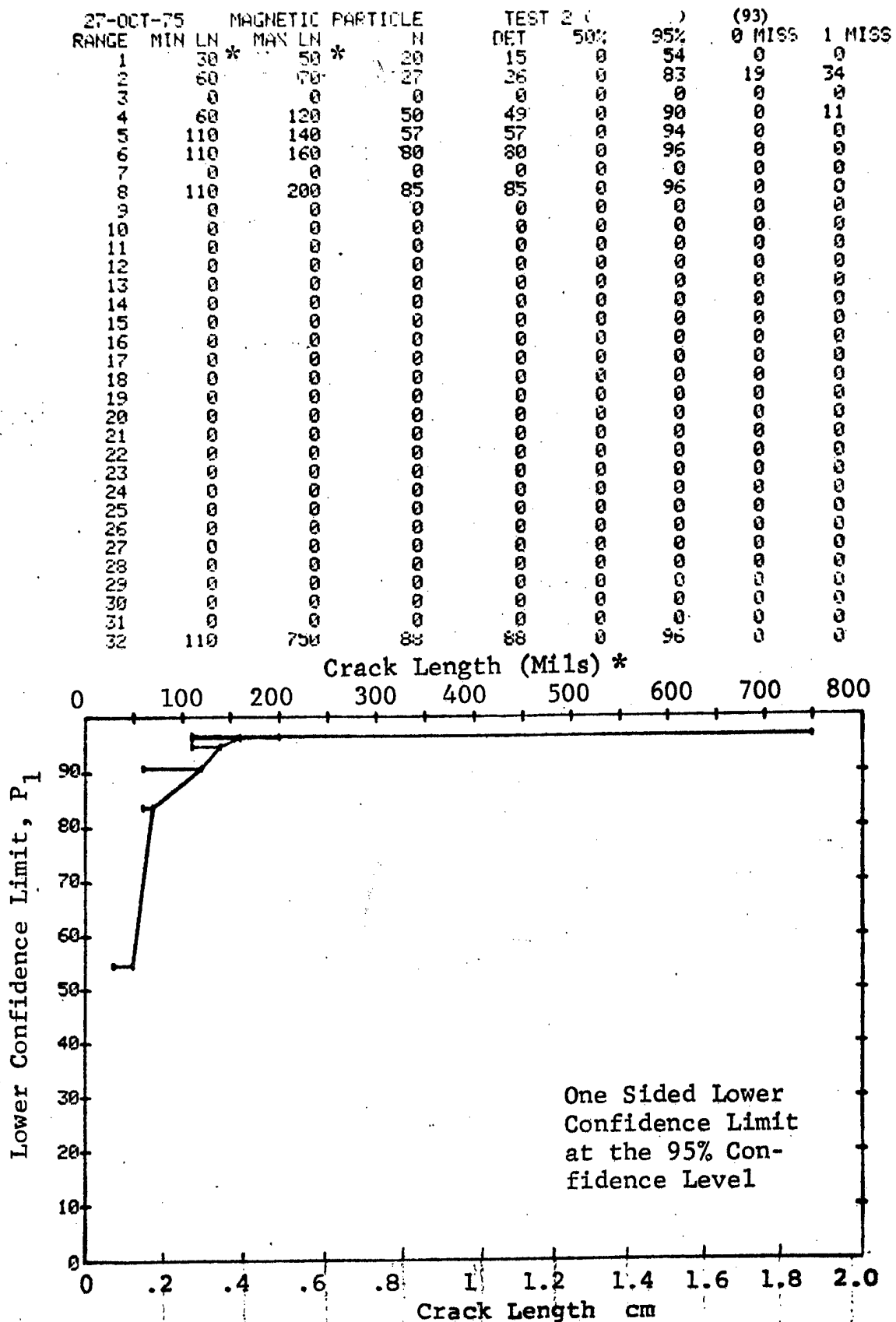


Figure D-93 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

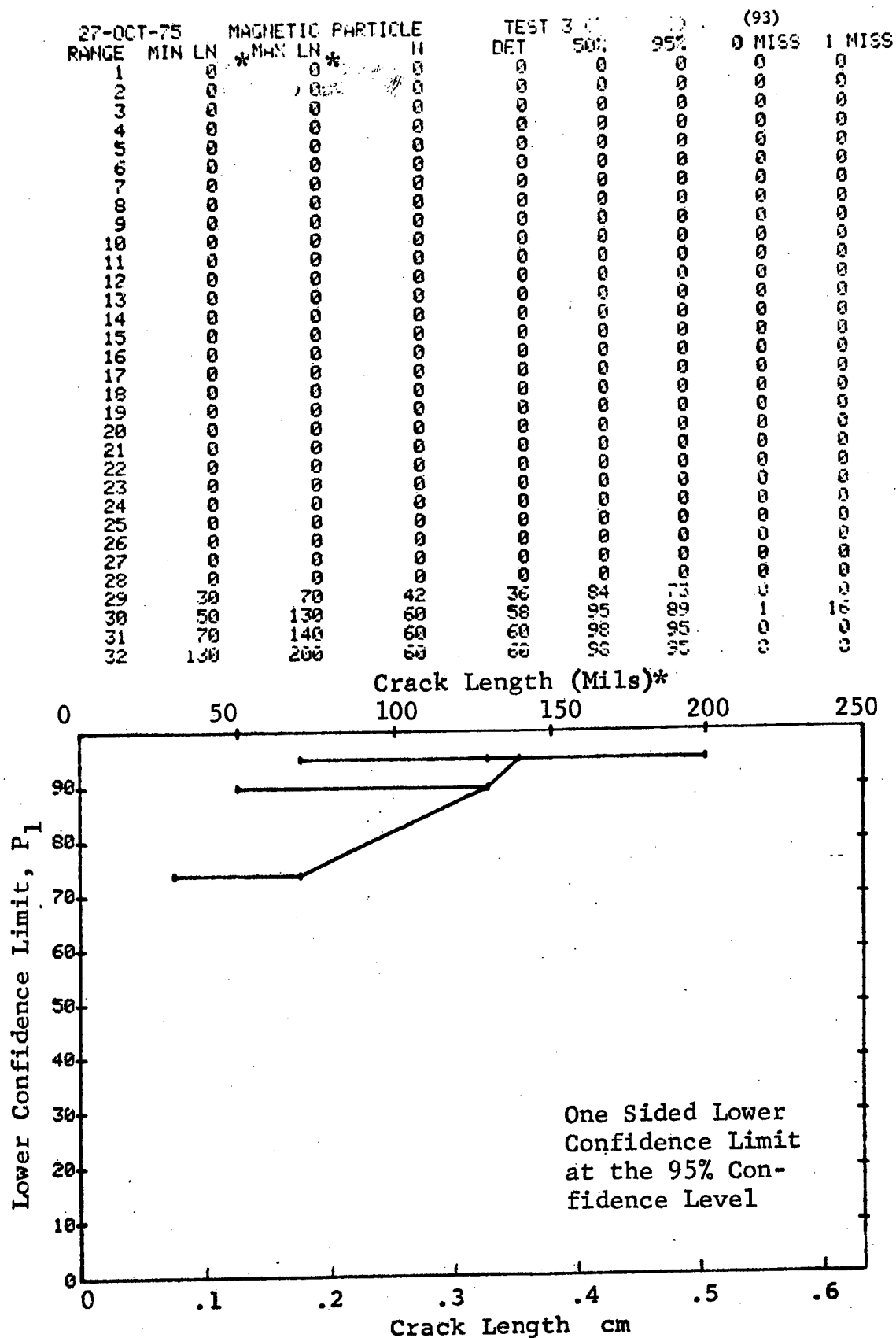


Figure D-93 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75				MAGNETIC PARTICLE		TEST 1		(94)		
RANGE	MIN	LN	* MAX	LN *	N	DET	50%	95%	0 MISS	1 MISS
1	20		30		13	3	20	6	0	0
2	0		0		0	0	0	0	0	0
3	0		0		0	0	0	0	0	0
4	60		60		9	9	92	71	0	0
5	70		70		16	15	89	73	0	0
6	0		0		0	0	0	0	0	0
7	90		90		11	11	93	76	18	35
8	100		100		8	8	91	68	0	0
9	0		0		0	0	0	0	0	0
10	130		130		4	4	84	47	0	0
11	140		140		7	7	90	65	0	0
12	150		150		9	9	92	71	0	0
13	0		0		0	0	0	0	0	0
14	0		0		0	0	0	0	0	0
15	0		0		0	0	0	0	0	0
16	0		0		0	0	0	0	0	0
17	0		0		0	0	0	0	0	0
18	0		0		0	0	0	0	0	0
19	0		0		0	0	0	0	0	0
20	0		0		0	0	0	0	0	0
21	0		0		0	0	0	0	0	0
22	260		260		2	2	70	22	0	0
23	0		0		0	0	0	0	0	0
24	0		0		0	0	0	0	0	0
25	300		300		5	5	87	54	0	0
26	0		0		0	0	0	0	0	0
27	0		0		0	0	0	0	0	0
28	0		0		0	0	0	0	0	0
29	0		0		0	0	0	0	0	0
30	0		0		0	0	0	0	0	0
31	0		0		0	0	0	0	0	0
32	370		380		5	5	87	54	0	0

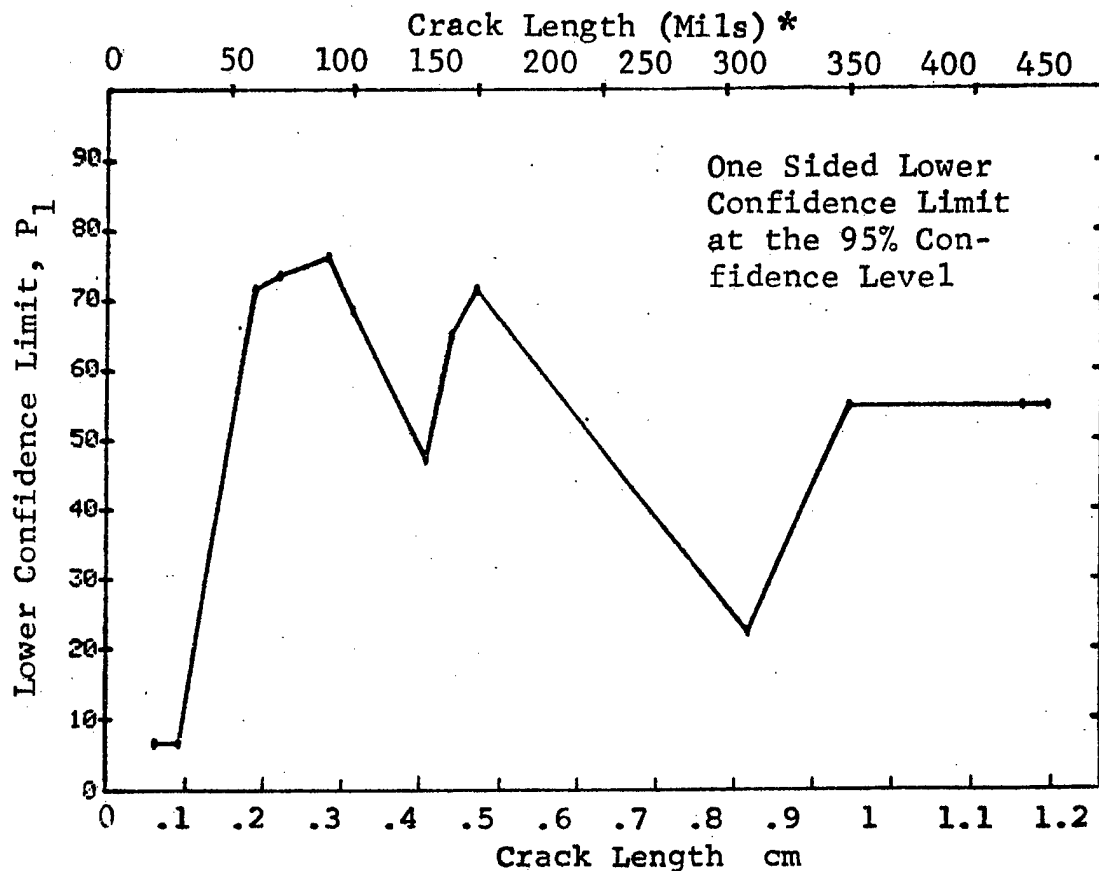


Figure D-94 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Hollow Filleted Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

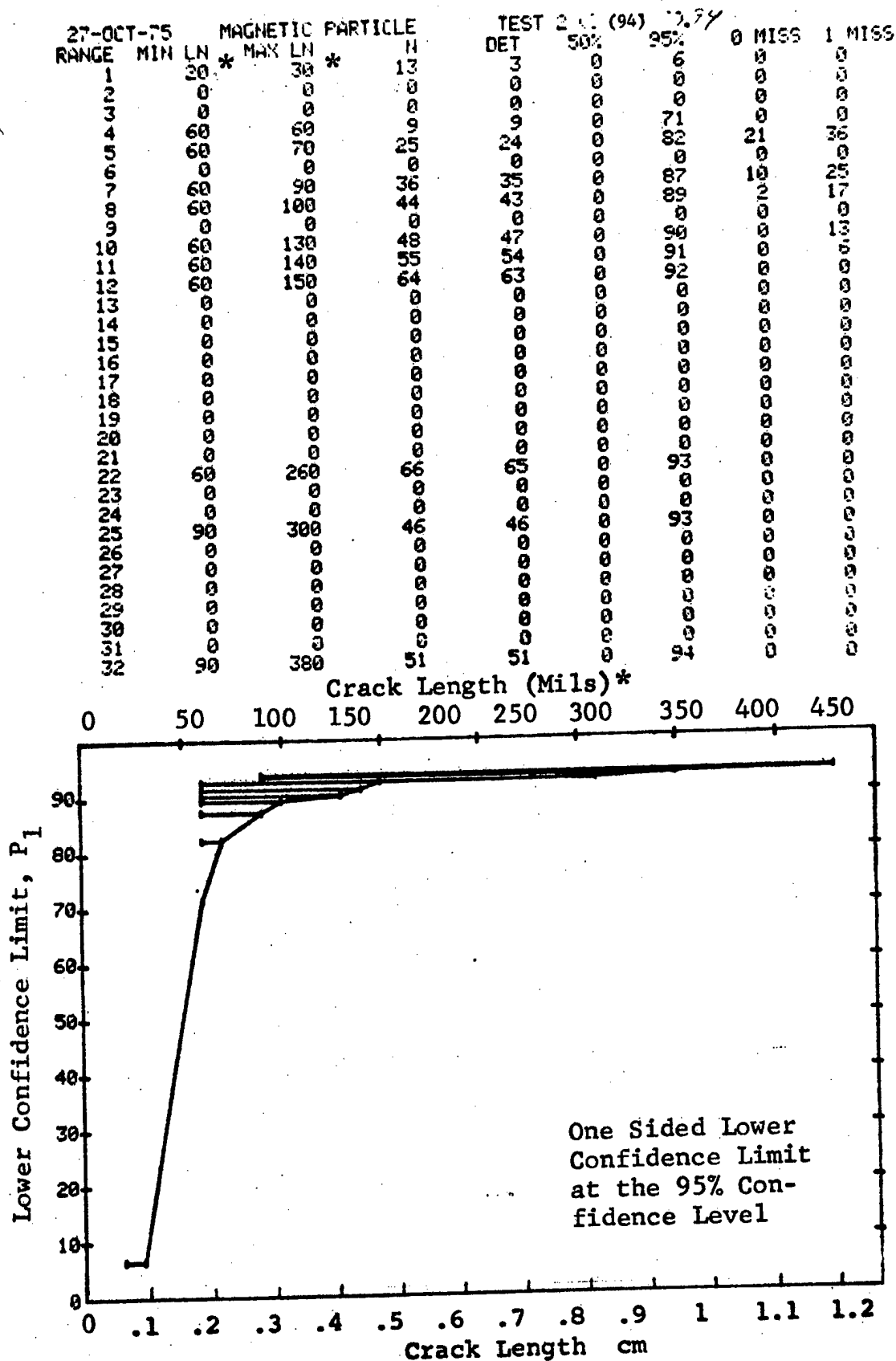


Figure D-94 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

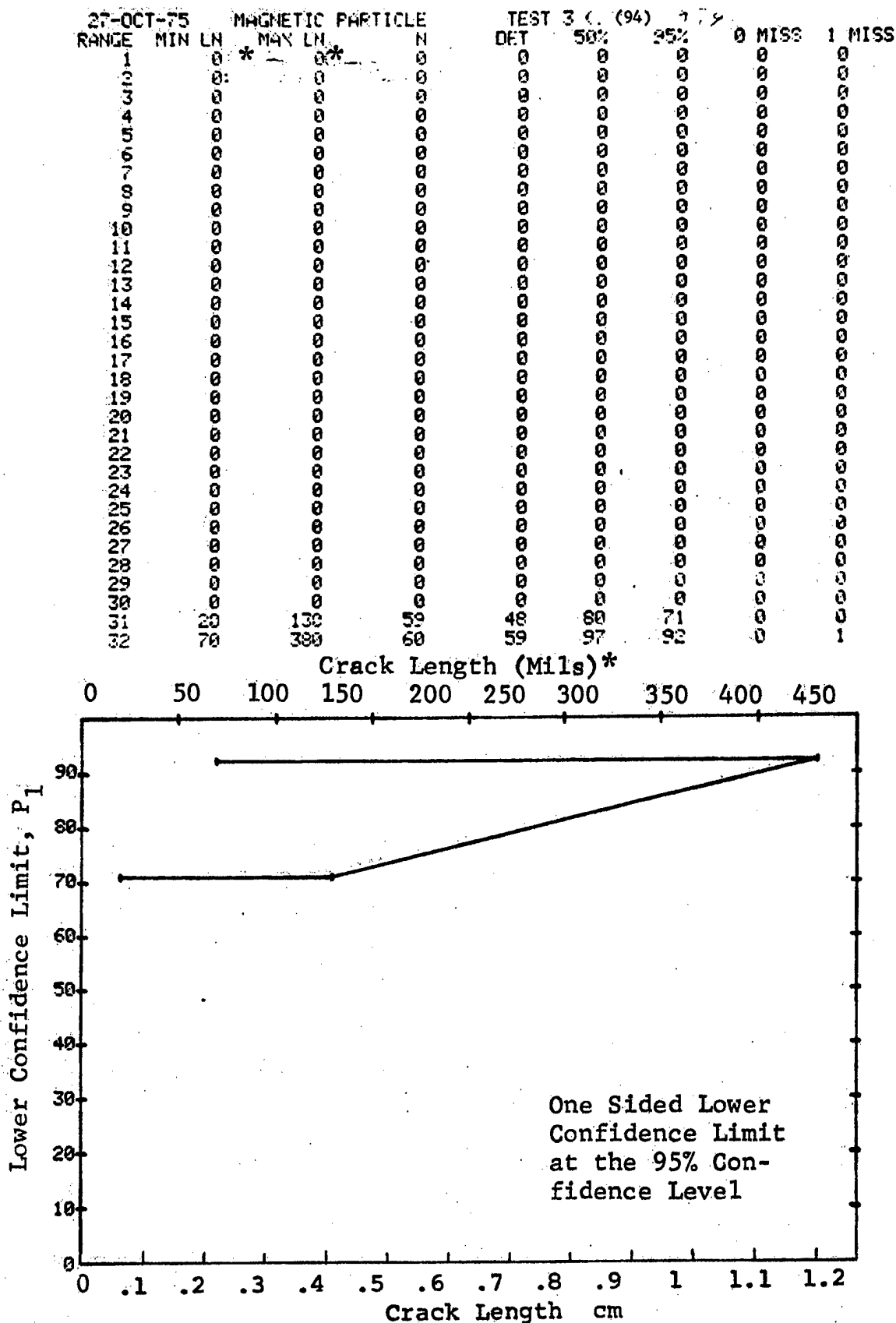


Figure D-94 (Concluded)

(a) Range Interval Method of Data Cumulation

27-OCT-75		MAGNETIC PARTICLE		TEST 1		75 (95)	
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS 1 MISS
1	60	60	3	0	0	0	0
2	0	0	0	0	0	0	0
3	100	100	13	5	35	16	0
4	120	120	4	1	15	1	0
5	130	130	2	1	29	2	0
6	140	140	6	3	42	15	0
7	160	160	3	1	20	1	0
8	180	180	4	2	38	9	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	230	230	2	1	29	2	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	310	310	4	3	61	24	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	350	350	10	9	83	60	0
20	0	0	0	0	0	0	0
21	390	390	4	4	84	47	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0
32	570	570	4	4	84	47	0

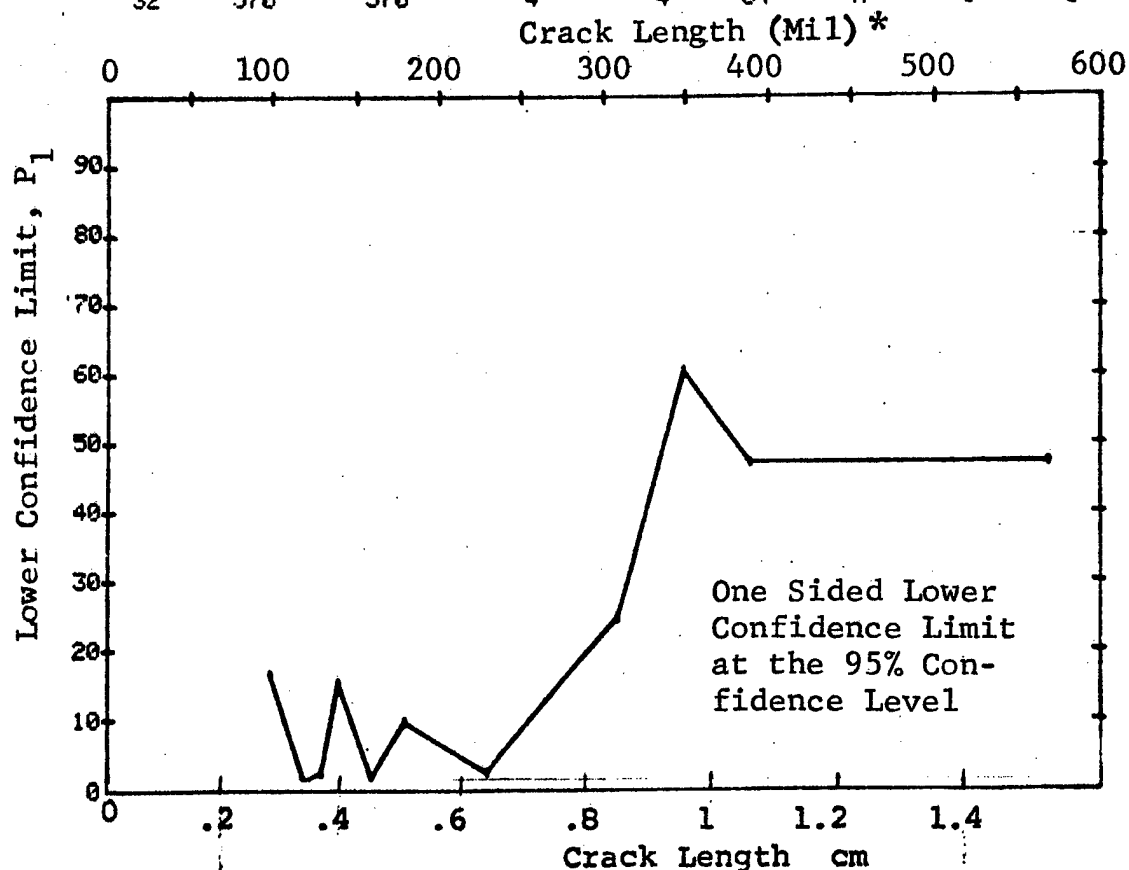


Figure D-95 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Hollow Filleted Cylinder. Prod. Env. D-291

(b) Optimum Probability Method of Data Cumulation

27-OCT-75 MAGNETIC PARTICLE				TEST 2 (05) 075				
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS
1	60	60	3	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	100	100	13	5	0	16	0	0
4	100	120	17	6	0	16	0	0
5	100	130	19	7	0	18	0	0
6	100	140	25	10	0	23	0	0
7	100	160	28	11	0	23	0	0
8	100	180	32	13	0	25	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	100	230	34	14	0	26	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	130	310	21	11	0	32	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	310	350	14	12	0	61	0	0
20	0	0	0	0	0	0	0	0
21	350	390	14	13	0	70	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	350	570	18	17	0	76	0	0

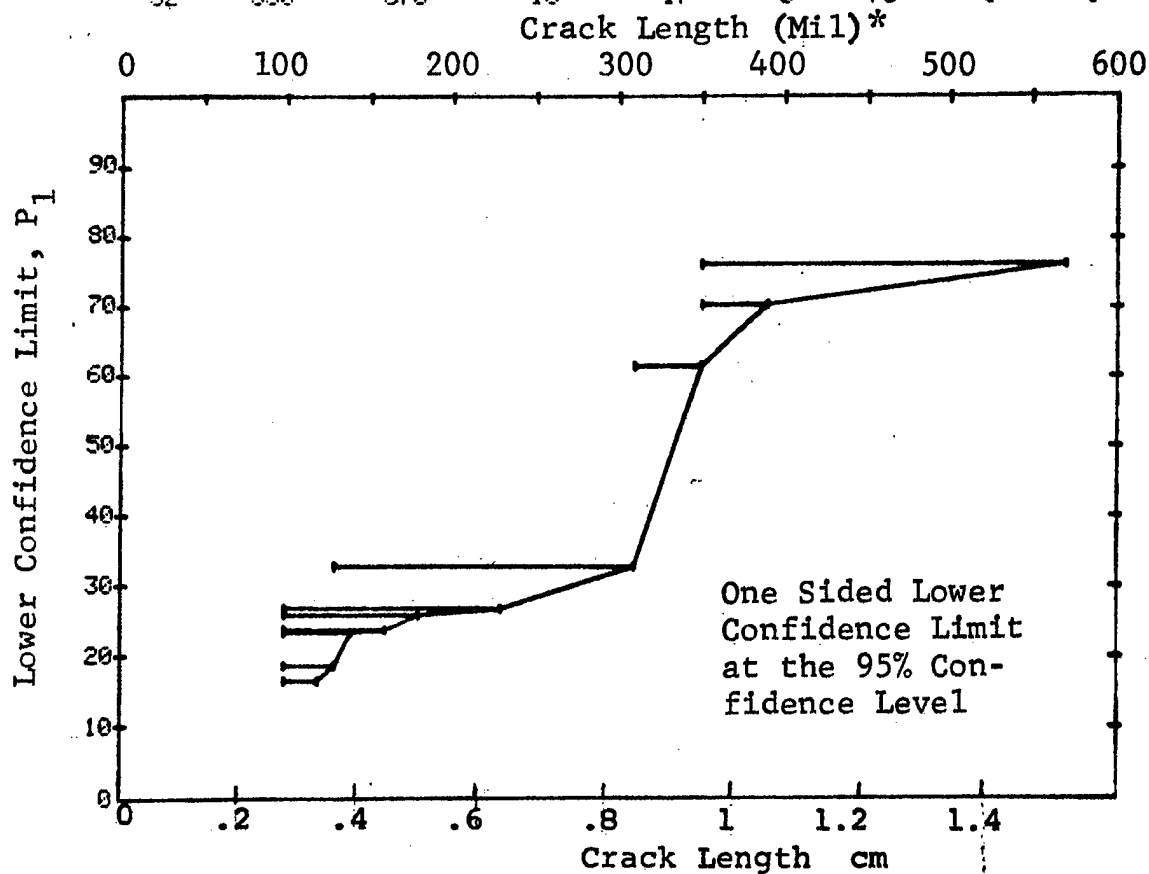


Figure D-95 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

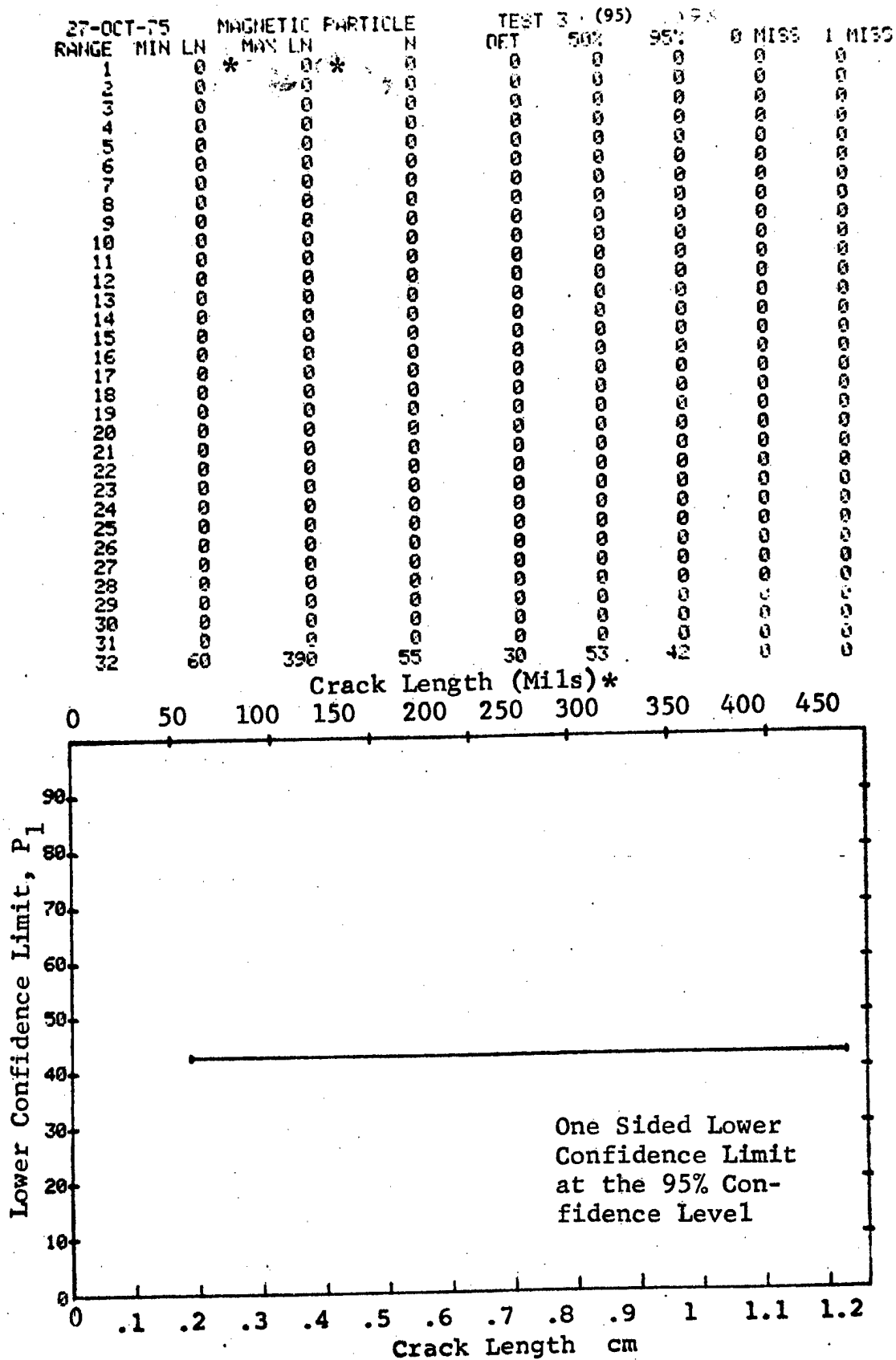


Figure D-95 (Concluded)

(a) Range Interval Method of Data Cumulation

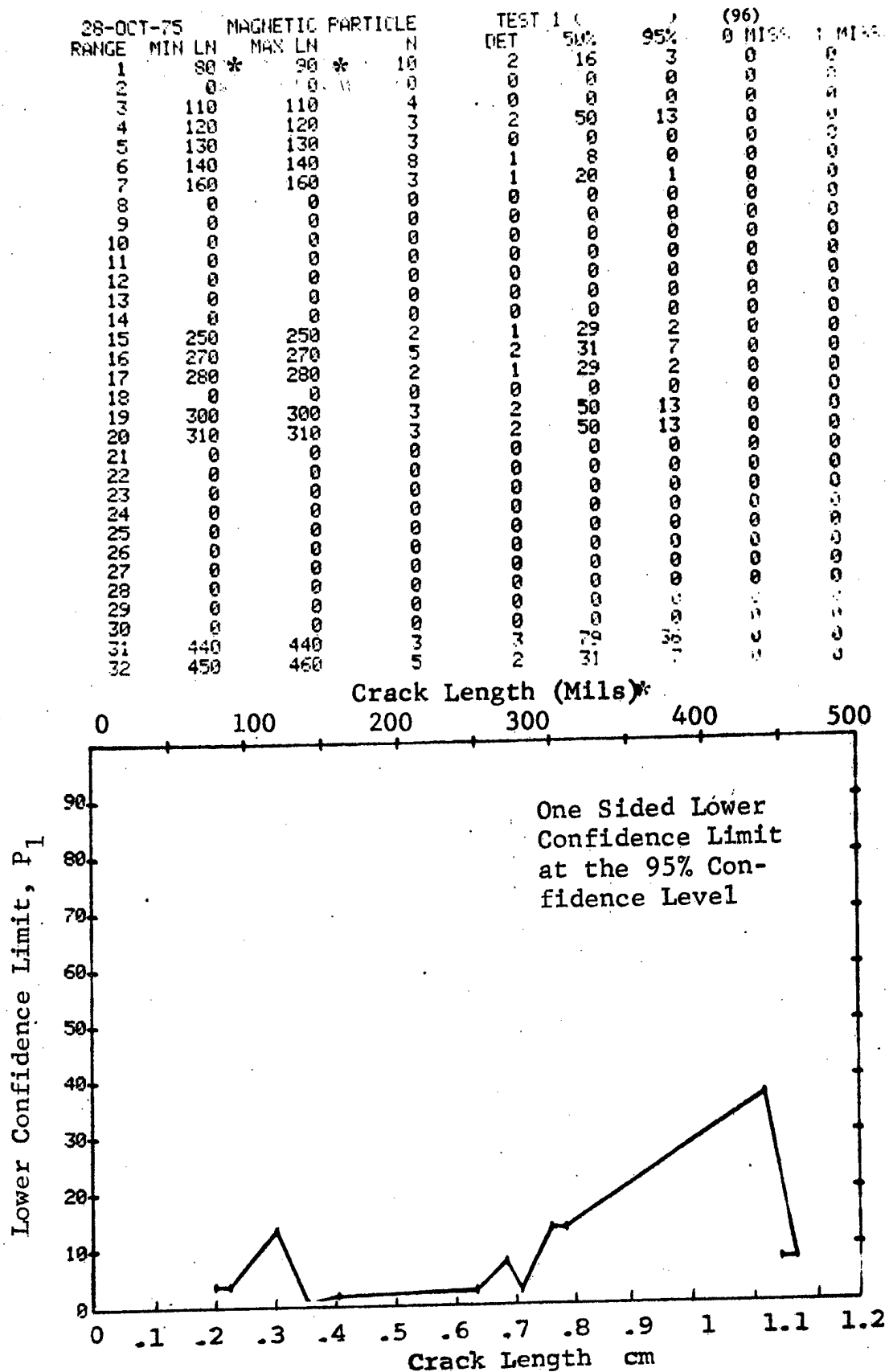


Figure D-96 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Hollow Filleted Cylinder Prod. Env. D-294

(b) Optimum Probability Method of Data Cumulation

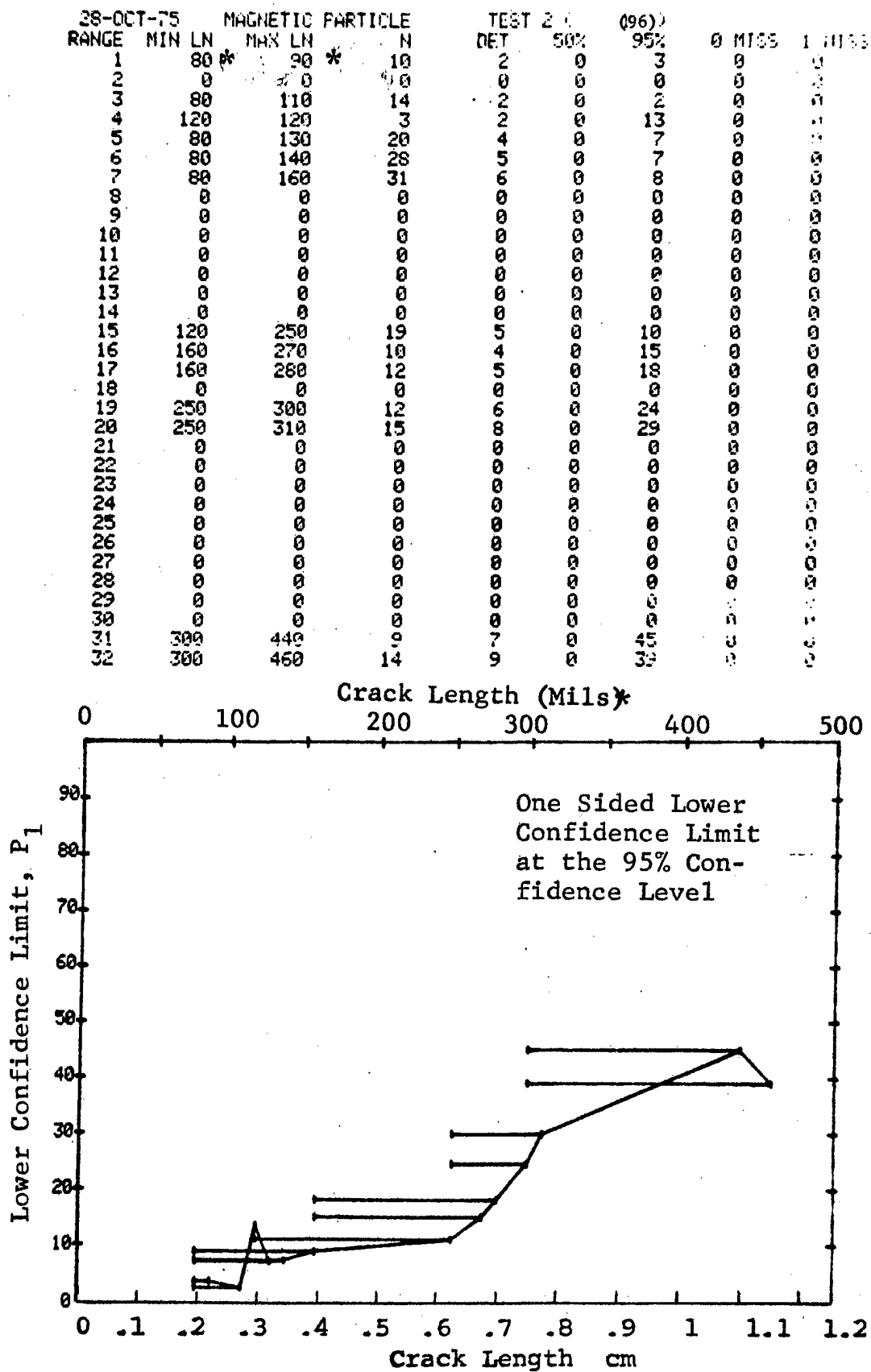


Figure D-96 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

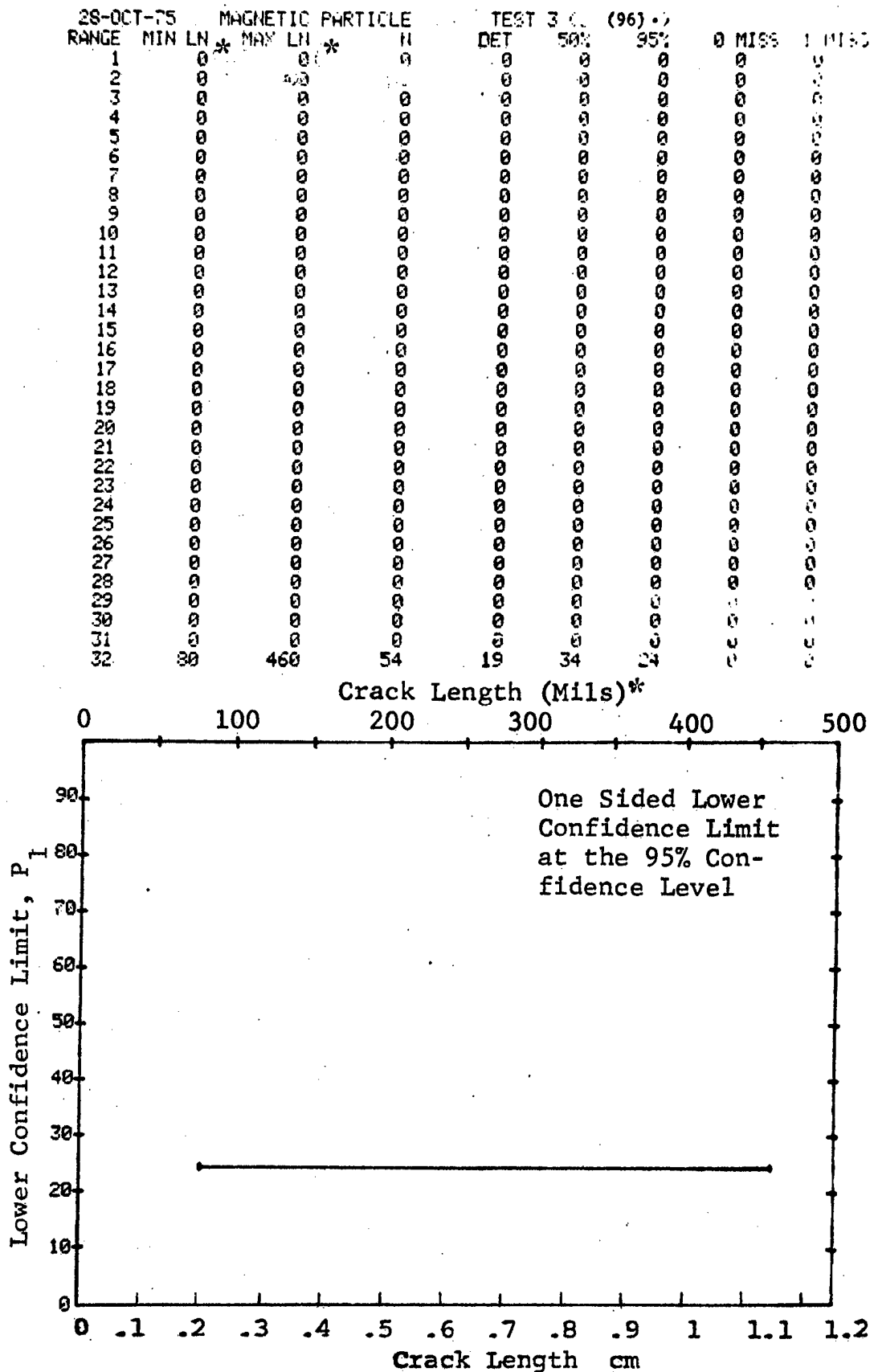


Figure D-96 (Concluded)

(a) Range Interval Method of Data Cumulation

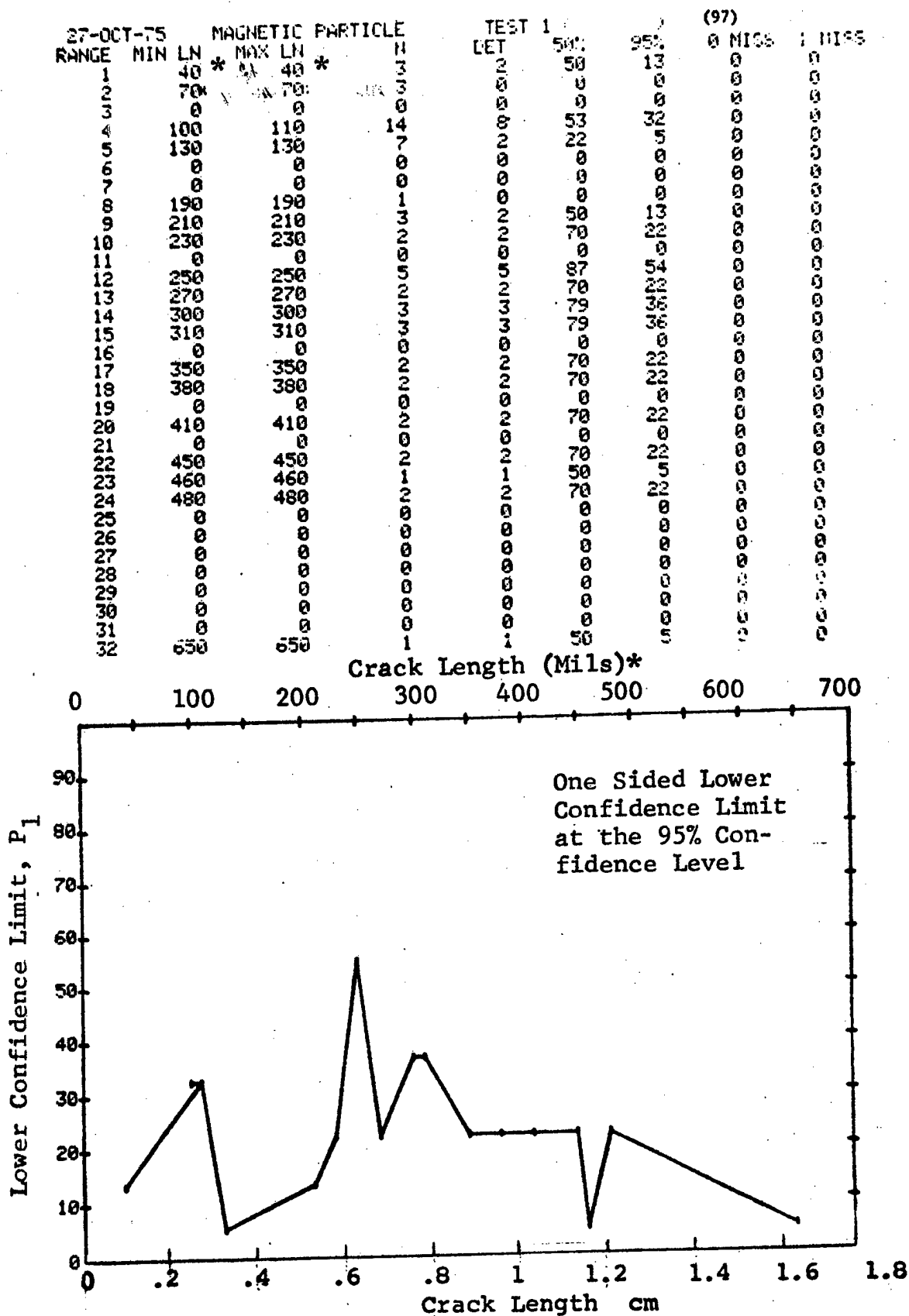


Figure D-97 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Solid Threaded Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

27-OCT-75				MAGNETIC PARTICLE			TEST 2		(97)		
RANGE	MIN	LN	MAX	LN	*	N	DET	50%	95%	0 MISS	1 MISS
1		40*	40	*		3	2	0	13	0	0
2		40	70			6	2	0	6	0	0
3		0	0			0	0	0	0	0	0
4	100		110			14	8	0	32	0	0
5	100		130			21	10	0	28	0	0
6	0		0			0	0	0	0	0	0
7	0		0			0	0	0	0	0	0
8	100		190			22	10	0	27	0	0
9	100		210			25	12	0	30	0	0
10	100		230			27	14	0	34	0	0
11	0		0			0	0	0	0	0	0
12	230		250			7	7	0	65	0	0
13	230		270			9	9	0	71	0	0
14	230		300			12	12	0	77	0	0
15	230		310			15	15	0	81	14	31
16	0		0			0	0	0	0	0	0
17	230		350			17	17	0	83	12	29
18	230		380			19	19	0	85	10	27
19	0		0			0	0	0	0	0	0
20	230		410			21	21	0	86	0	25
21	0		0			0	0	0	0	0	0
22	230		450			23	23	0	87	6	23
23	230		460			24	24	0	88	5	22
24	230		480			26	26	0	89	3	20
25	0		0			0	0	0	0	0	0
26	0		0			0	0	0	0	0	0
27	0		0			0	0	0	0	0	0
28	0		0			0	0	0	0	0	0
29	0		0			0	0	0	0	0	0
30	0		0			0	0	0	0	0	0
31	0		0			0	0	0	0	0	0
32	230		650			27	27	0	89	2	19

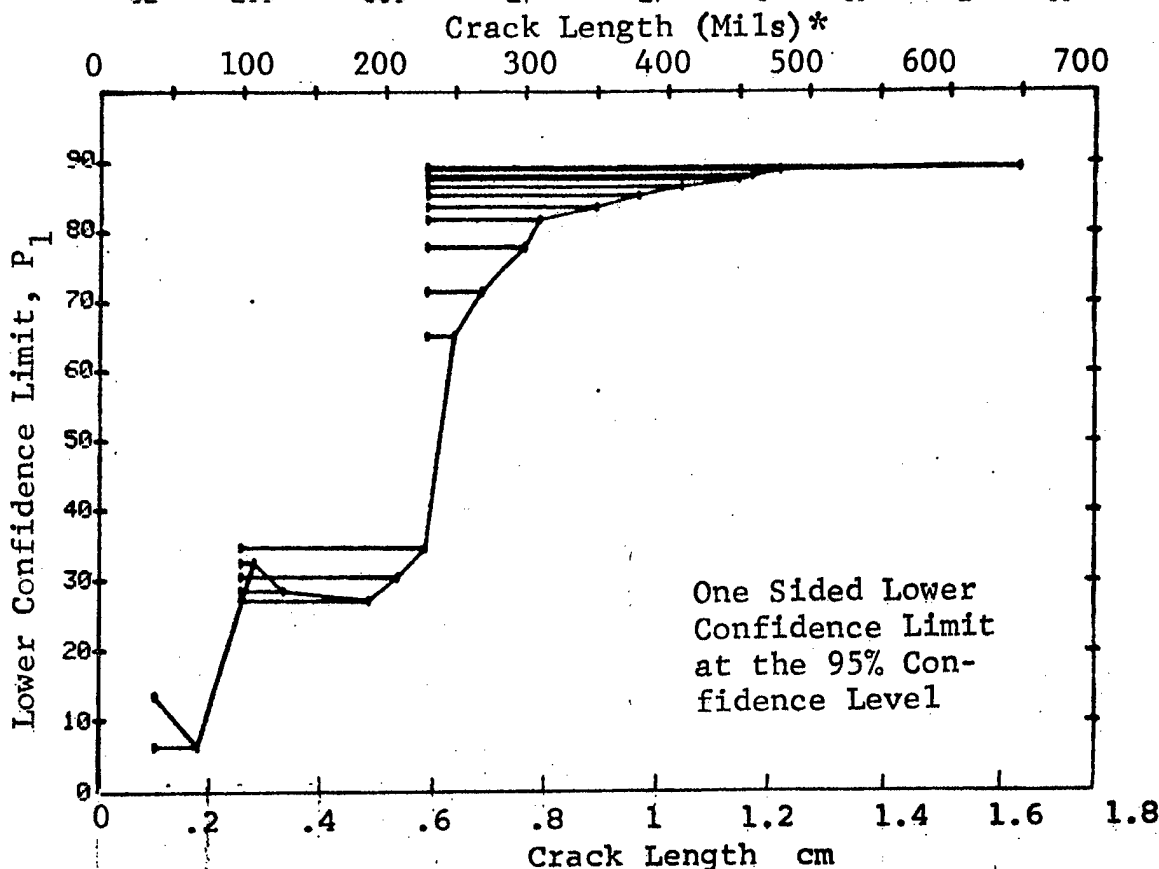


Figure D-97 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

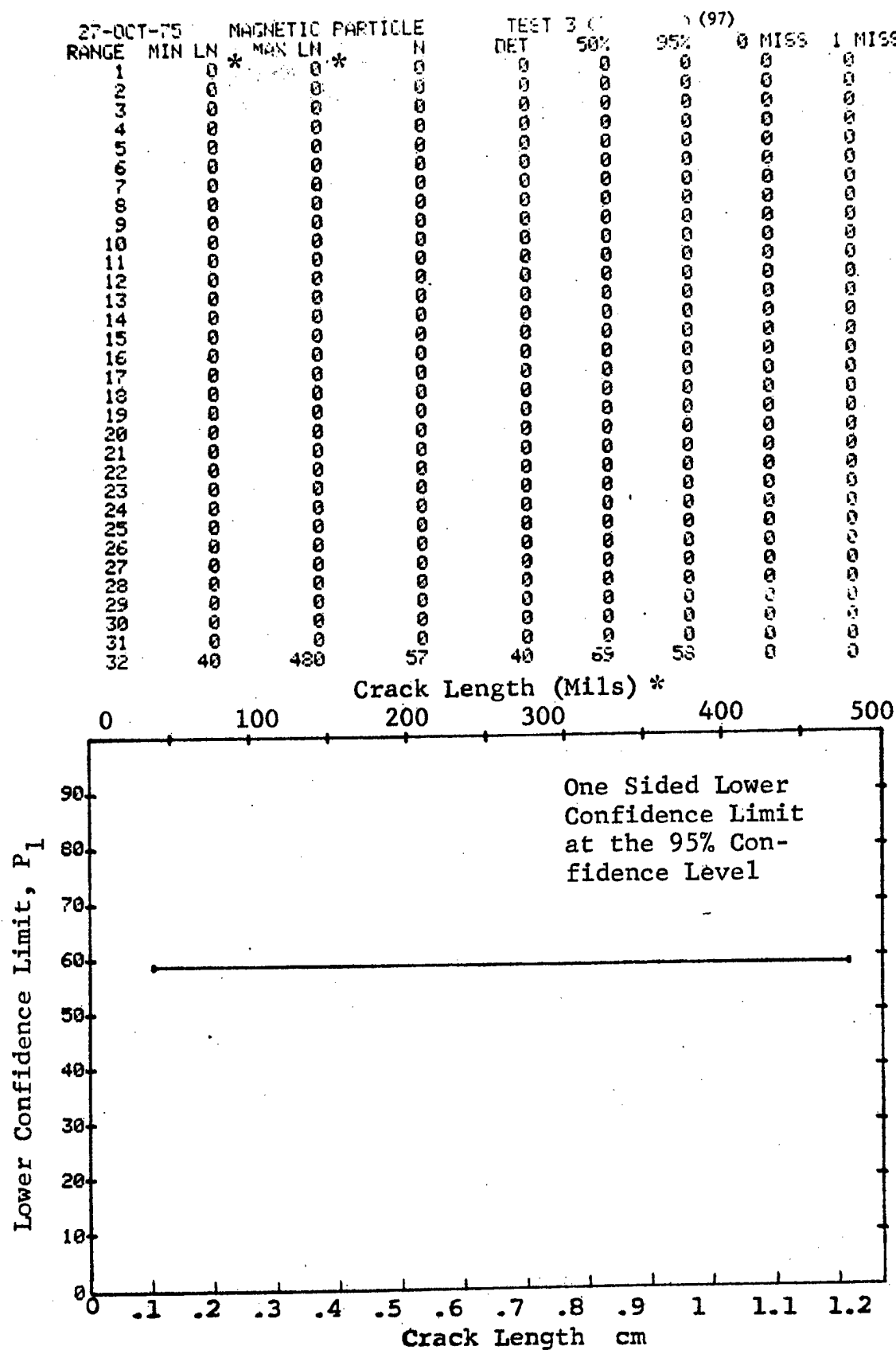


Figure D-97(Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75				MAGNETIC PARTICLE			TEST 1			(98)		
RANGE	MIN	LN *	MAX LN *	N	DET	50%	95%	0 MISS	1 MISS			
1		30	50	31	24	75	61	0	0			
2		60	100	27	27	97	89	2	19			
3		0	0	0	0	0	0	0	0			
4		110	120	25	25	97	88	4	21			
5		130	140	38	38	98	92	0	0			
6		150	160	13	13	94	79	16	33			
7		0	0	0	0	0	0	0	0			
8		200	200	3	3	79	36	0	0			
9		0	0	0	0	0	0	0	0			
10		0	0	0	0	0	0	0	0			
11		0	0	0	0	0	0	0	0			
12		0	0	0	0	0	0	0	0			
13		0	0	0	0	0	0	0	0			
14		0	0	0	0	0	0	0	0			
15		0	0	0	0	0	0	0	0			
16		0	0	0	0	0	0	0	0			
17		0	0	0	0	0	0	0	0			
18		0	0	0	0	0	0	0	0			
19		0	0	0	0	0	0	0	0			
20		0	0	0	0	0	0	0	0			
21		0	0	0	0	0	0	0	0			
22		0	0	0	0	0	0	0	0			
23		0	0	0	0	0	0	0	0			
24		0	0	0	0	0	0	0	0			
25		0	0	0	0	0	0	0	0			
26		0	0	0	0	0	0	0	0			
27		0	0	0	0	0	0	0	0			
28		0	0	0	0	0	0	0	0			
29		0	0	0	0	0	0	0	0			
30		0	0	0	0	0	0	0	0			
31		0	0	0	0	0	0	0	0			
32	750		750	5	5	89	60	0	0			

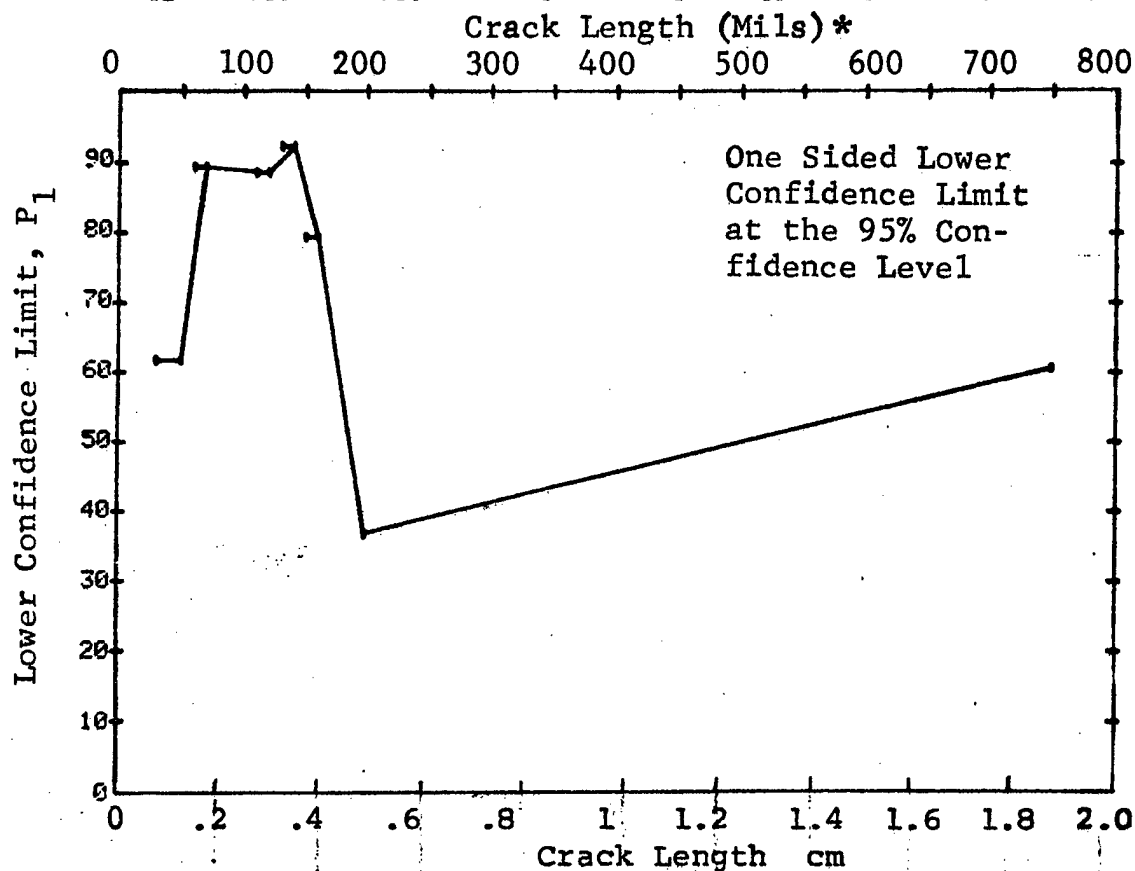


Figure D-98 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Solid Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

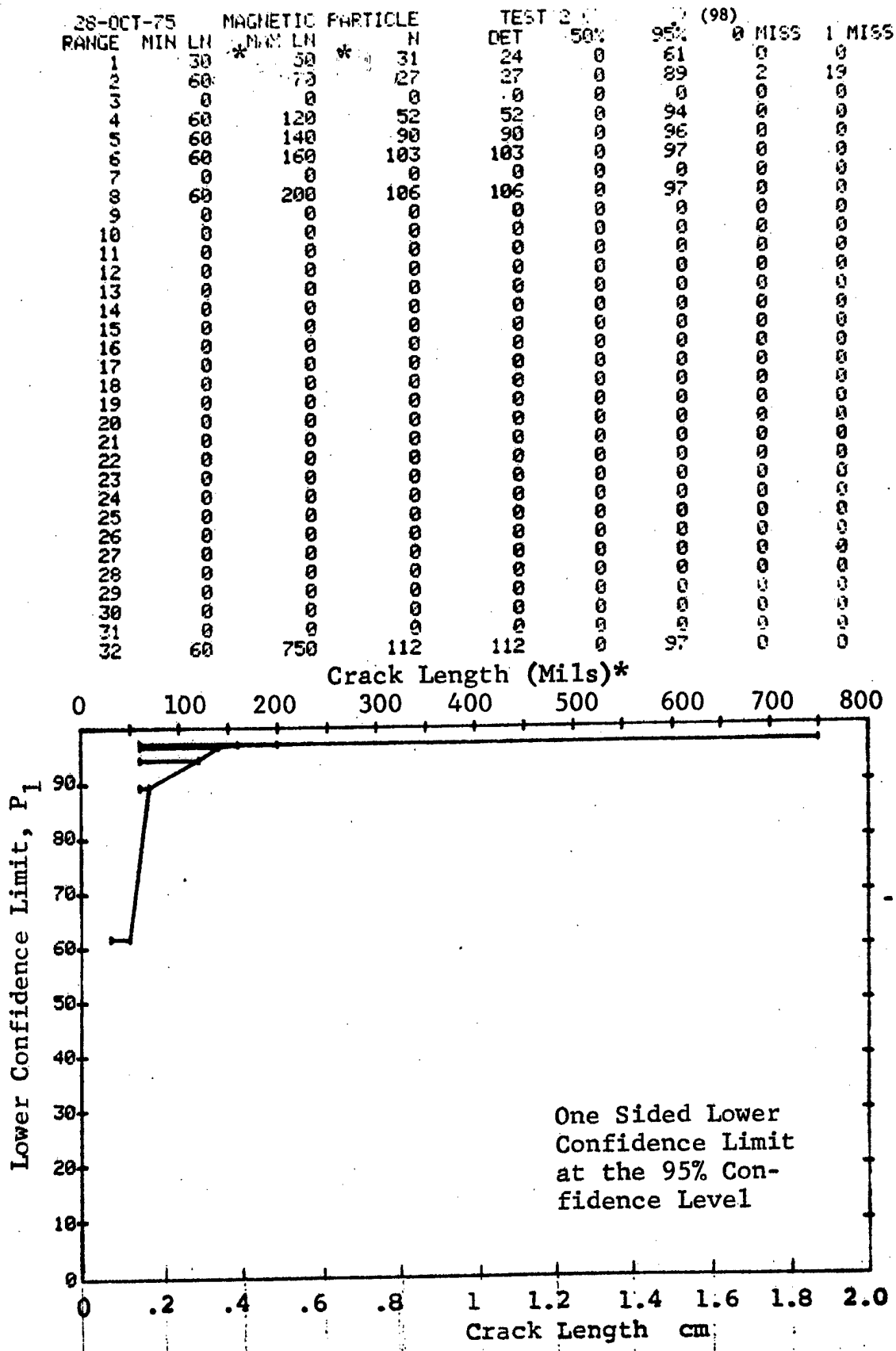


Figure D-98 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

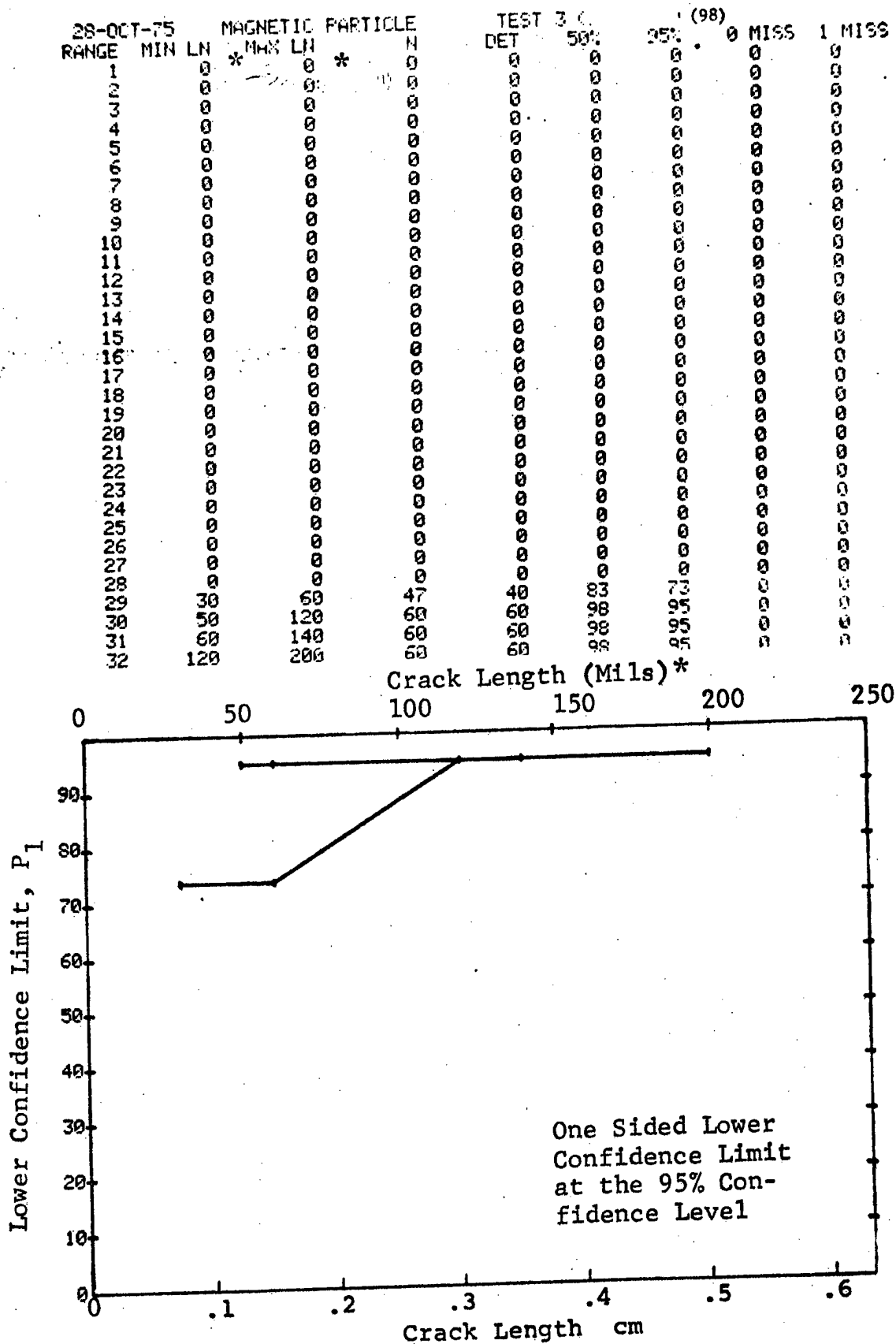


Figure D-98 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75				MAGNETIC PARTICLE		TEST 1		(99)		
RANGE	MIN	LN	*	MAX	LN	DET	50%	95%	0 MISS	1 MISS
1	70	80	*	80	20	20	96	96	9	26
2	90	90	*	90	19	19	96	85	10	27
3	0	0		0	0	0	0	0	0	0
4	110	110		110	8	6	67	40	0	0
5	120	130		130	12	12	94	77	17	34
6	140	140		140	16	16	95	82	13	30
7	0	0		0	0	0	0	0	0	0
8	160	160		160	2	2	70	22	0	0
9	0	0		0	0	0	0	0	0	0
10	180	180		180	9	9	92	71	0	0
11	0	0		0	0	0	0	0	0	0
12	0	0		0	0	0	0	0	0	0
13	0	0		0	0	0	0	0	0	0
14	0	0		0	0	0	0	0	0	0
15	250	250		250	1	1	50	5	0	0
16	0	0		0	0	0	0	0	0	0
17	270	270		270	2	2	70	22	0	0
18	280	280		280	1	1	50	5	0	0
19	300	300		300	11	11	93	76	18	35
20	310	310		310	1	1	50	5	0	0
21	0	0		0	0	0	0	0	0	0
22	0	0		0	0	0	0	0	0	0
23	0	0		0	0	0	0	0	0	0
24	0	0		0	0	0	0	0	0	0
25	0	0		0	0	0	0	0	0	0
26	0	0		0	0	0	0	0	0	0
27	390	390		390	1	1	50	5	0	0
28	0	0		0	0	0	0	0	0	0
29	0	0		0	0	0	0	0	0	0
30	0	0		0	0	0	0	0	0	0
31	0	0		0	0	0	0	0	0	0
32	450	460		460	3	3	79	36	0	0

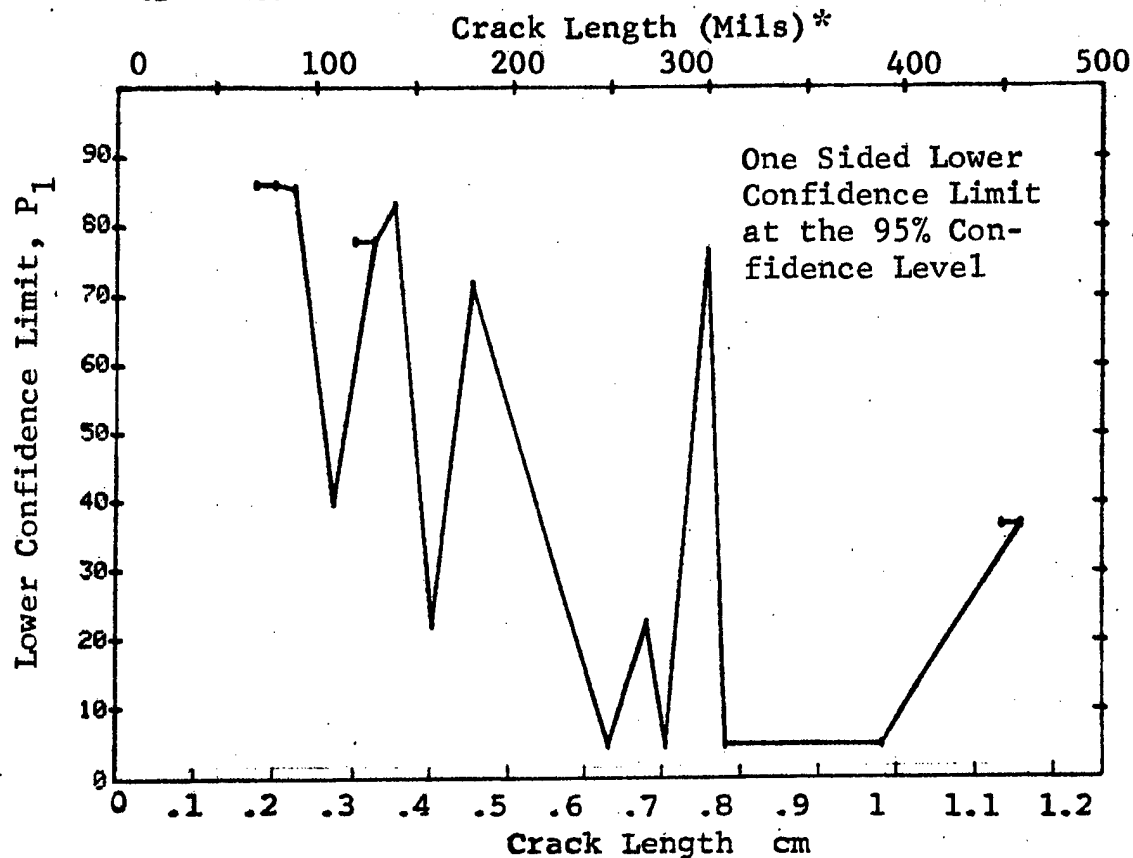


Figure D-99 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Hollow Filleted Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

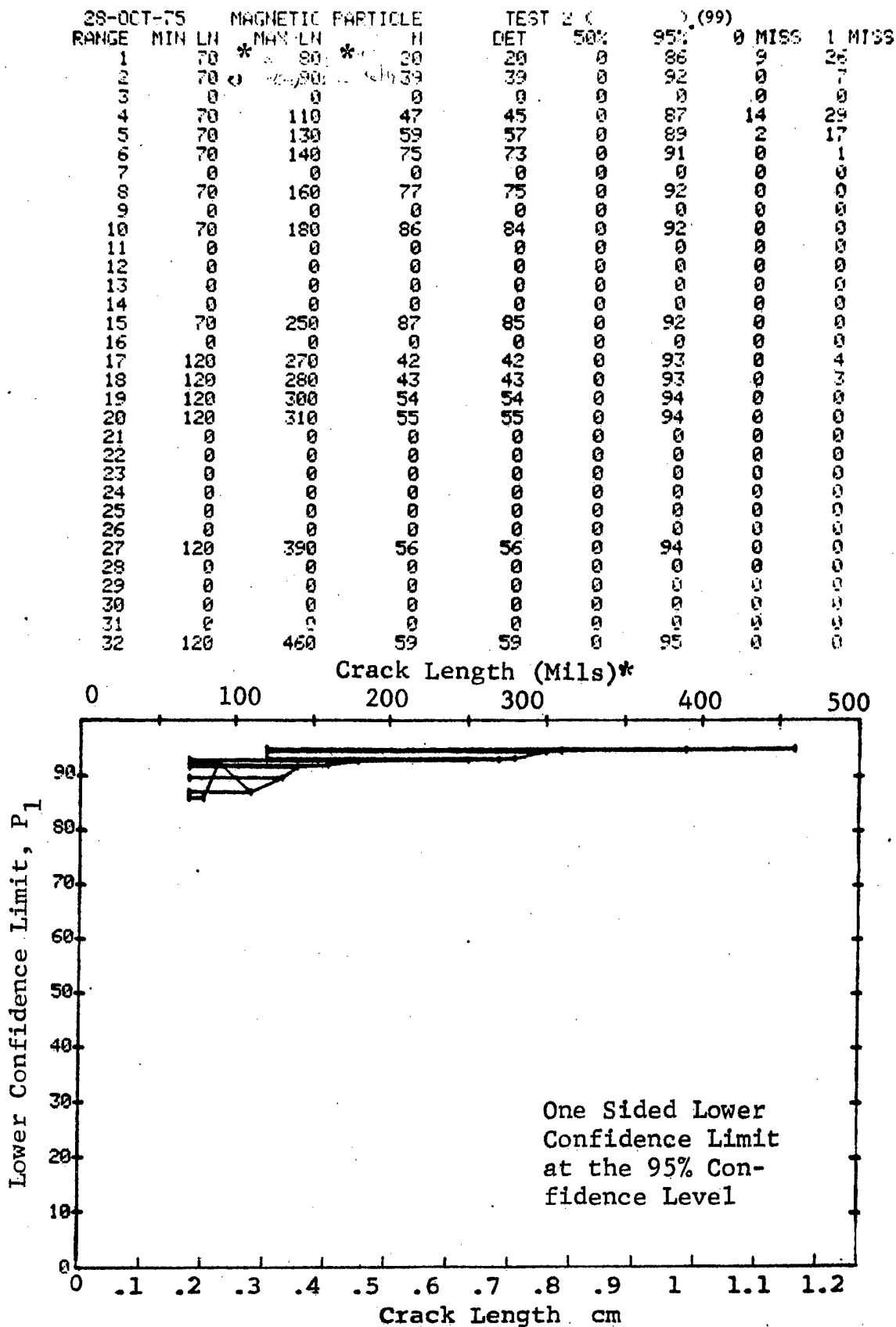


Figure D-99 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

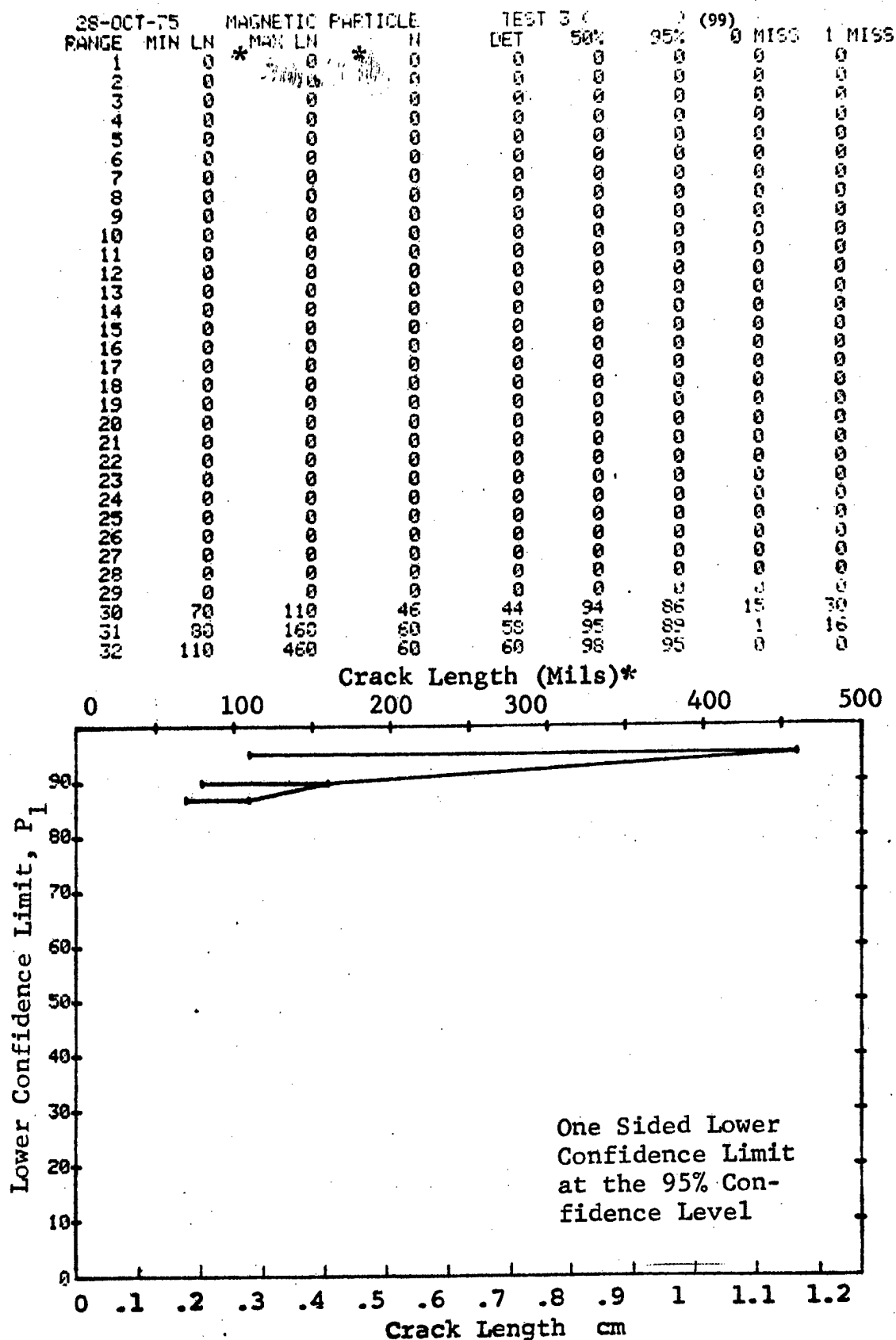


Figure D-99 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75		MAGNETIC PARTICLE		TEST 1 (		) (100)		0 MISS	1 MISS
RANGE	MIN LN	* MAX LN	* N	DET	50%	95%			
1	40	40	1	1	50	5	0	0	0
2	70	70	1	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	100	110	7	3	36	12	0	0	0
5	130	130	4	1	15	1	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	190	190	1	1	50	5	0	0	0
9	210	210	1	1	50	5	0	0	0
10	230	230	1	1	50	5	0	0	0
11	0	0	0	0	0	0	0	0	0
12	250	250	2	2	70	22	0	0	0
13	270	270	1	1	50	5	0	0	0
14	300	300	1	1	50	5	0	0	0
15	310	310	1	1	50	5	0	0	0
16	0	0	0	0	0	0	0	0	0
17	350	350	1	1	50	5	0	0	0
18	380	380	1	1	50	5	0	0	0
19	0	0	0	0	0	0	0	0	0
20	410	410	1	1	50	5	0	0	0
21	0	0	0	0	0	0	0	0	0
22	450	450	1	1	50	5	0	0	0
23	460	460	1	1	50	5	0	0	0
24	480	480	1	1	50	5	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	650	650	1	1	50	5	0	0	0

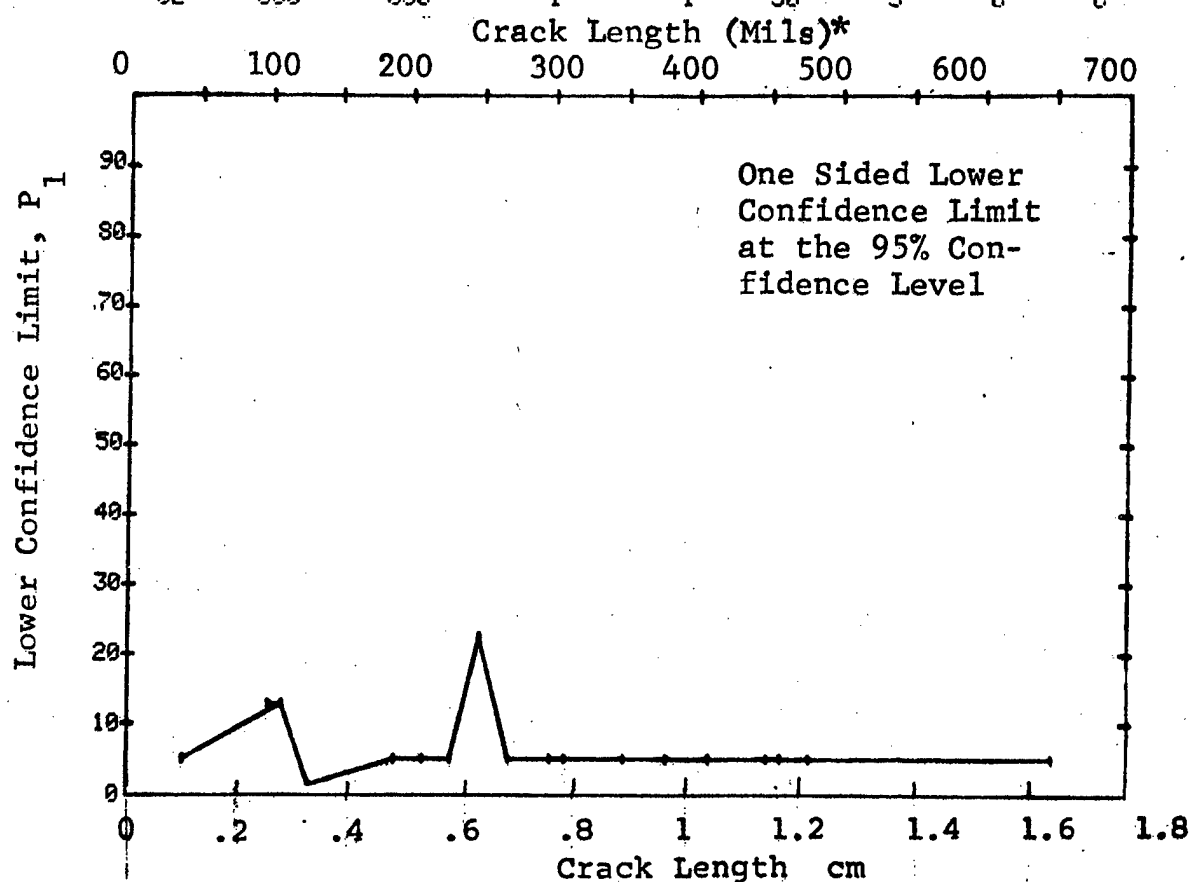


Figure D-100 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Solid Threaded Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

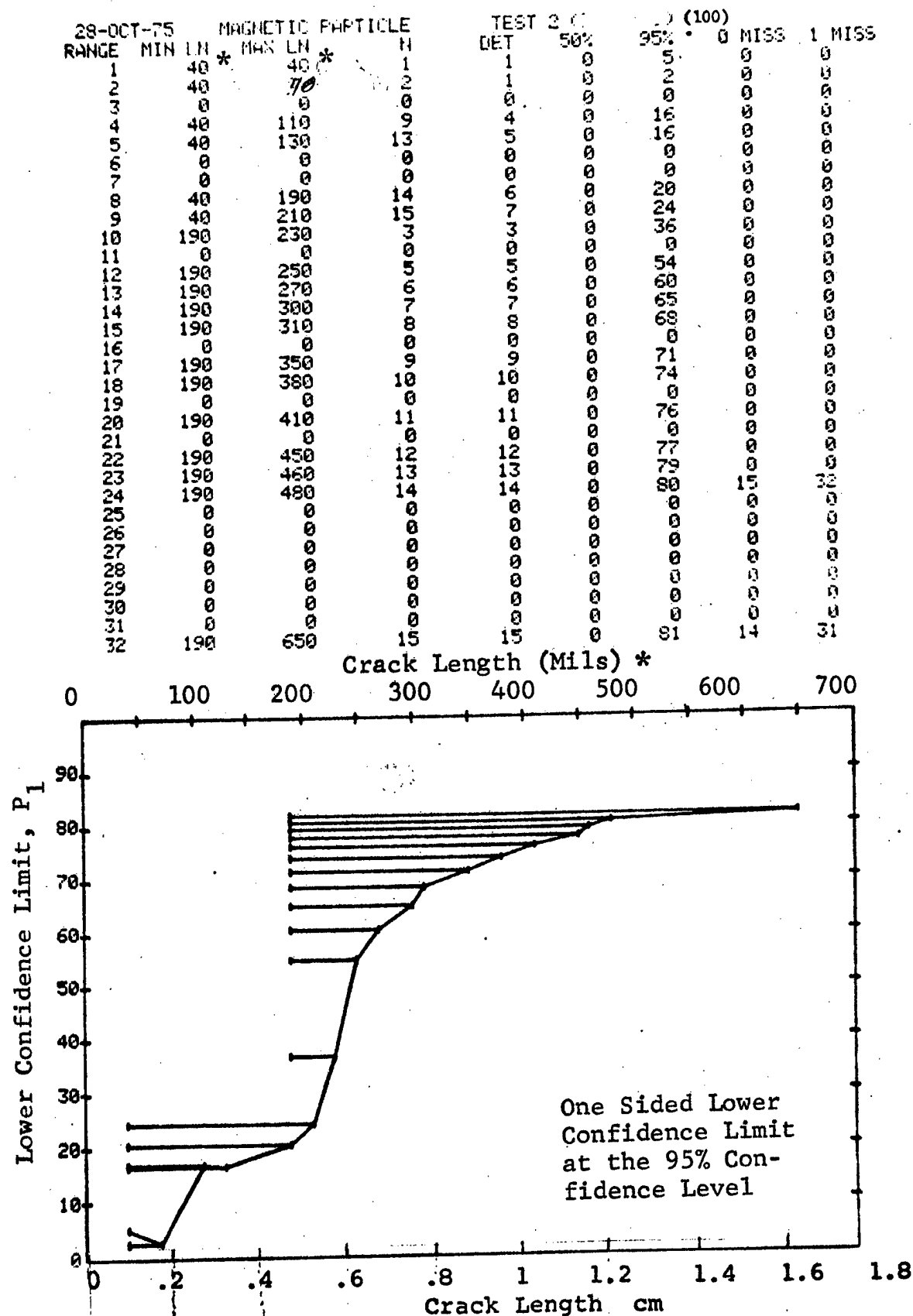


Figure D-100 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

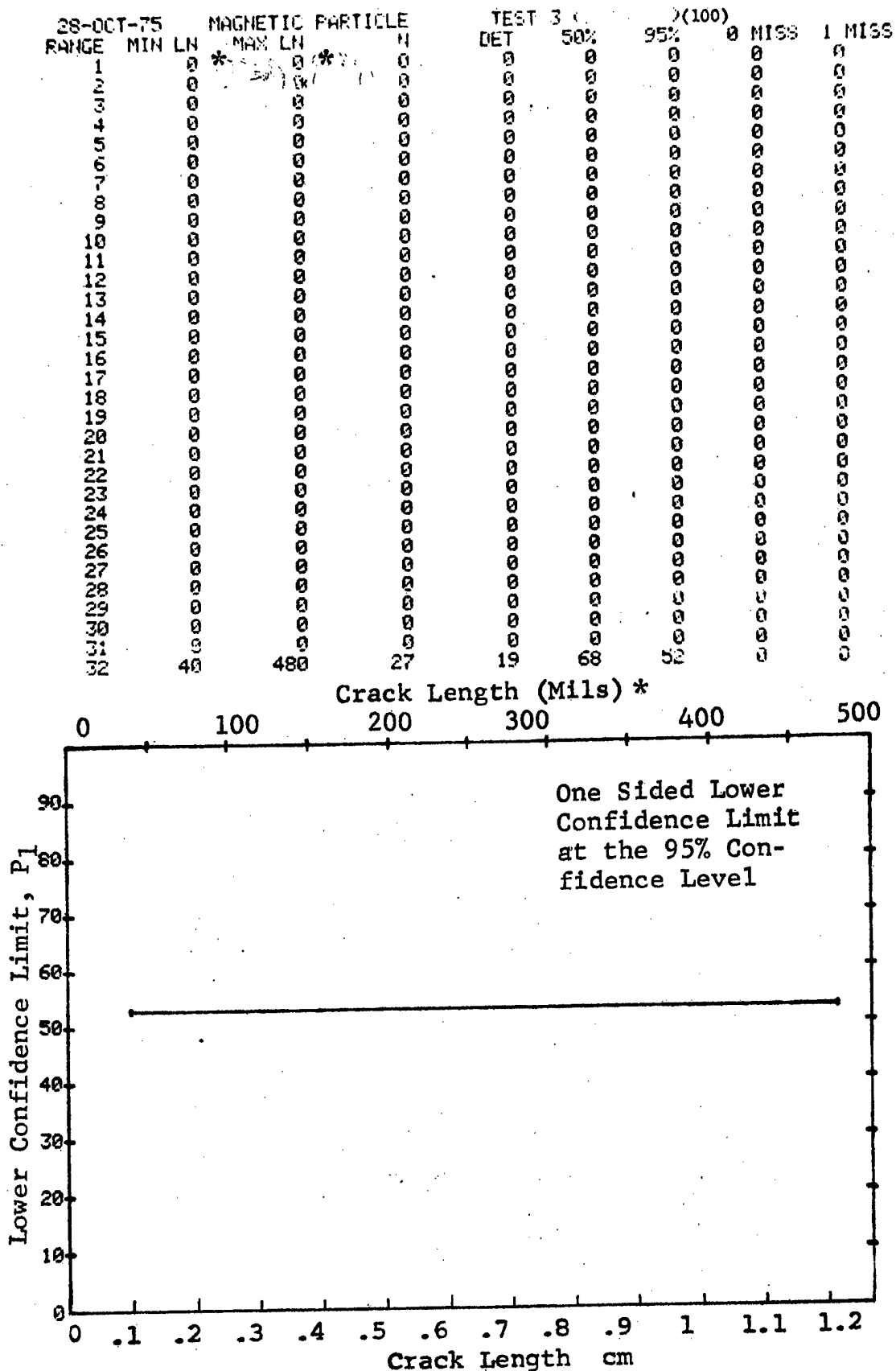


Figure D-100 (Concluded)

(a) Range Interval Method of Data Cumulation

26-OCT-75	MAGNETIC PARTICLE			TEST 1 (101)					
RANGE	MIN LN	MAX LN	N	DET	50%	95%	0 MISS	1 MISS	
1	20	30	23	16	67	50	0	0	
2	0	0	0	0	0	0	0	0	
3	60	60	11	11	93	76	18	35	
4	70	70	18	18	96	84	11	28	
5	90	90	13	13	94	79	16	33	
6	100	100	10	10	93	74	0	0	
7	0	0	0	0	0	0	0	0	
8	130	140	26	25	93	83	20	35	
9	150	150	13	12	87	68	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	200	200	2	2	70	22	0	0	
13	0	0	0	0	0	0	0	0	
14	230	230	3	3	79	36	0	0	
15	240	240	2	2	70	22	0	0	
16	250	260	4	4	84	47	0	0	
17	0	0	0	0	0	0	0	0	
18	280	280	2	2	70	22	0	0	
19	300	300	10	10	93	74	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	370	380	11	11	93	76	18	35	
25	390	390	4	4	84	47	0	0	
26	410	410	2	2	70	22	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	0	0	0	0	0	0	0	0	
32	500	500	2	2	70	22	0	0	

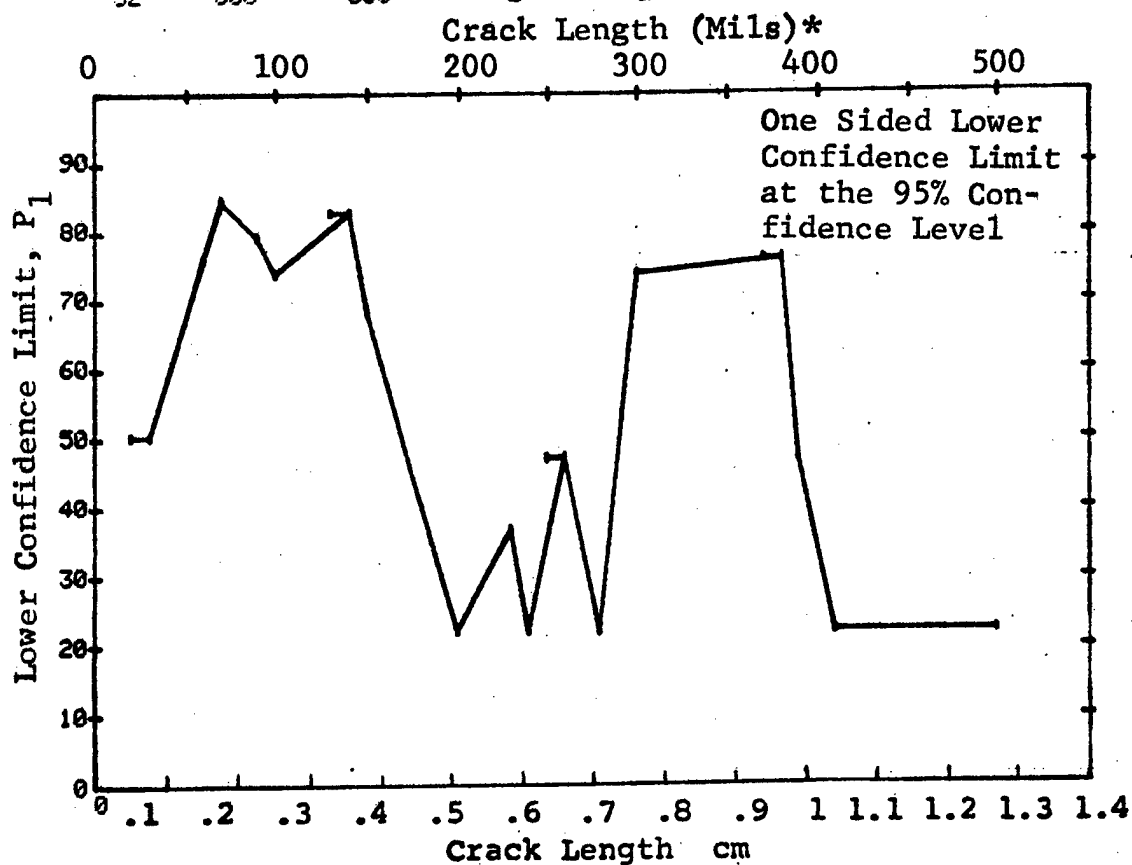


Figure D-101 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Solid Filleted Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

28-OCT-75		MAGNETIC PARTICLE			TEST 2 (1)		TEST 2 (101)		
RANGE	MIN LN	* MAX LN	* N	DET	50%	95%	0 MISS	1 MISS	
1	20	30	23	16	0	50	0	0	
2	0	0	0	0	0	0	0	0	
3	60	60	11	11	0	76	0	0	
4	60	70	29	29	0	90	0	17	
5	60	90	42	42	0	93	0	4	
6	60	100	52	52	0	94	0	0	
7	0	0	0	0	0	0	0	0	
8	60	140	78	77	0	94	0	0	
9	60	150	91	89	0	95	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	60	200	93	91	0	93	0	0	
13	0	0	0	0	0	0	0	0	
14	60	230	96	94	0	93	0	0	
15	60	240	98	96	0	93	0	0	
16	60	260	102	100	0	93	0	0	
17	0	0	0	0	0	0	0	0	
18	60	280	104	102	0	94	0	0	
19	60	300	114	112	0	94	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	60	380	125	123	0	95	0	0	
25	60	390	129	127	0	95	0	0	
26	60	410	131	129	0	95	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	0	0	0	0	0	0	0	0	
32	60	500	133	131	0	95	0	0	

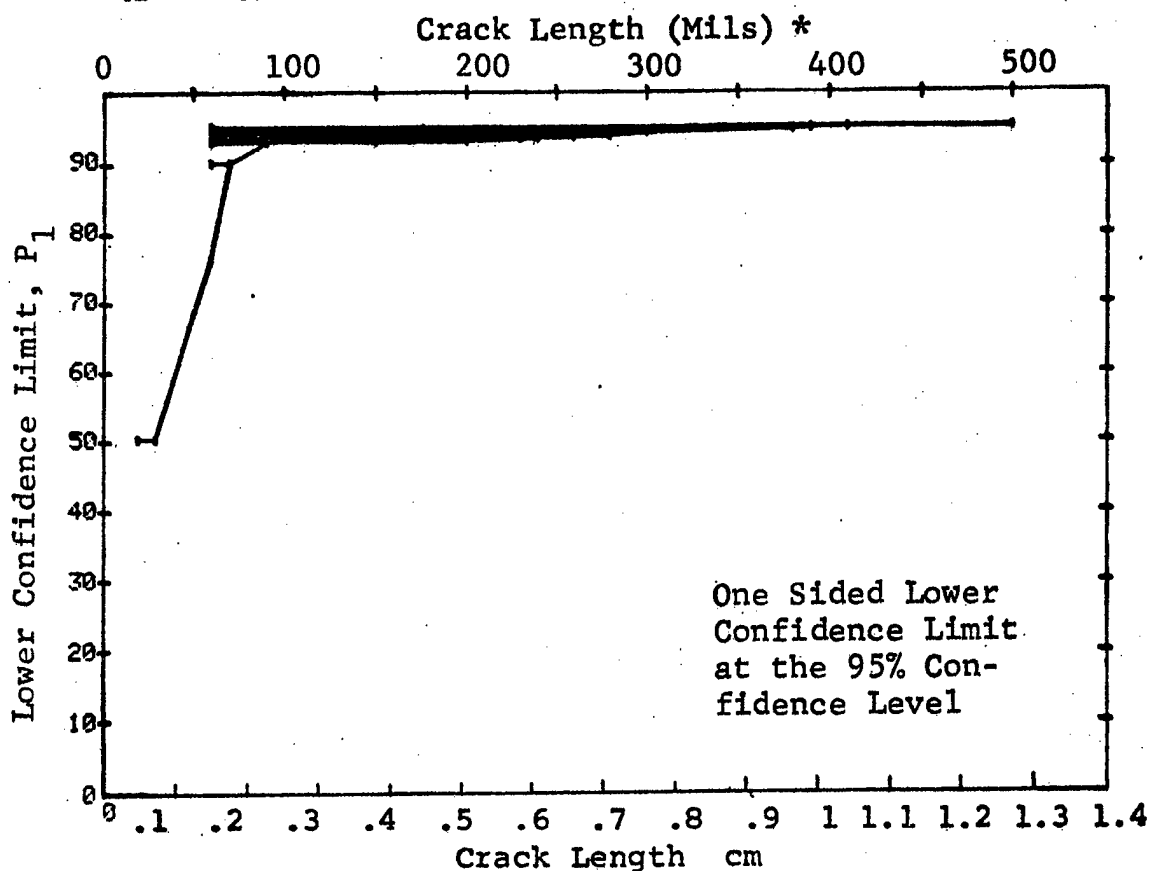


Figure D-101 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

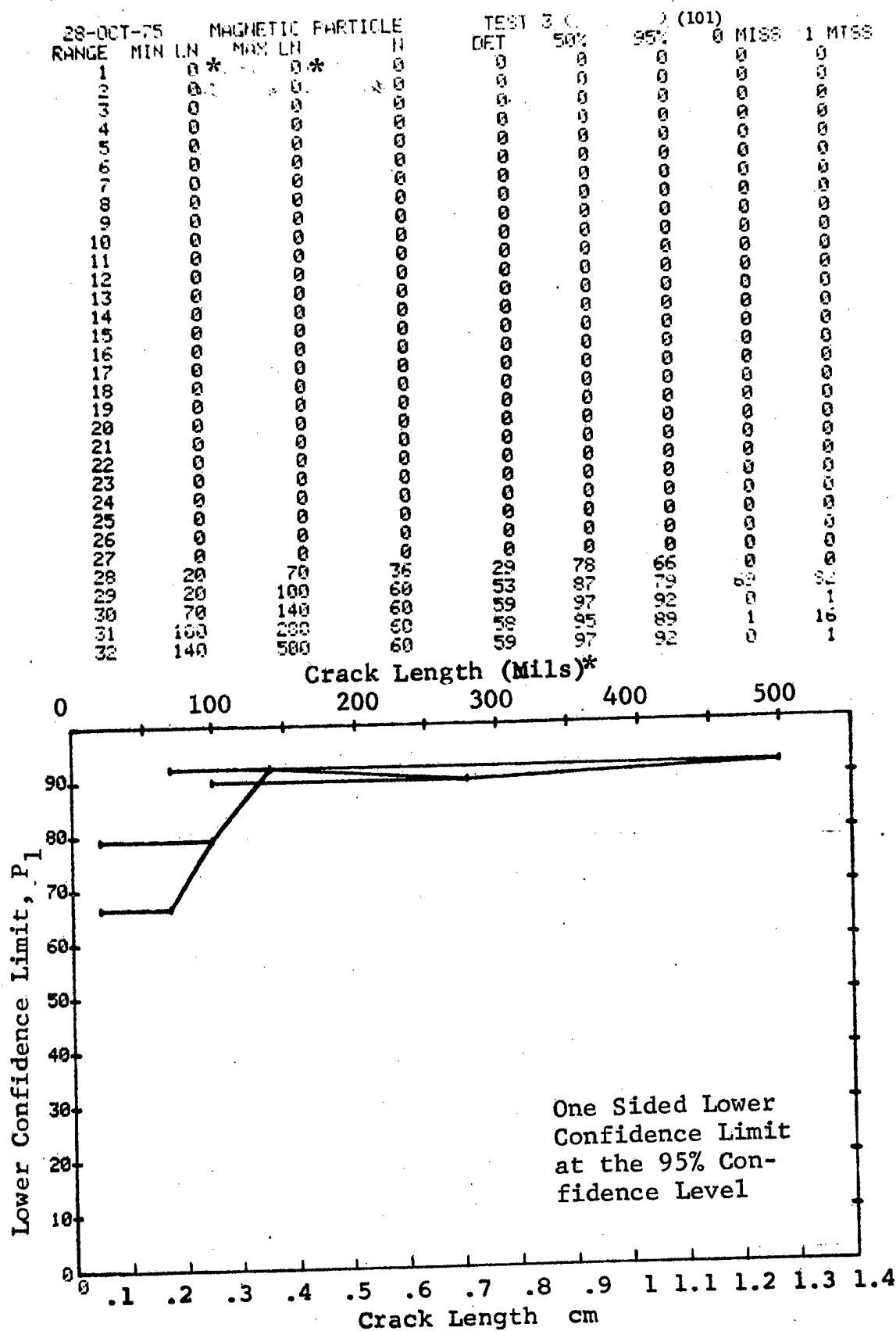


Figure D-101 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75 MAGNETIC PARTICLE				TEST 1		(102)		
RANGE	MIN LN	* MAX LN	* N	DET	50%	95%	0 MISS	1 MISS
1	50	50	17	17	96	83	12	29
2	90	90	1	1	50	5	0	0
3	100	100	17	17	96	83	12	29
4	120	120	2	2	70	22	0	0
5	130	130	9	9	92	71	0	0
6	140	140	8	8	91	68	0	0
7	160	170	22	22	70	22	0	0
8	180	180	22	22	70	22	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	230	230	3	3	79	36	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	310	310	1	1	50	5	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	350	350	4	4	84	47	0	0
20	0	0	0	0	0	0	0	0
21	390	390	1	1	50	5	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	570	570	1	1	50	5	0	0

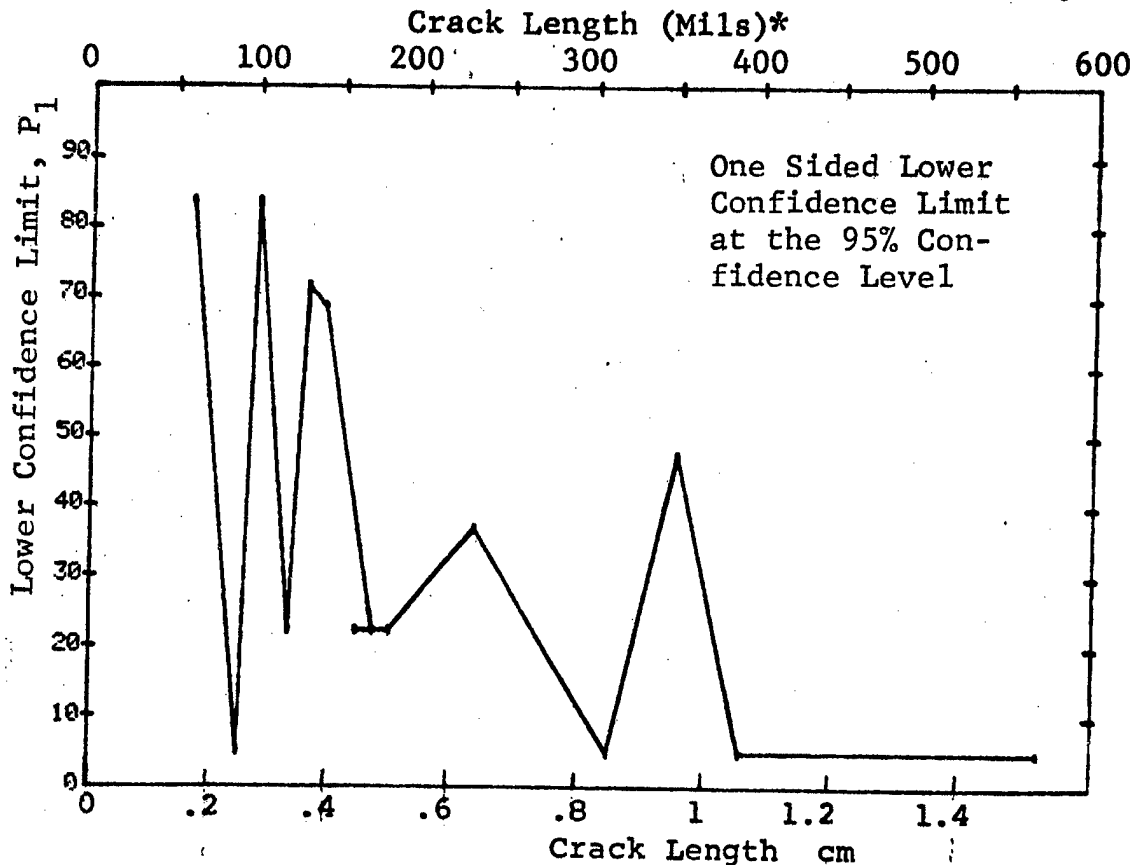


Figure D-102 Probability of Detection for 4340M Steel Using Magnetic Particles. Compressed Notch Flaws in Hollow Cylinder. Lab. Env.

(b) Optimum Probability Method of Data Cumulation

28-OCT-75		MAGNETIC PARTICLE			TEST 2 (402)			0 MISS	1 MISS
RANGE	MIN	LN	* MAX LN *	N	DET	50%	95%		
1	60	60	60	17	17	0	83	12	29
2	60	90	90	18	18	0	84	11	28
3	60	100	100	35	35	0	91	0	11
4	60	120	120	37	37	0	92	0	0
5	60	130	130	46	46	0	93	0	0
6	60	140	140	54	54	0	94	0	0
7	60	170	170	56	56	0	94	0	0
8	60	180	180	58	58	0	94	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	60	230	230	61	61	0	95	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	60	310	310	62	62	0	95	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	60	350	350	66	66	0	95	0	0
20	0	0	0	0	0	0	0	0	0
21	60	390	390	67	67	0	95	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	60	570	570	68	68	0	95	0	0

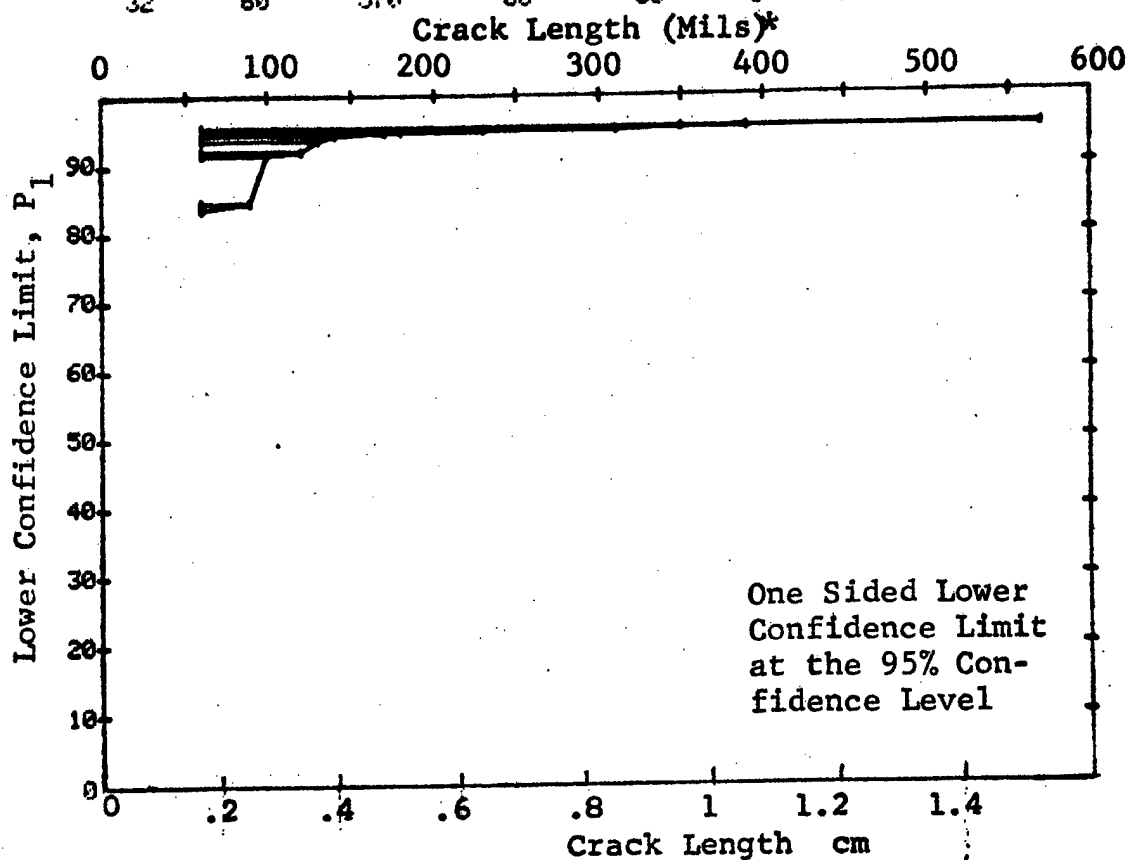


Figure D-102 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

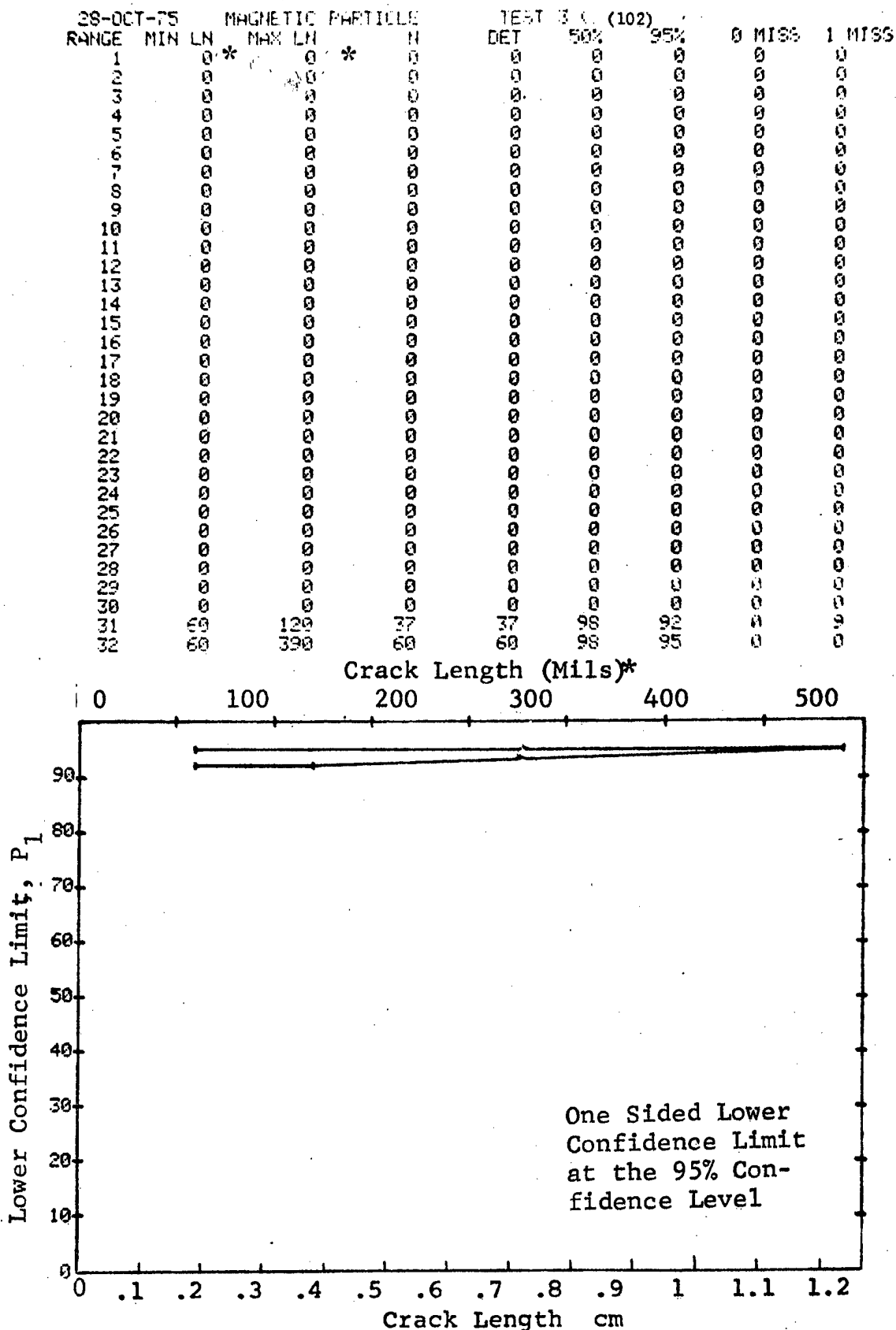


Figure D-102 (Concluded)

(a) Range Interval Method of Data Cumulation

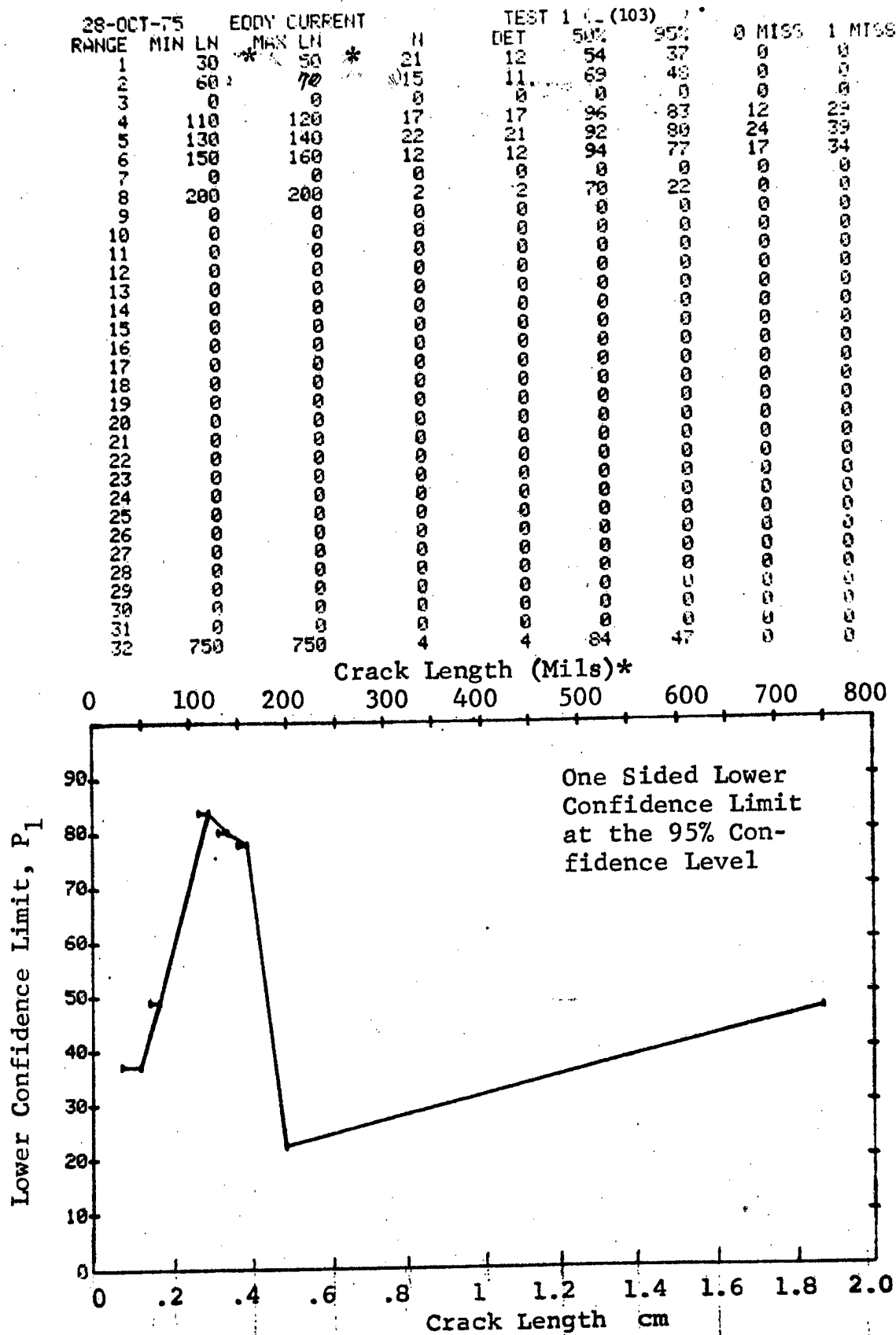


Figure D-103 Probability of Detection for 4340M Steel Using Eddy Current. Compressed Notch Flaws in Solid Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

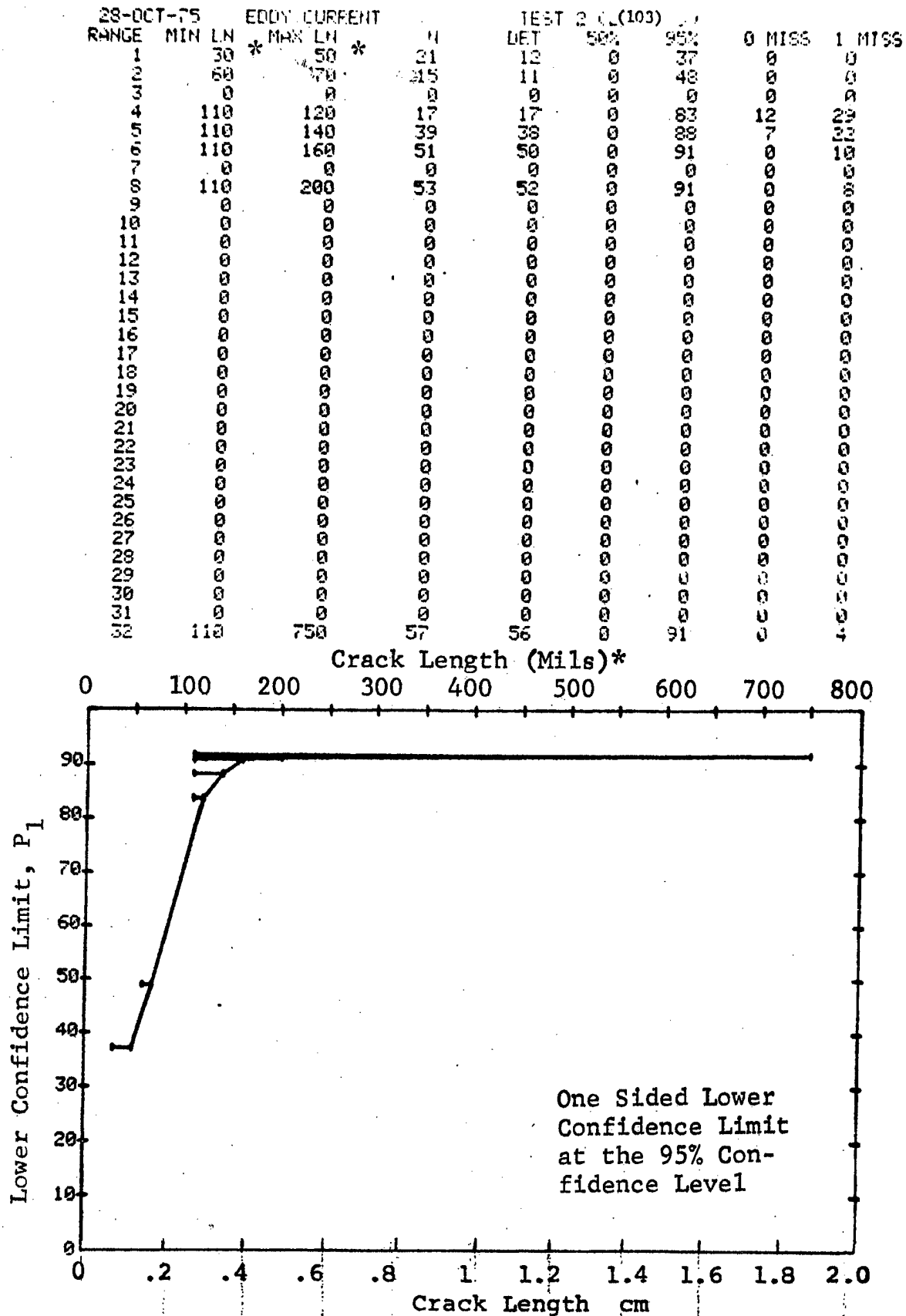


Figure D-103 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

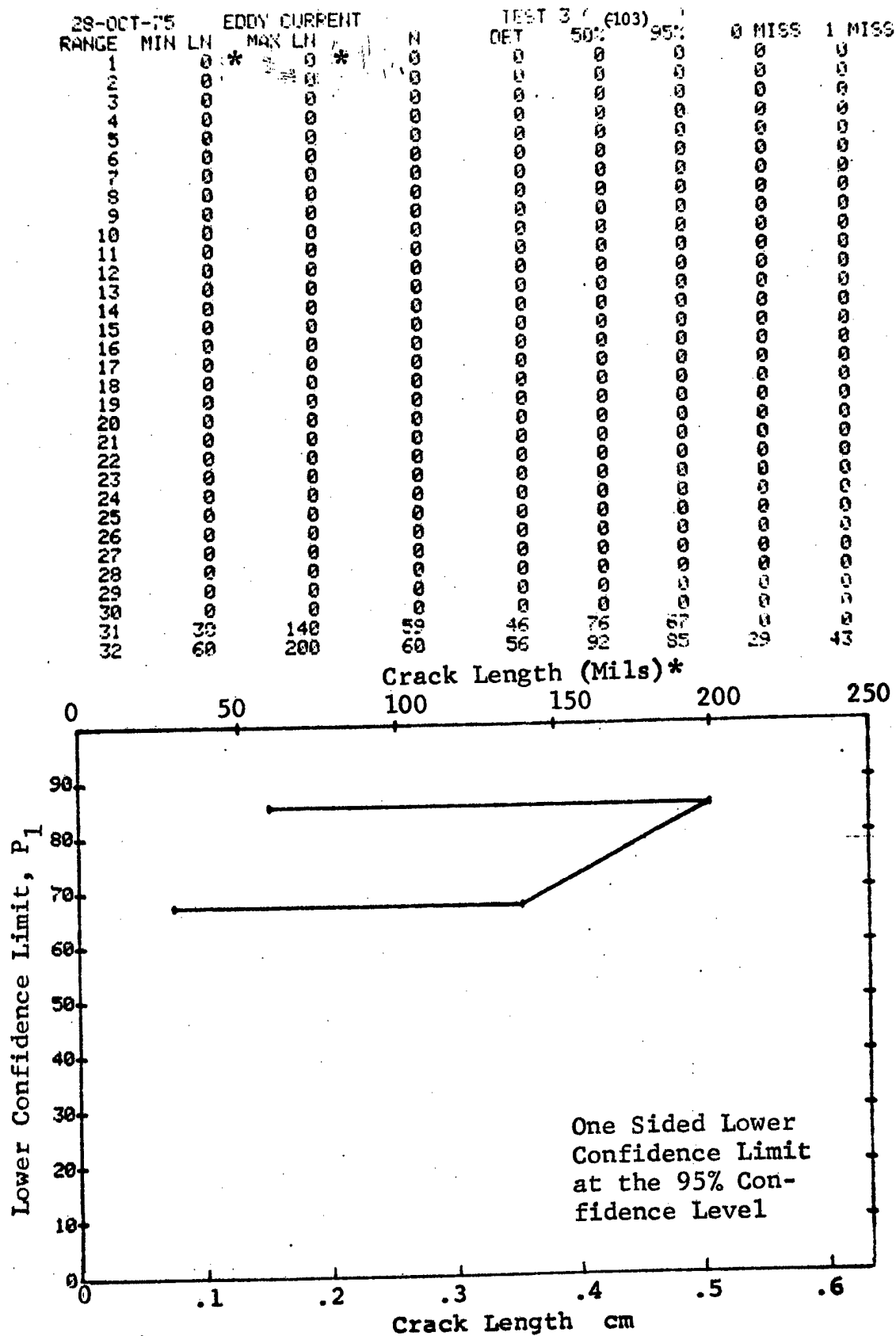


Figure D-103 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75		EDDY CURRENT		N	TEST 1 / (104)		0 MISS	1 MISS
RANGE	MIN LN	MAX LN	*		DET	50%		
1	20	20	*	5	0	0	0	0
2	0	0		0	0	0	0	0
3	60	60		7	6	77	47	0
4	70	70		11	9	76	52	0
5	90	90		7	6	77	47	0
6	100	100		9	9	92	71	0
7	0	0		0	0	0	0	0
8	130	140		9	9	92	71	0
9	150	150		7	7	90	65	0
10	0	0		0	0	0	0	0
11	0	0		0	0	0	0	0
12	0	0		0	0	0	0	0
13	0	0		0	0	0	0	0
14	0	0		0	0	0	0	0
15	0	0		0	0	0	0	0
16	250	260		3	3	79	36	0
17	0	0		0	0	0	0	0
18	0	0		0	0	0	0	0
19	300	300		5	5	87	54	0
20	0	0		0	0	0	0	0
21	0	0		0	0	0	0	0
22	0	0		0	0	0	0	0
23	0	0		0	0	0	0	0
24	370	370		1	1	50	5	0
25	0	0		0	0	0	0	0
26	0	0		0	0	0	0	0
27	0	0		0	0	0	0	0
28	0	0		0	0	0	0	0
29	0	0		0	0	0	0	0
30	0	0		0	0	0	0	0
31	0	0		0	0	0	0	0
32	500	500		1	1	50	5	0

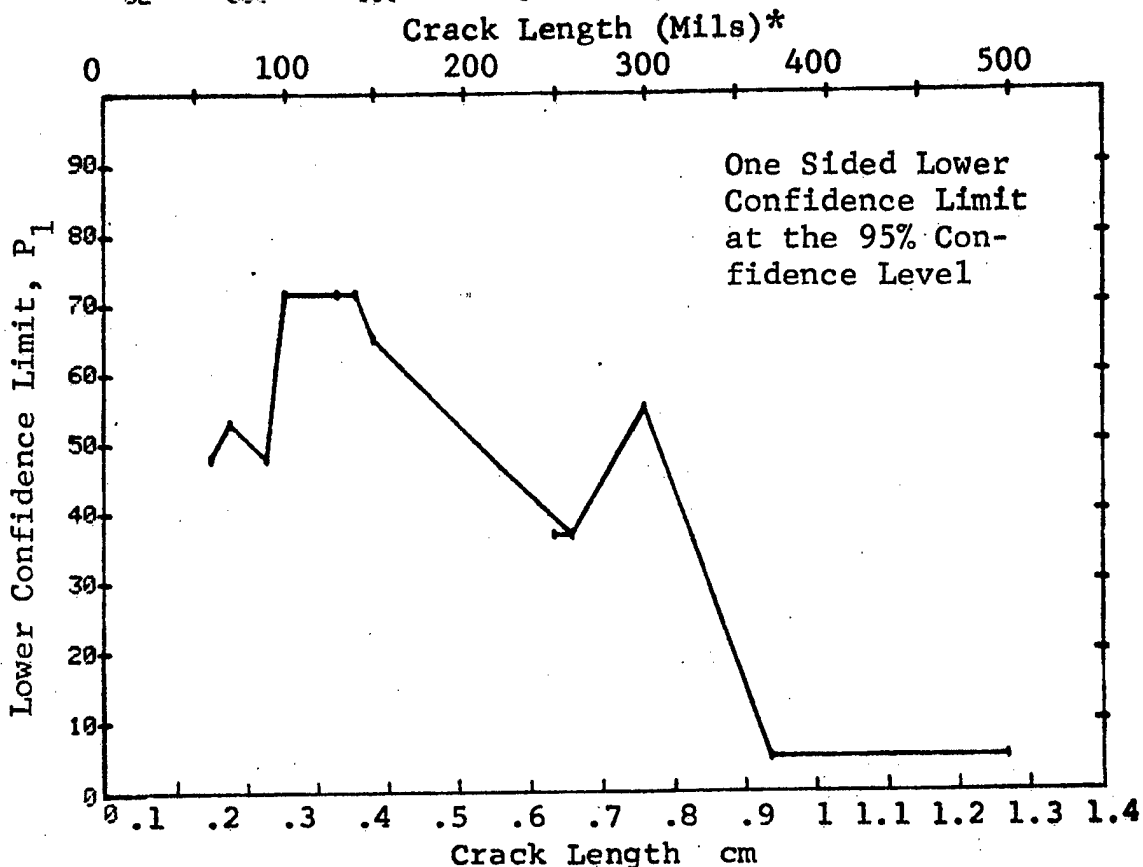


Figure D-104 Probability of Detection for 4340M Steel Using Eddy Current. Compressed Notch Flaws in Solid Filleted Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

28-OCT-75		EDDY CURRENT		N	TEST 2 (104)			0 MISS	1 MISS
RANGE	MIN LN	* MAX LN *			DFT	50%	95%		
1	20	20	5	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	60	60	7	6	0	47	0	0	0
4	60	70	12	15	0	62	0	0	0
5	60	90	25	21	0	65	0	0	0
6	60	100	34	20	0	75	0	0	0
7	0	0	0	0	0	0	0	0	0
8	100	140	18	18	0	84	11	23	0
9	100	150	25	25	0	88	4	21	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	100	260	28	28	0	89	1	13	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	100	300	33	33	0	91	0	13	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	100	370	34	34	0	91	0	12	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	100	500	35	35	0	91	0	11	0

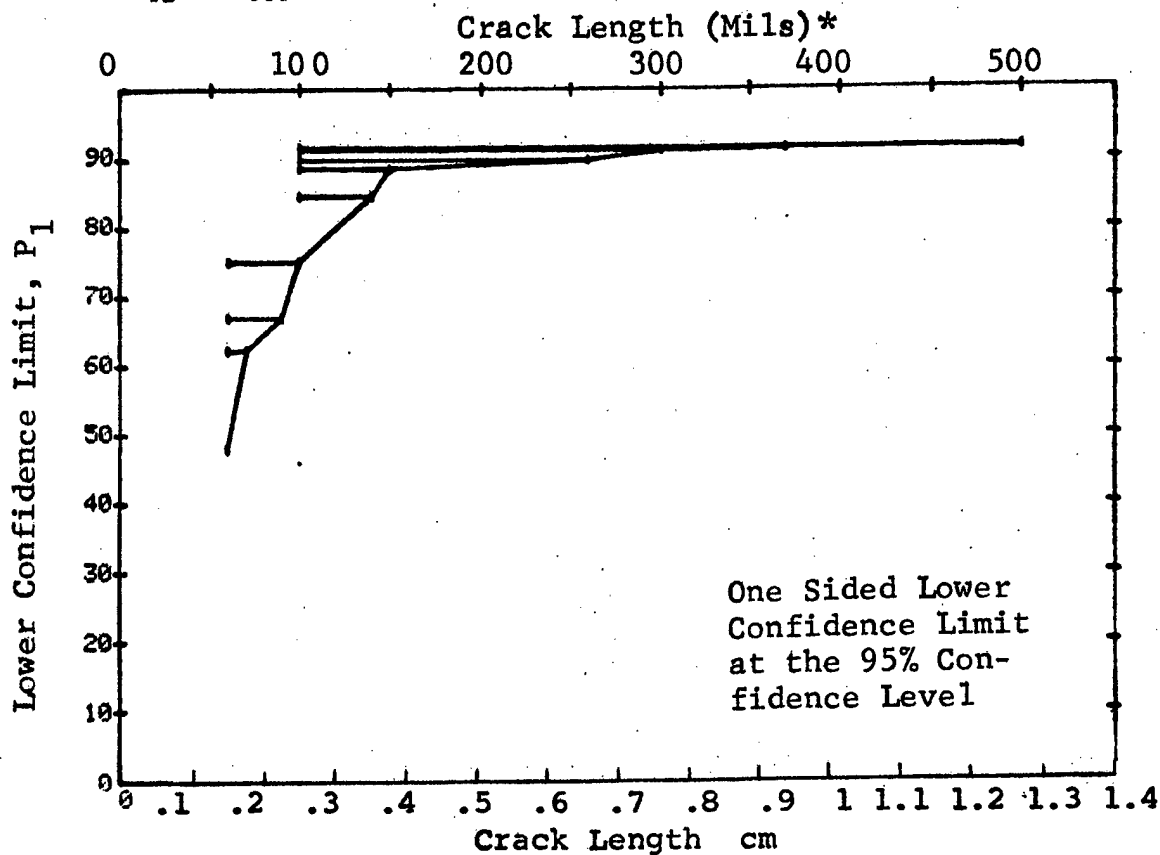


Figure D-104 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

28-OCT-75		EDDY CURRENT		TEST 2 (104)					
RANGE	MIN LN	* MAX LN *	N	DET	50%	95%	0 MISS	1 MISS	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	
31	20	100	35	26	72	59	0	0	
32	60	500	60	56	92	85	29	40	

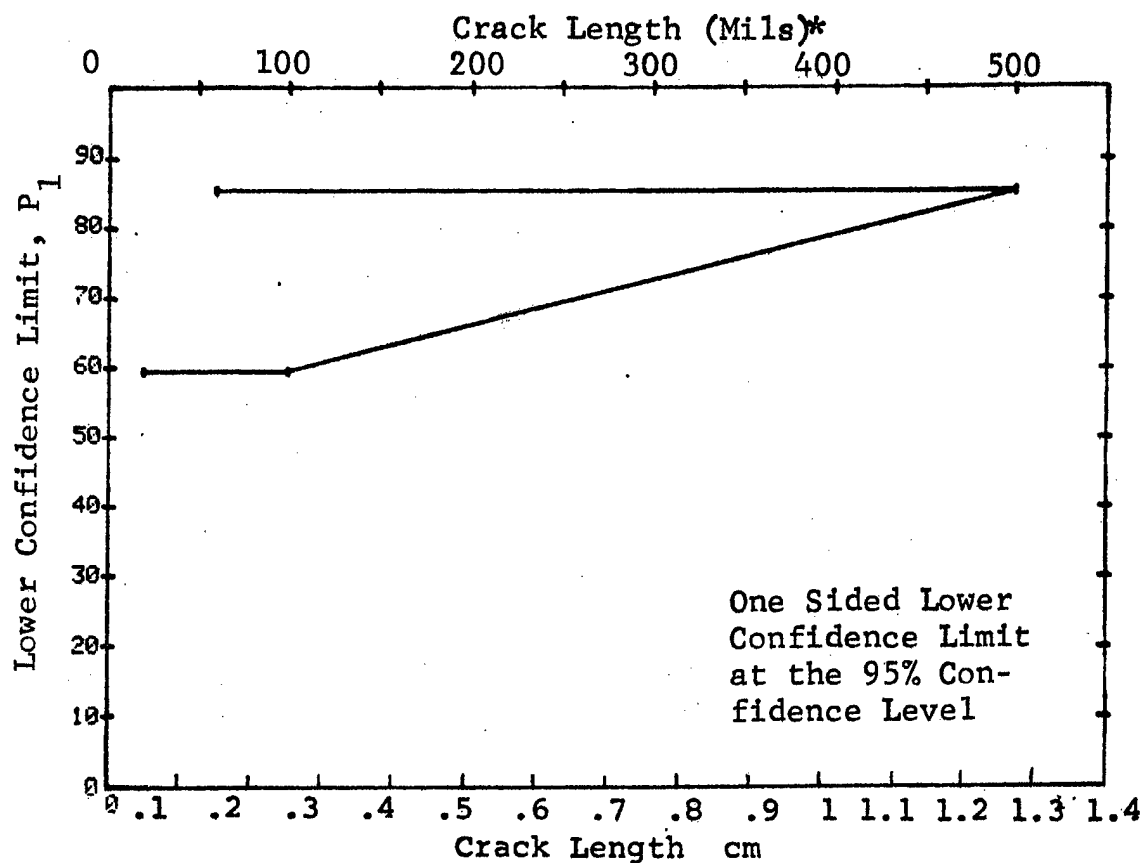


Figure D-104 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75		EDDY CURRENT		N	TEST 1 (105)		0 MISS	1 MISS
RANGE	MIN LN	* MAX LN *			DET	50%		
1	60	60	4	4	84	47	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	100	100	0	0	91	68	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	120	120	2	2	70	22	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	140	140	2	2	70	22	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	160	160	3	2	50	13	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	180	180	2	2	70	22	0	0

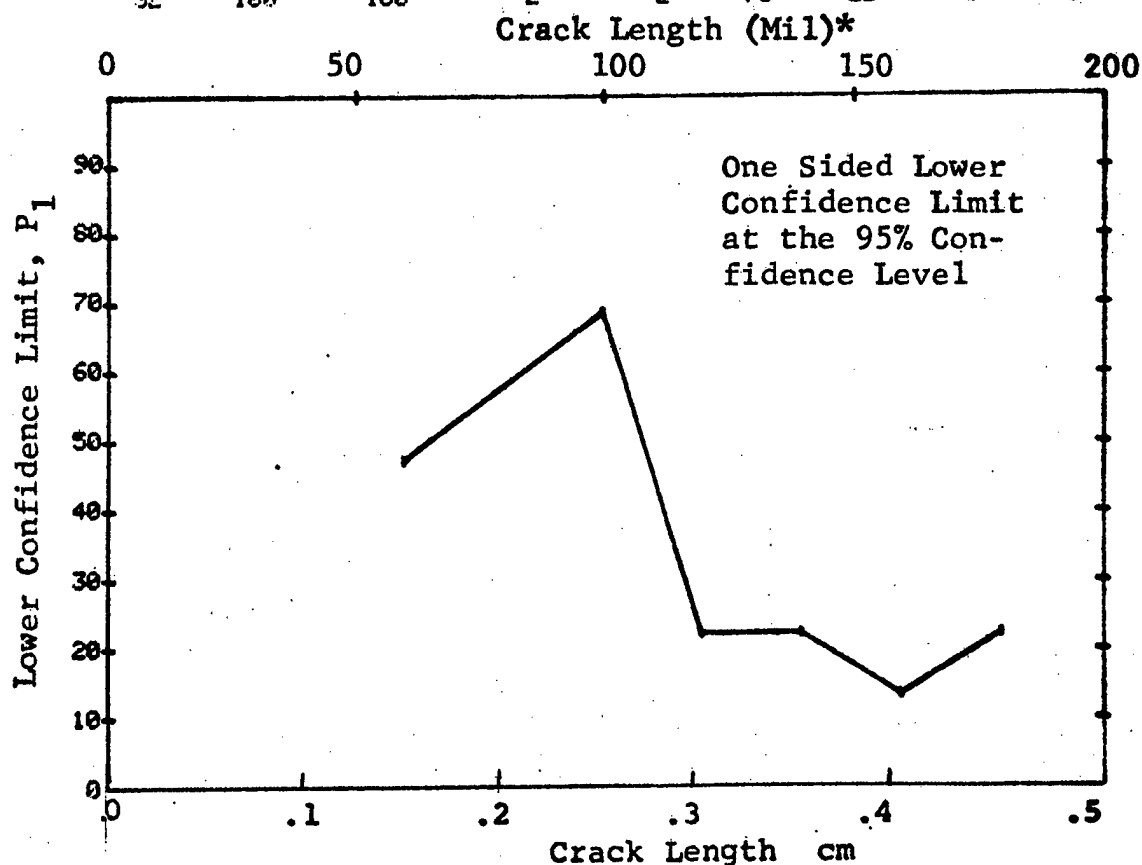


Figure D-105 Probability of Detection for 4340M Steel Using Eddy Current. Compressed Notch Flaws in Hollow Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

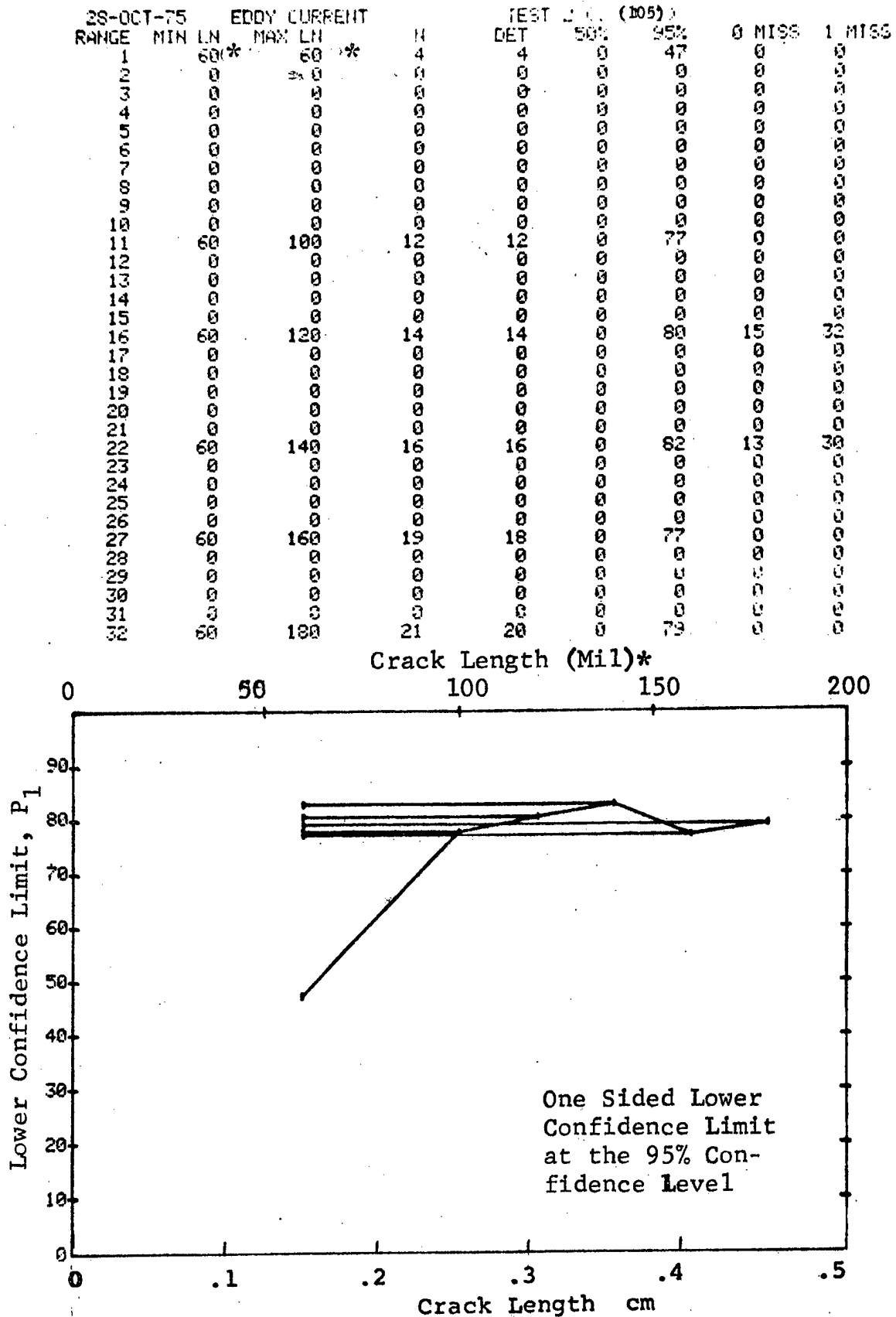


Figure D-105 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

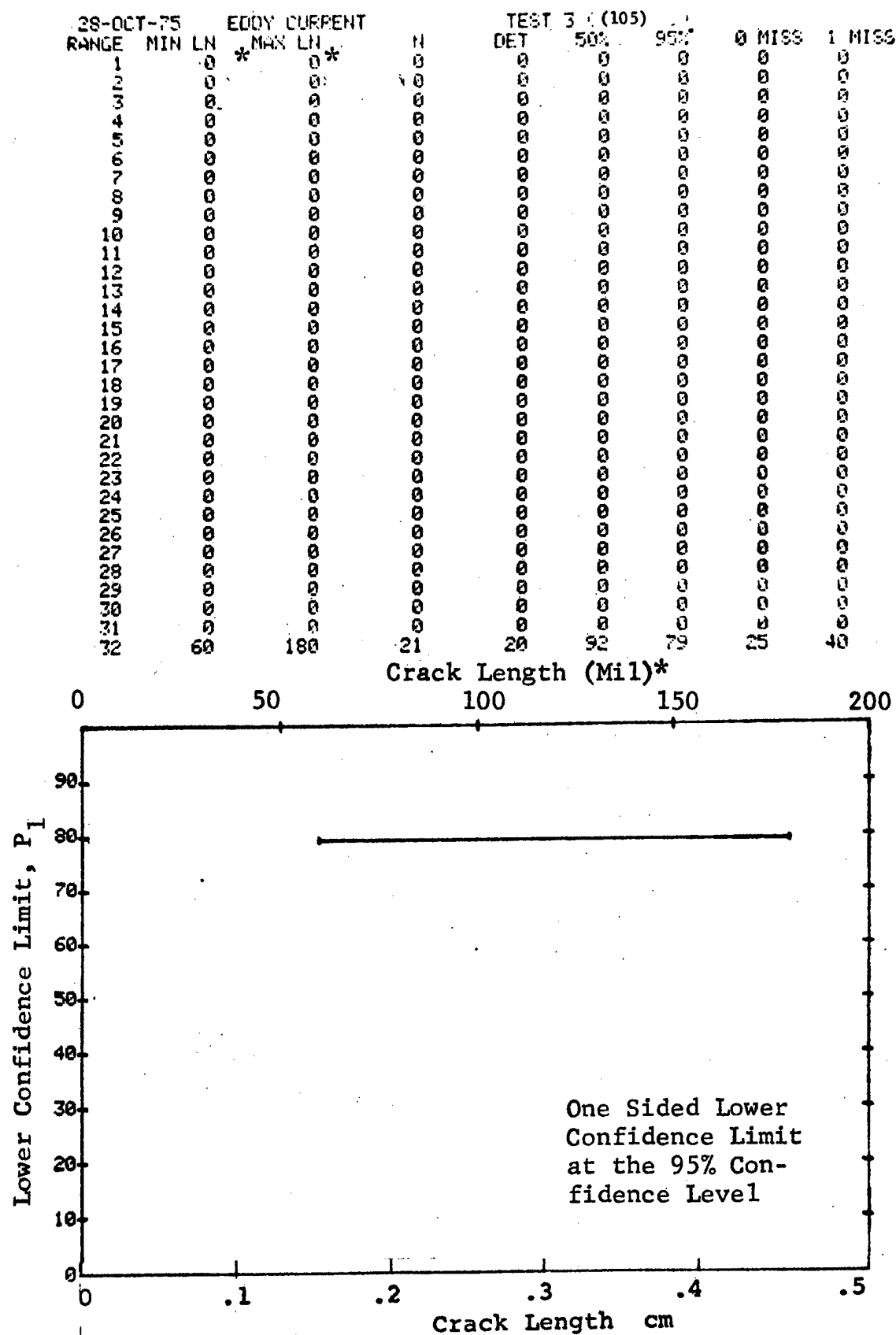


Figure D-105 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75		EDDY CURRENT		N	TEST 1 (106)		0 MISS	1 MISS
RANGE	MIN LN	* MAX LN *		DFT	50%	95%		
1	90	* 90 *	1	1	50	5	0	0
2	90	90	0	0	31	68	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	110	110	4	4	84	47	0	0
6	120	120	1	1	50	5	0	0
7	0	0	0	0	0	0	0	0
8	130	130	1	1	50	5	0	0
9	140	140	7	7	90	65	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	300	300	3	3	79	36	0	0

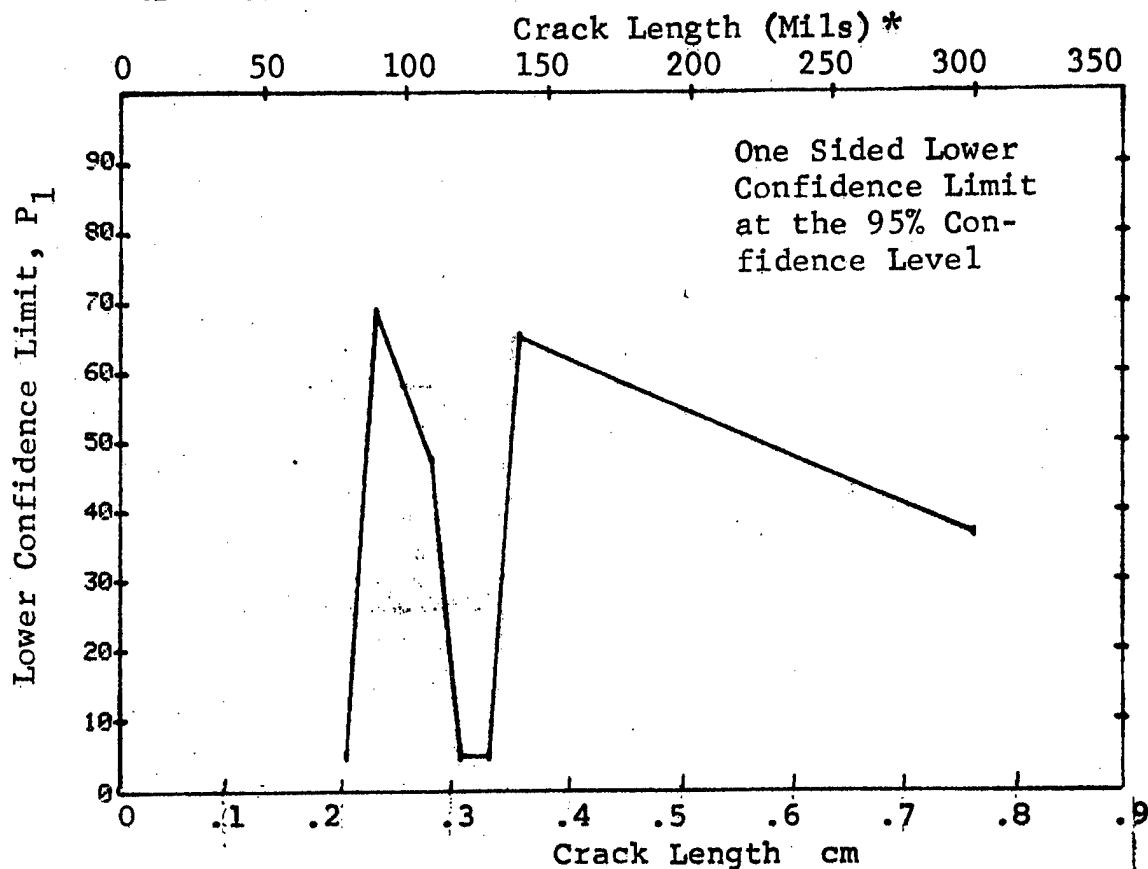


Figure D-106 Probability of Detection for 4340M Steel Using Eddy Current Compressed Notch Flaws in Hollow Cylinder. Prod. Env.

(b) Optimum Probability Method of Data Cumulation

28-OCT-75		EDDY CURRENT		N	TEST 2 (106)		0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DET	50%		
1		80	80	1	1	0	0	0
2		80	80	2	2	0	0	0
3		0	0	0	0	0	0	0
4		0	0	0	0	0	0	0
5		80	110	13	13	0	0	0
6		80	120	14	14	0	15	32
7		0	0	0	0	0	0	0
8		80	130	15	15	0	14	31
9		80	140	22	22	0	7	24
10		0	0	0	0	0	0	0
11		0	0	0	0	0	0	0
12		0	0	0	0	0	0	0
13		0	0	0	0	0	0	0
14		0	0	0	0	0	0	0
15		0	0	0	0	0	0	0
16		0	0	0	0	0	0	0
17		0	0	0	0	0	0	0
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21		0	0	0	0	0	0	0
22		0	0	0	0	0	0	0
23		0	0	0	0	0	0	0
24		0	0	0	0	0	0	0
25		0	0	0	0	0	0	0
26		0	0	0	0	0	0	0
27		0	0	0	0	0	0	0
28		0	0	0	0	0	0	0
29		0	0	0	0	0	0	0
30		0	0	0	0	0	0	0
31		0	0	0	0	0	0	0
32	80		300	25	25	0	4	21

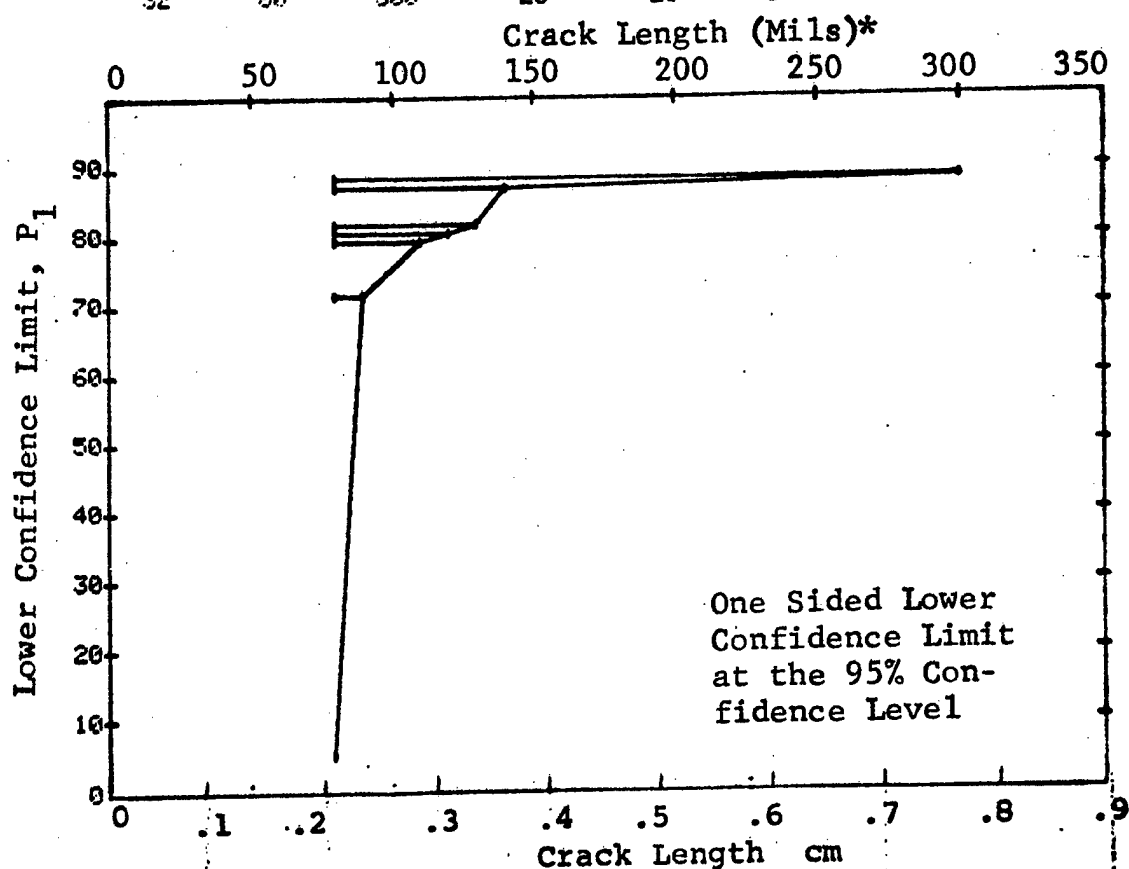


Figure D-106 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

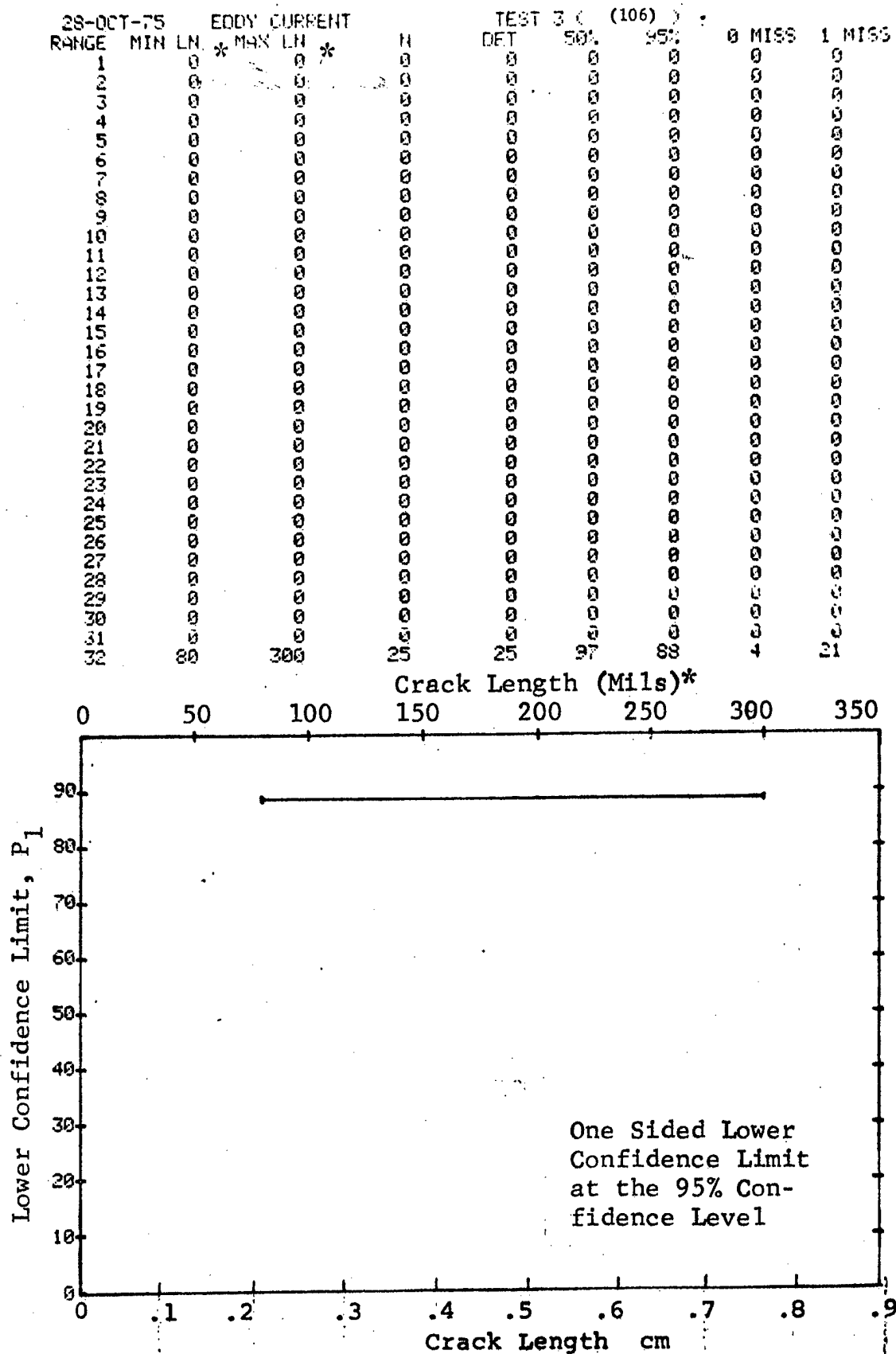


Figure D-106 (Concluded)

(a) Range Interval Method of Data Cumulation

28-OCT-75		EDDY CURRENT		N	TEST 1 (107)			0 MISS	1 MISS
RANGE	MIN	LN	MAX LN		DET	50%	95%		
1	10	10	10	1	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	30	30	30	5	4	60	34	0	0
4	0	0	0	0	0	0	0	0	0
5	40	40	40	7	22	22	5	0	0
6	50	50	50	14	12	81	61	0	0
7	0	0	0	0	0	0	0	0	0
8	60	60	60	3	2	50	13	0	0
9	70	70	70	6	6	89	60	0	0
10	0	0	0	0	0	0	0	0	0
11	80	80	80	13	12	87	60	0	0
12	90	90	90	11	11	93	76	18	35
13	0	0	0	0	0	0	0	0	0
14	100	100	100	14	11	74	53	0	0
15	110	110	110	26	25	93	83	20	35
16	120	120	120	9	9	92	71	0	0
17	0	0	0	0	0	0	0	0	0
18	130	130	130	11	11	93	76	18	35
19	140	140	140	13	11	79	58	0	0
20	0	0	0	0	0	0	0	0	0
21	150	150	150	19	15	75	58	0	0
22	160	160	160	10	10	93	74	0	0
23	0	0	0	0	0	0	0	0	0
24	170	170	170	15	15	95	81	14	31
25	180	180	180	11	11	93	76	18	35
26	0	0	0	0	0	0	0	0	0
27	190	190	190	7	6	77	47	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	210	210	210	2	2	70	22	0	0
31	220	220	220	9	9	92	71	0	0
32	230	230	230	13	13	94	79	16	33

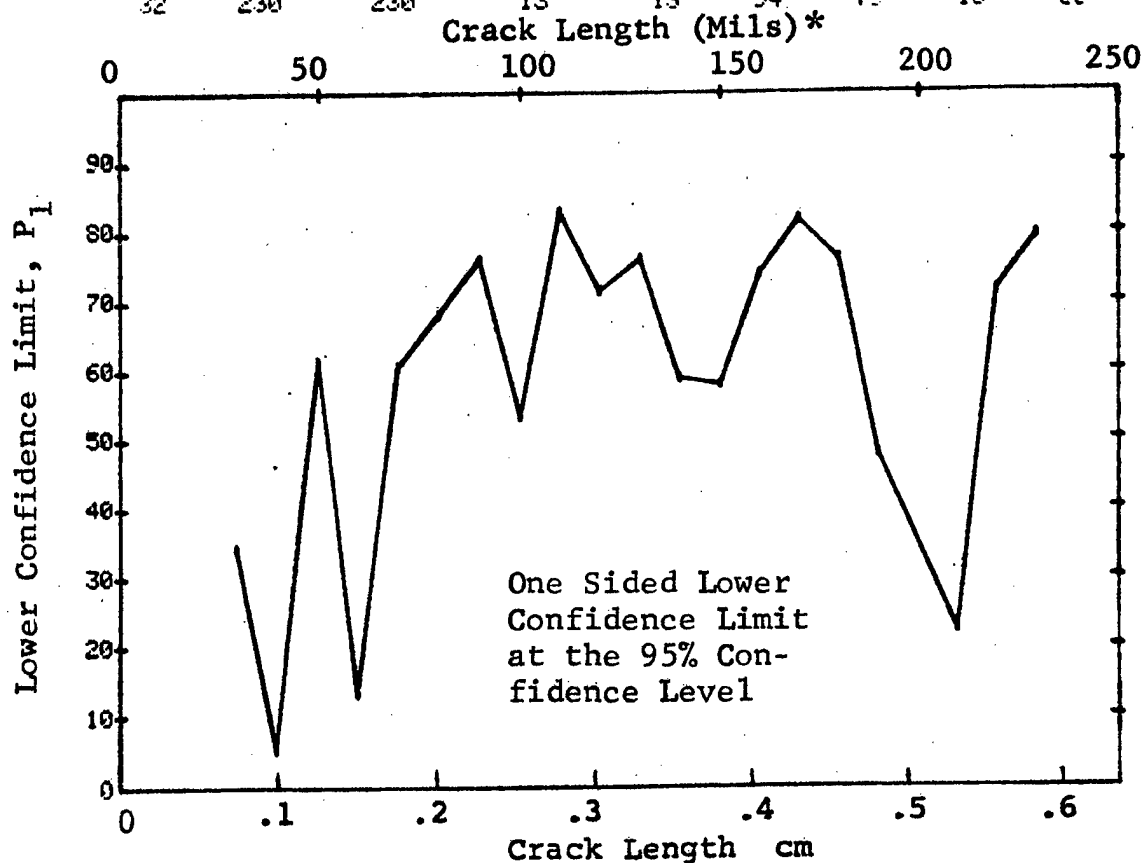


Figure D-107 Probability of Detection for 2024-T6 Al Using Eddy Current. Compressed Notch Flaws in Tandem T Specimens. Production Environment.

(b) Optimum Probability Method of Data Cumulation

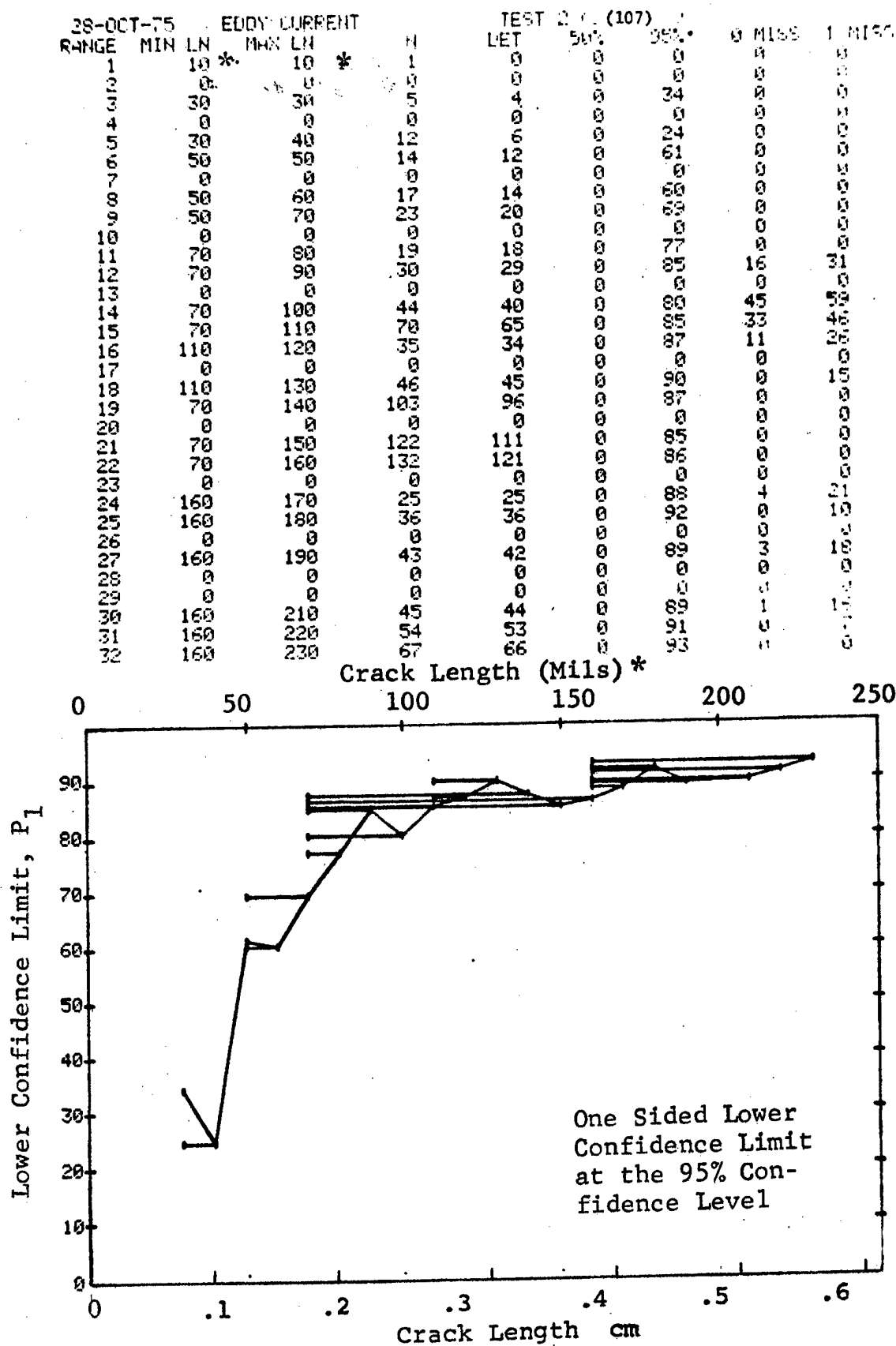


Figure D-107 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

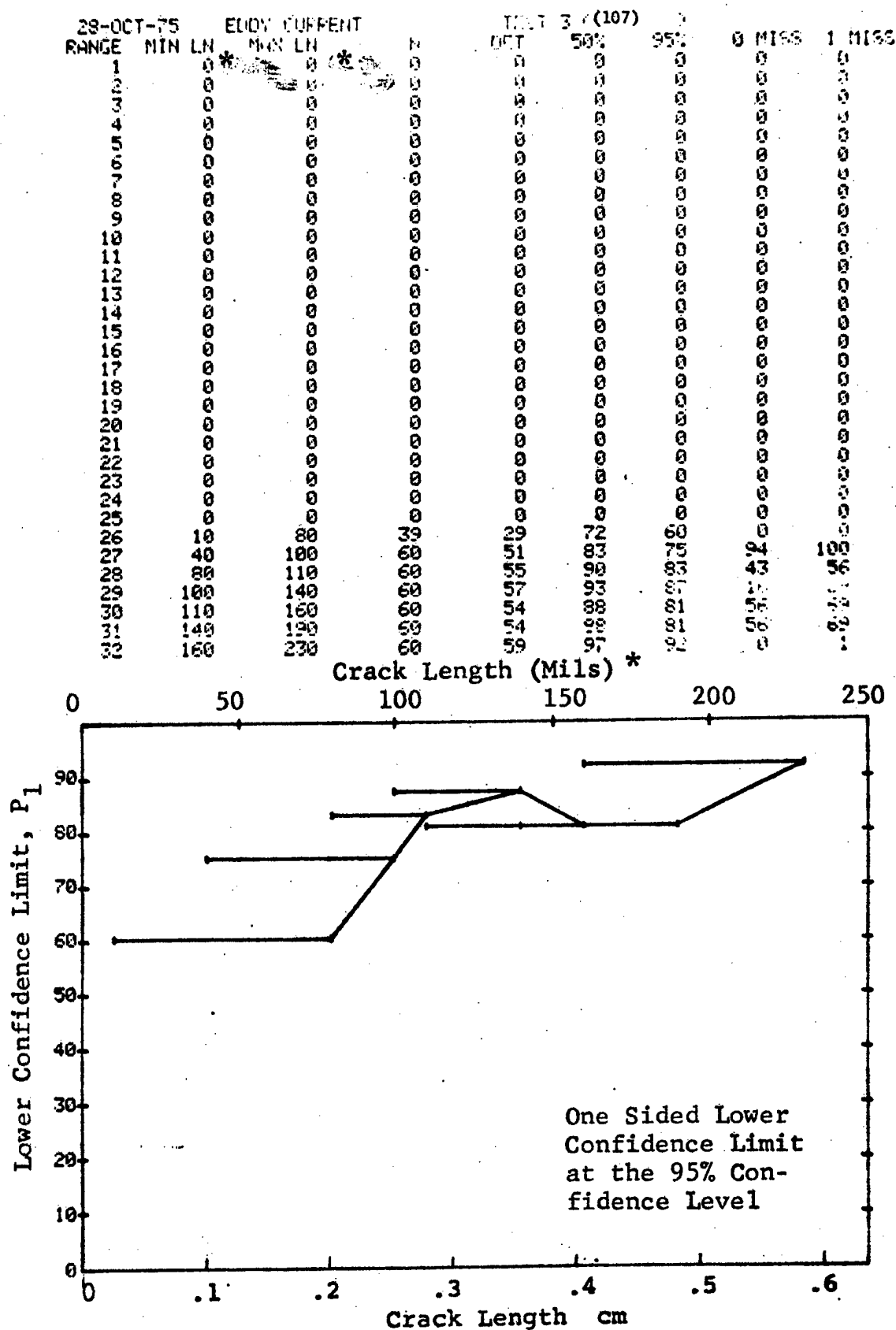


Figure D-107 (Concluded)

(a) Range Interval Method of Data Cumulation

RANGE	MIN	LN	EDC	DEF	INT	(108)	0	MIN	LN
1	10	10	*	10	*	10	0	0	0
2	0	0	0	0	0	0	0	0	0
3	30	30	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	40	40	0	0	0	0	0	0	0
6	50	50	10	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	60	60	4	0	0	0	0	0	0
9	70	70	4	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	80	80	14	0	0	0	0	0	0
12	90	90	15	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	100	100	6	0	0	0	0	0	0
15	110	110	23	0	0	0	0	0	0
16	120	120	3	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	130	130	4	0	0	0	0	0	0
19	140	140	12	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	150	150	14	0	0	0	0	0	0
22	160	160	5	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	170	170	8	0	0	0	0	0	0
25	180	180	14	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	190	190	4	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	210	210	10	0	0	0	0	0	0
31	220	220	10	0	0	0	0	0	0
32	230	230	14	0	0	0	0	0	0

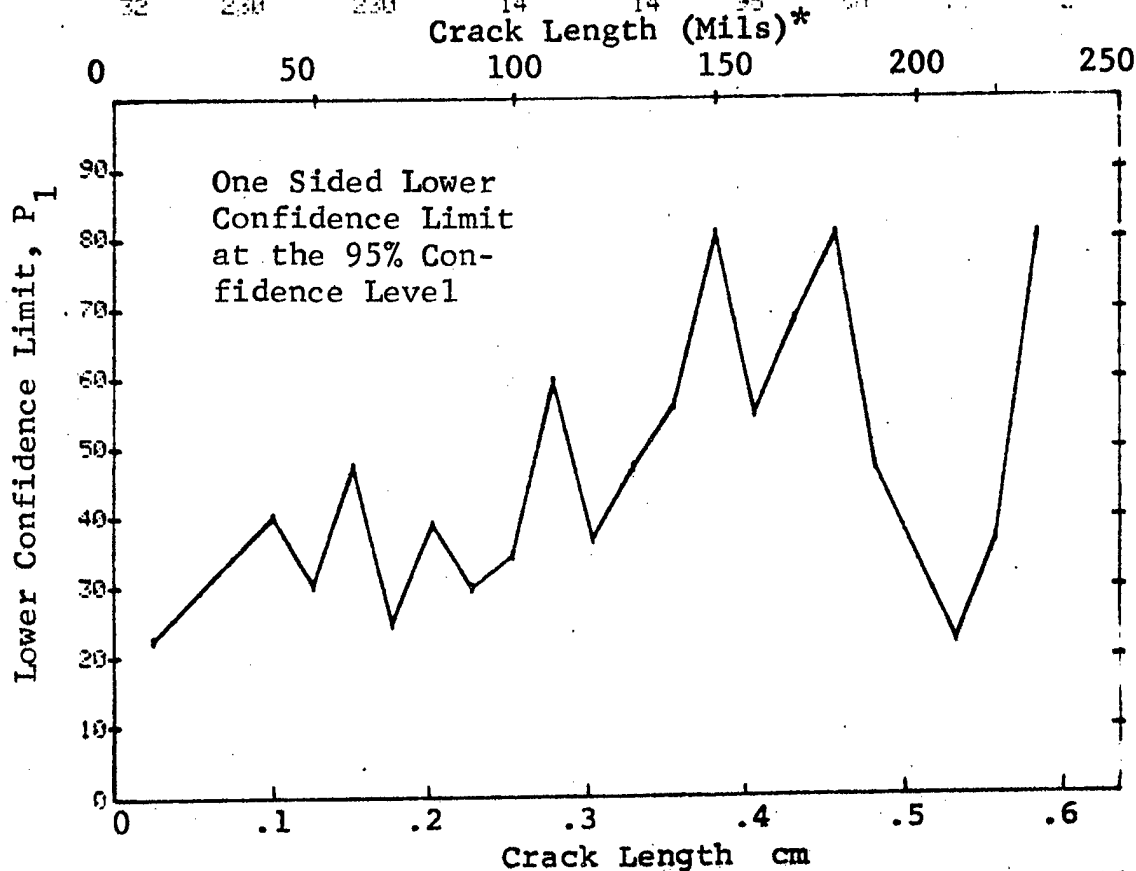


Figure D-108 Probability of Detection for 2024-T6 Al Using Eddy Current. Compressed Notch Flaws in Tandem T Specimen. Laboratory Environment.

(b) Optimum Probability Method of Data Cumulation

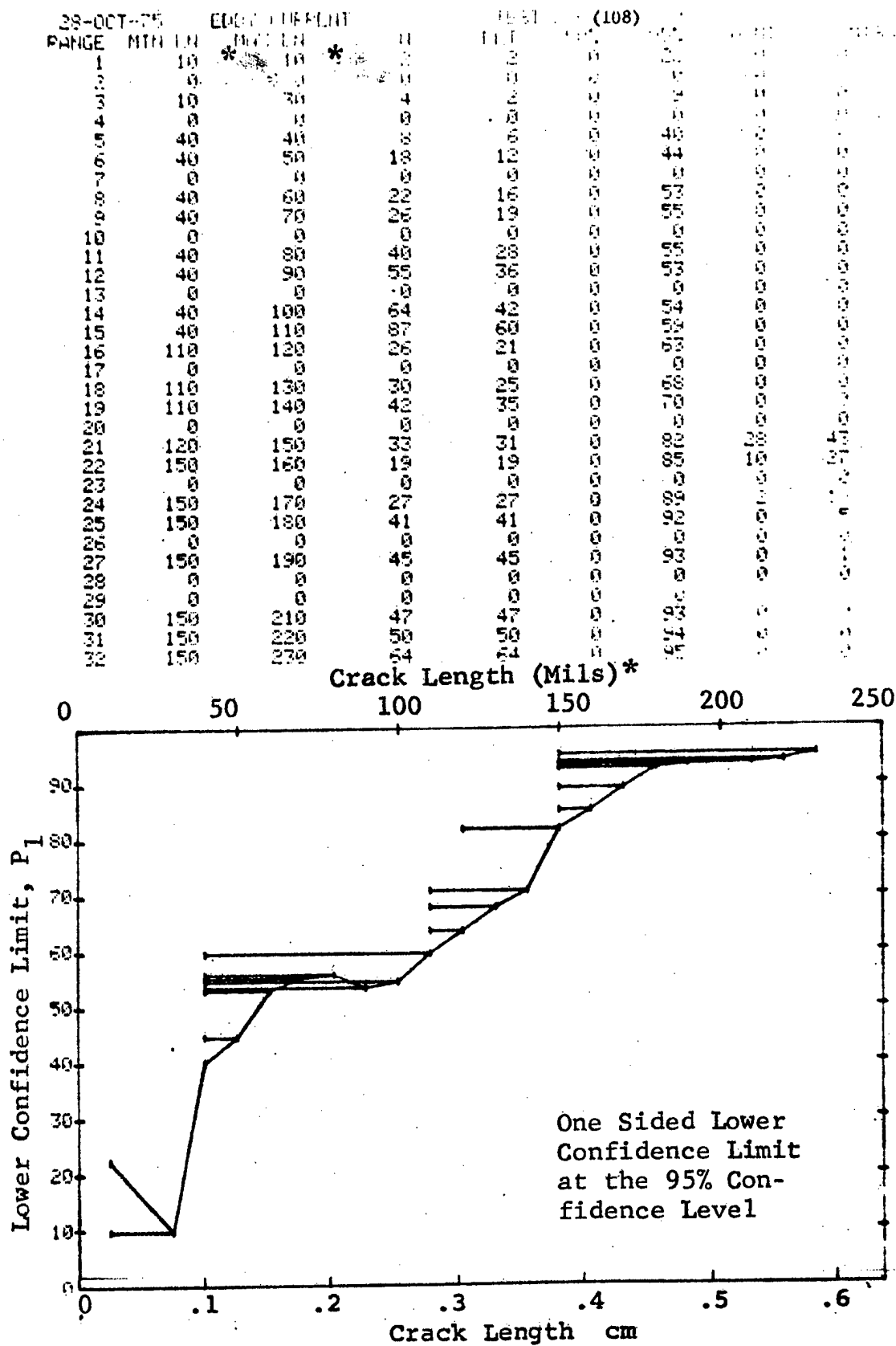


Figure D-108. (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

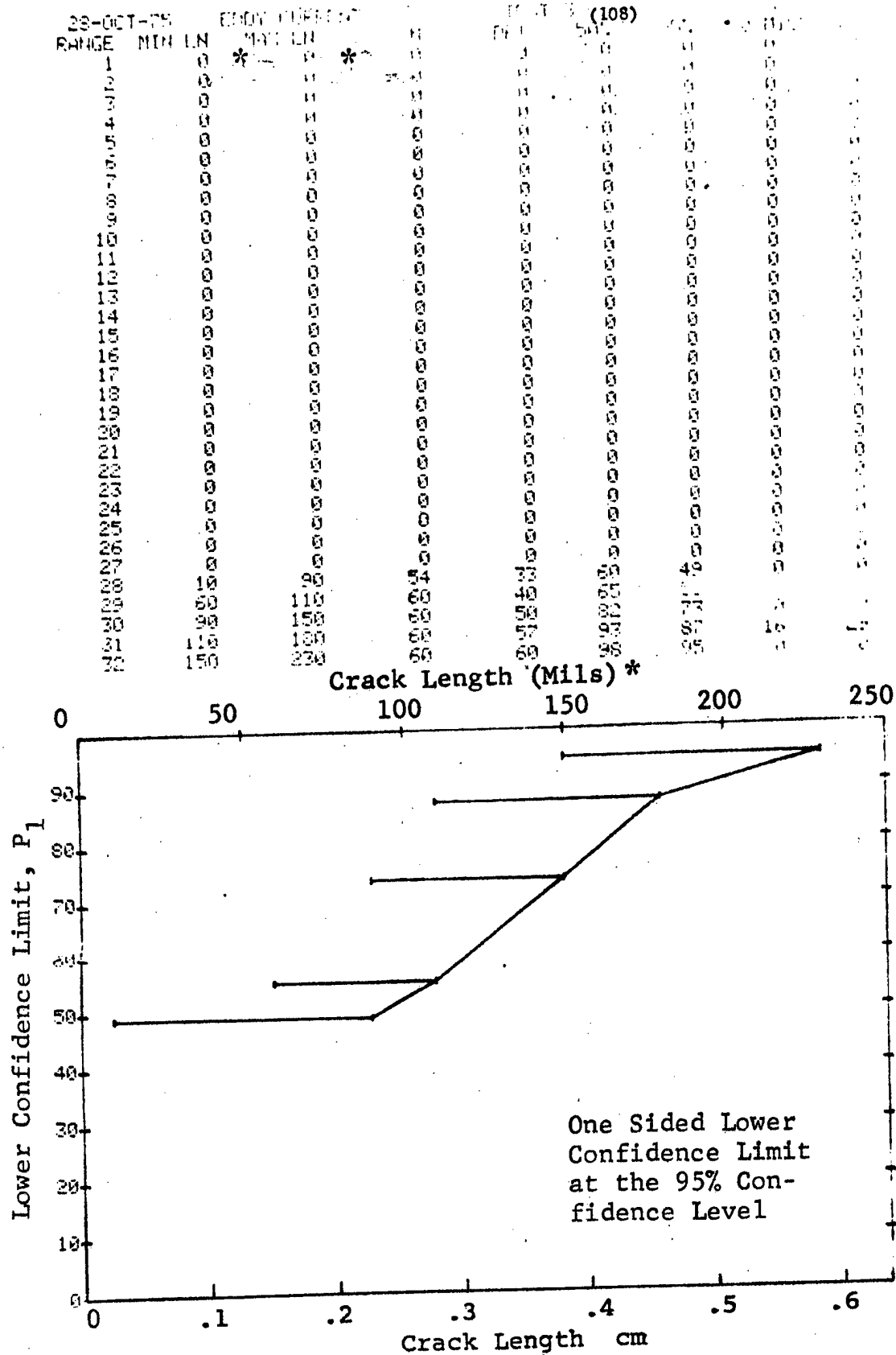


Figure D-108 (Concluded)

(a) Range Interval Method of Data Cumulation

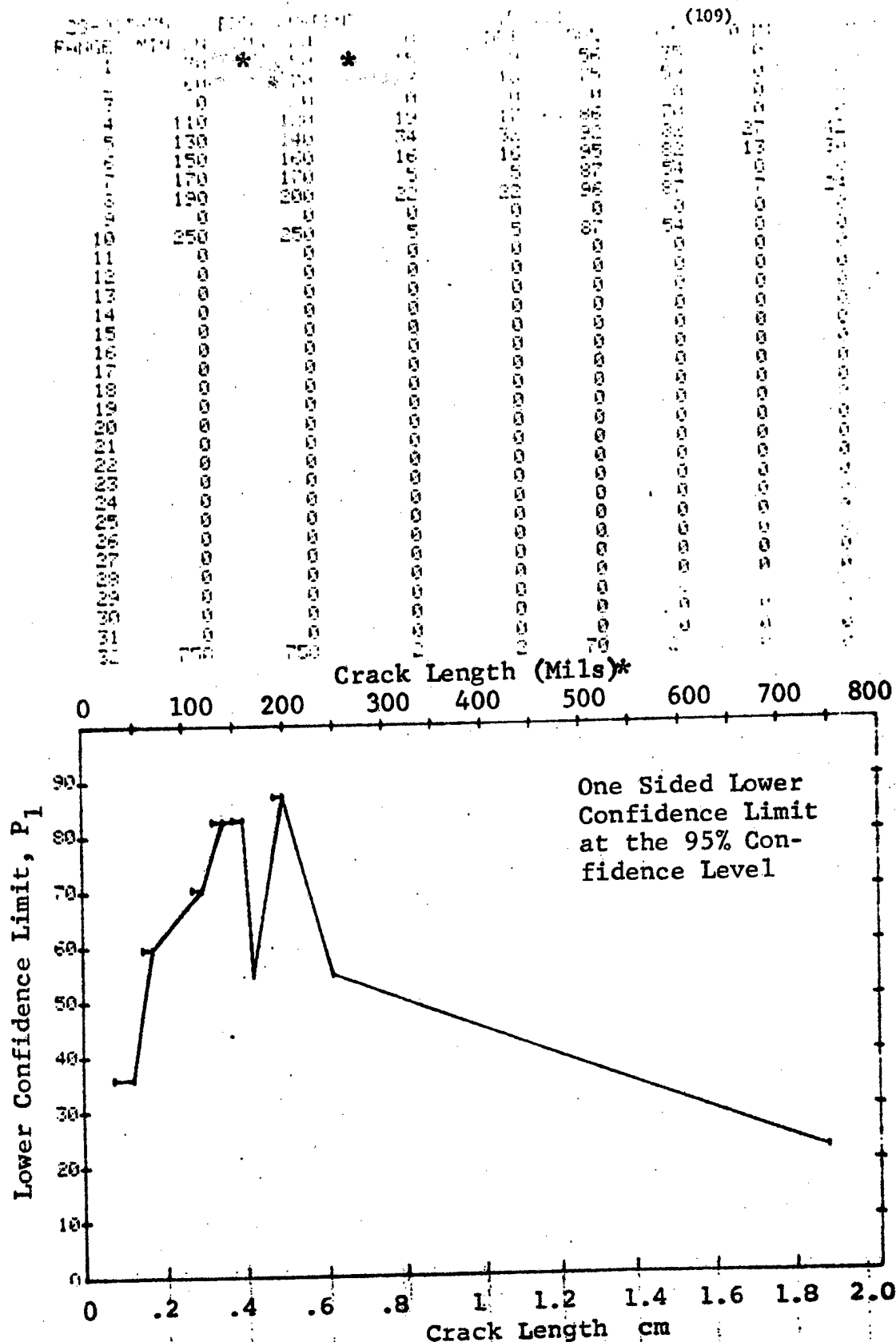


Figure D-109 Probability of Detection for 4340M Steel Using Eddy Current. Compressed Notch Flaws in Solid Cylinder. Laboratory Environment.

(b) Optimum Probability Method of Data Cumulation

RANGE	NIN	LN	M.DEN	H	1061	500	107	(109)
1	30	*	50	15	0	0	0	0
2	60	*	100	30	0	0	0	0
3	0		0	0	0	0	0	0
4	60		100	45	0	0	0	0
5	110		140	50	0	0	0	0
6	130		160	50	0	0	0	0
7	130		170	55	0	0	0	0
8	150		200	43	0	0	0	0
9	0		0	0	0	0	0	0
10	150		250	48	0	0	0	0
11	0		0	0	0	0	0	0
12	0		0	0	0	0	0	0
13	0		0	0	0	0	0	0
14	0		0	0	0	0	0	0
15	0		0	0	0	0	0	0
16	0		0	0	0	0	0	0
17	0		0	0	0	0	0	0
18	0		0	0	0	0	0	0
19	0		0	0	0	0	0	0
20	0		0	0	0	0	0	0
21	0		0	0	0	0	0	0
22	0		0	0	0	0	0	0
23	0		0	0	0	0	0	0
24	0		0	0	0	0	0	0
25	0		0	0	0	0	0	0
26	0		0	0	0	0	0	0
27	0		0	0	0	0	0	0
28	0		0	0	0	0	0	0
29	0		0	0	0	0	0	0
30	0		0	0	0	0	0	0
31	0		0	0	0	0	0	0
32	150		750	50	50	0	0	0

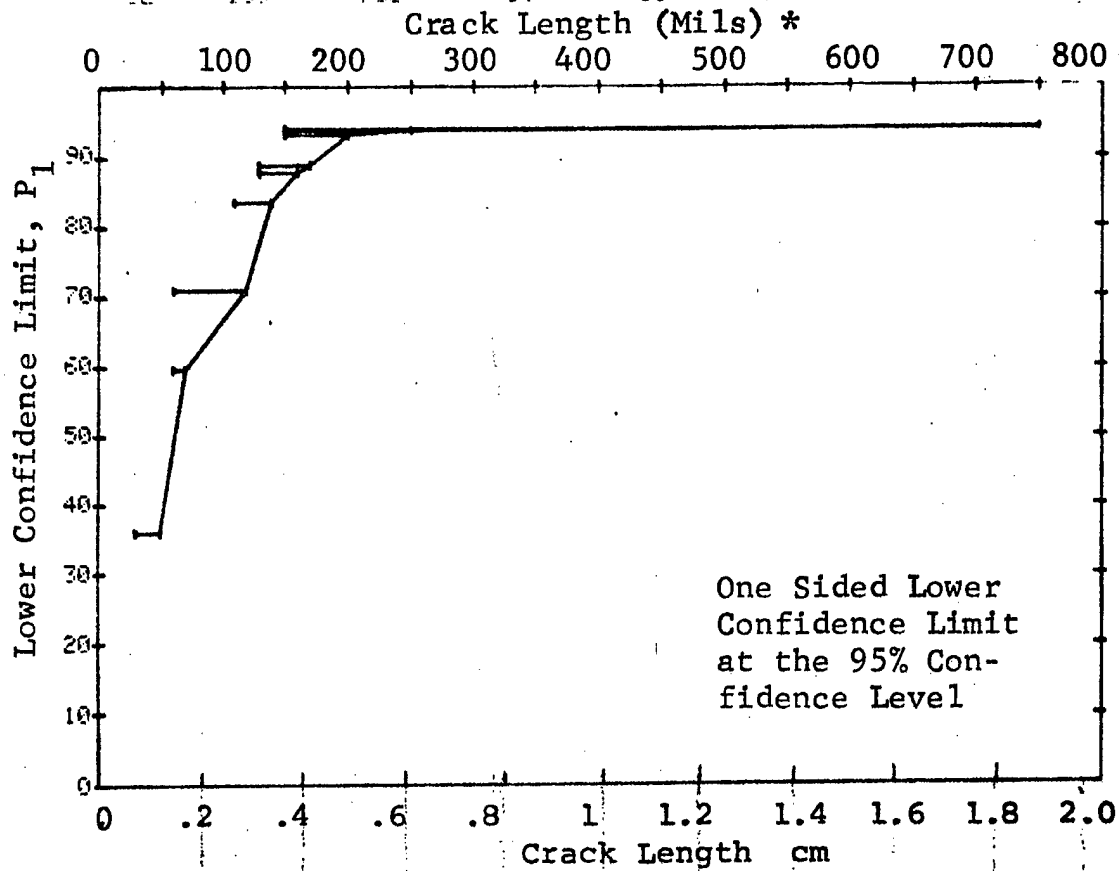
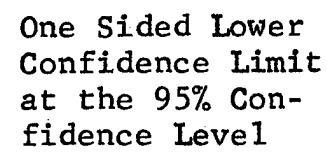


Figure D-109 (Continued)

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(a) Range Interval Method of Data Cumulation

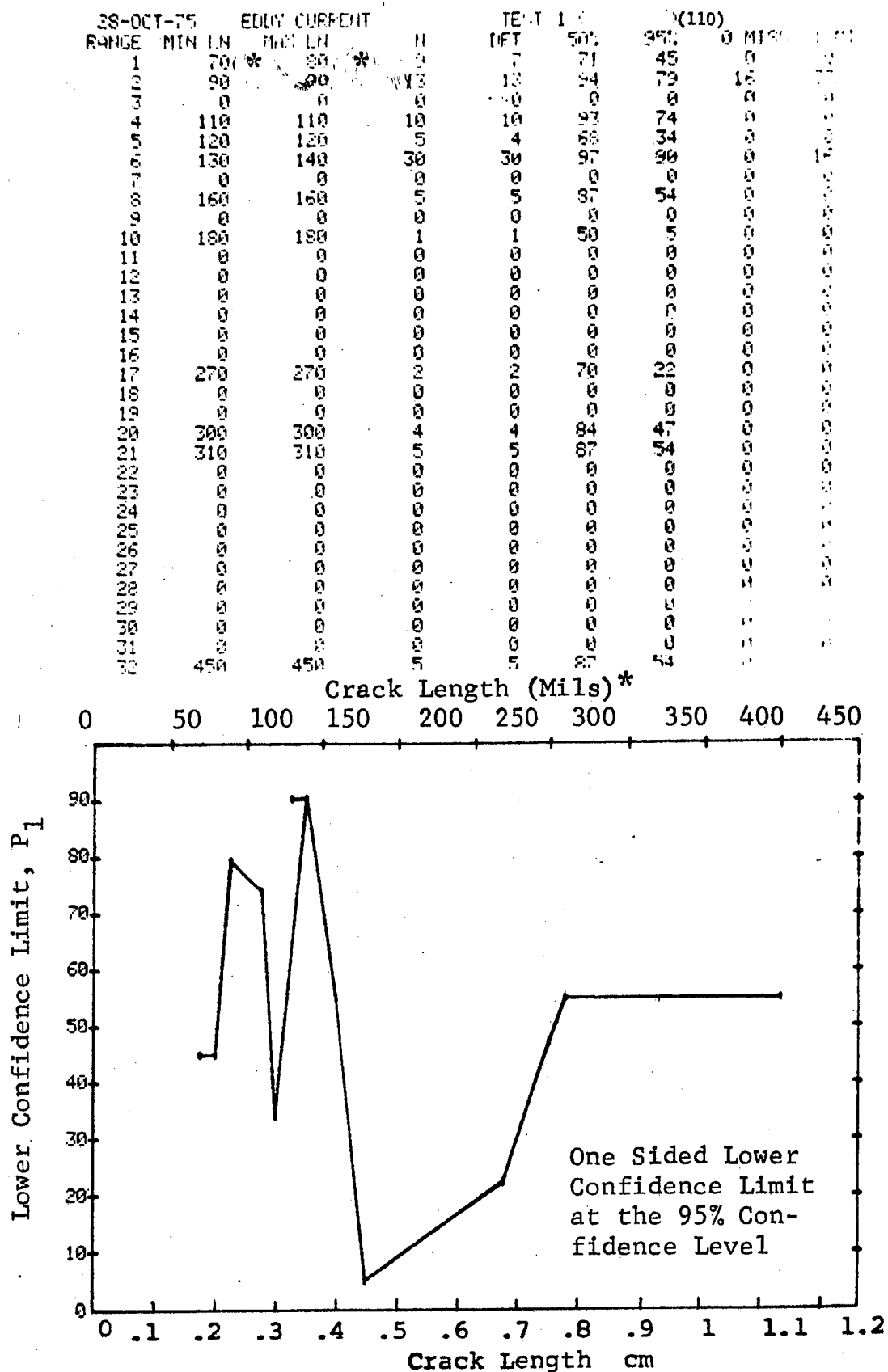


Figure D-110 Probability of Detection for 4340M Steel Using Eddy Current. Compressed Notch Flaws in Hollow Filleted Cylinder. Laboratory Environment.

(b) Optimum Probability Method of Data Cumulation

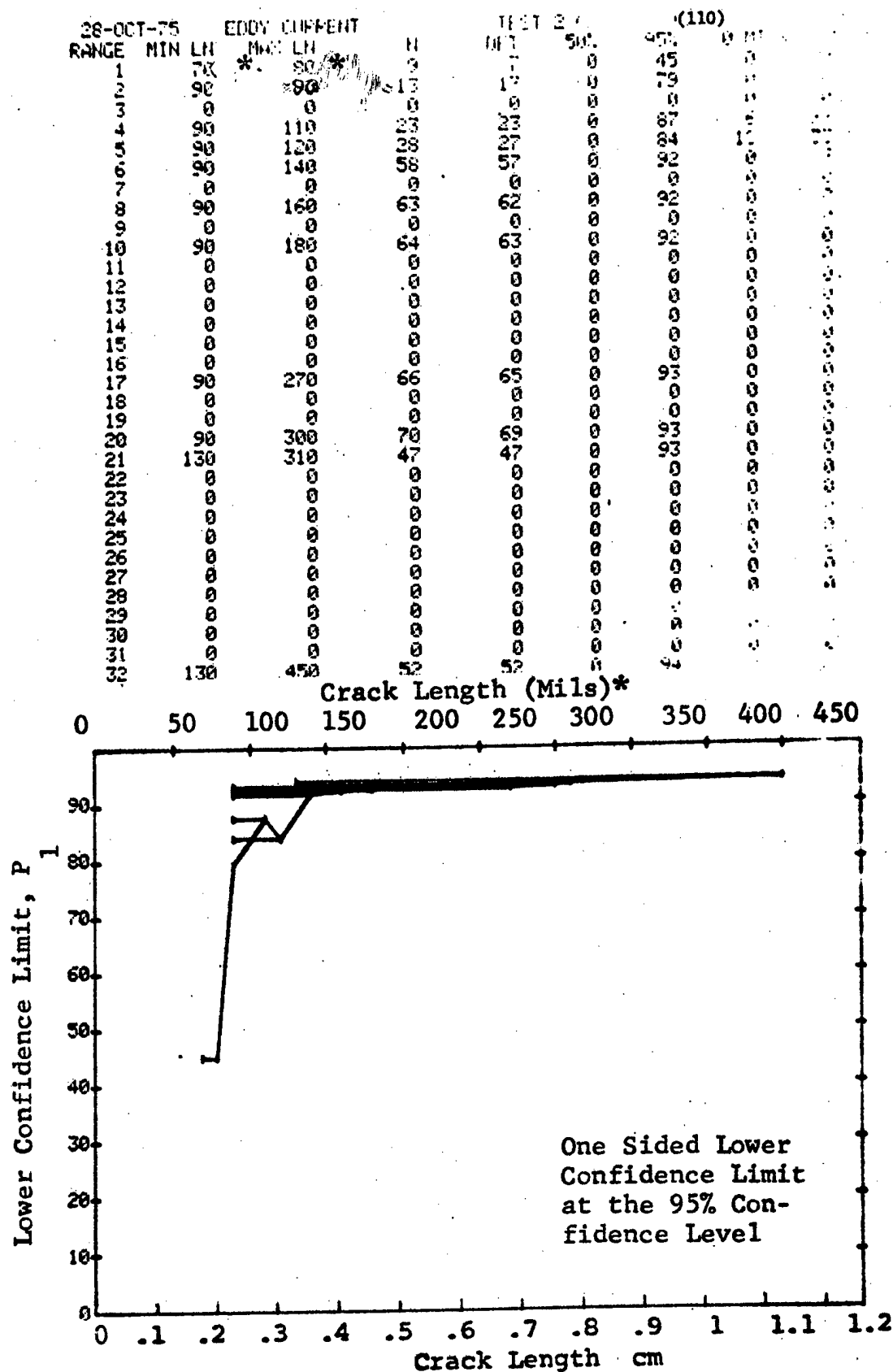


Figure D-110 (Continued)

(c). Overlapping Sixty Point Method of Data Cumulation

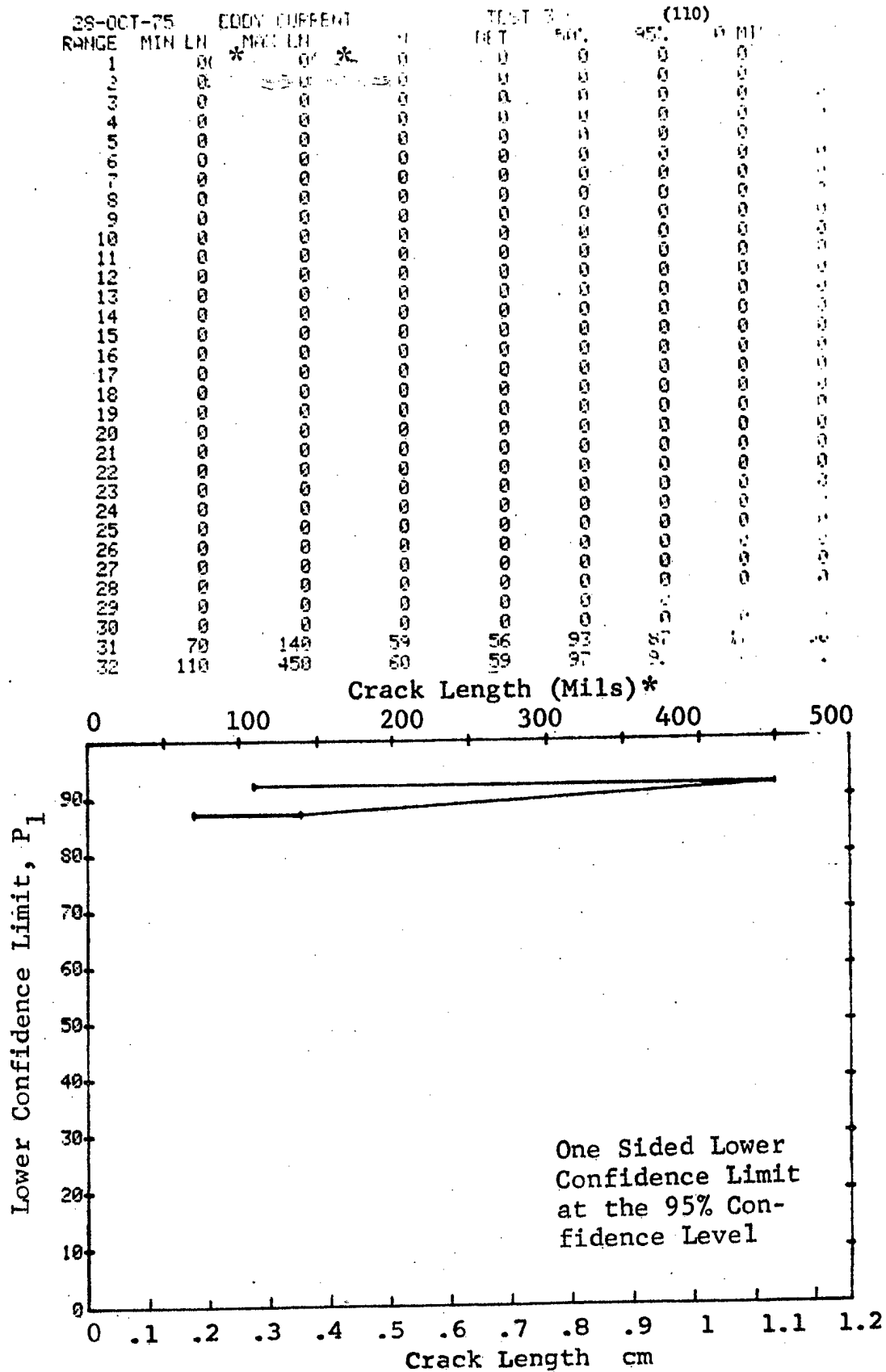


Figure D-110 (Concluded)

(a) Range Interval Method of Data Cumulation

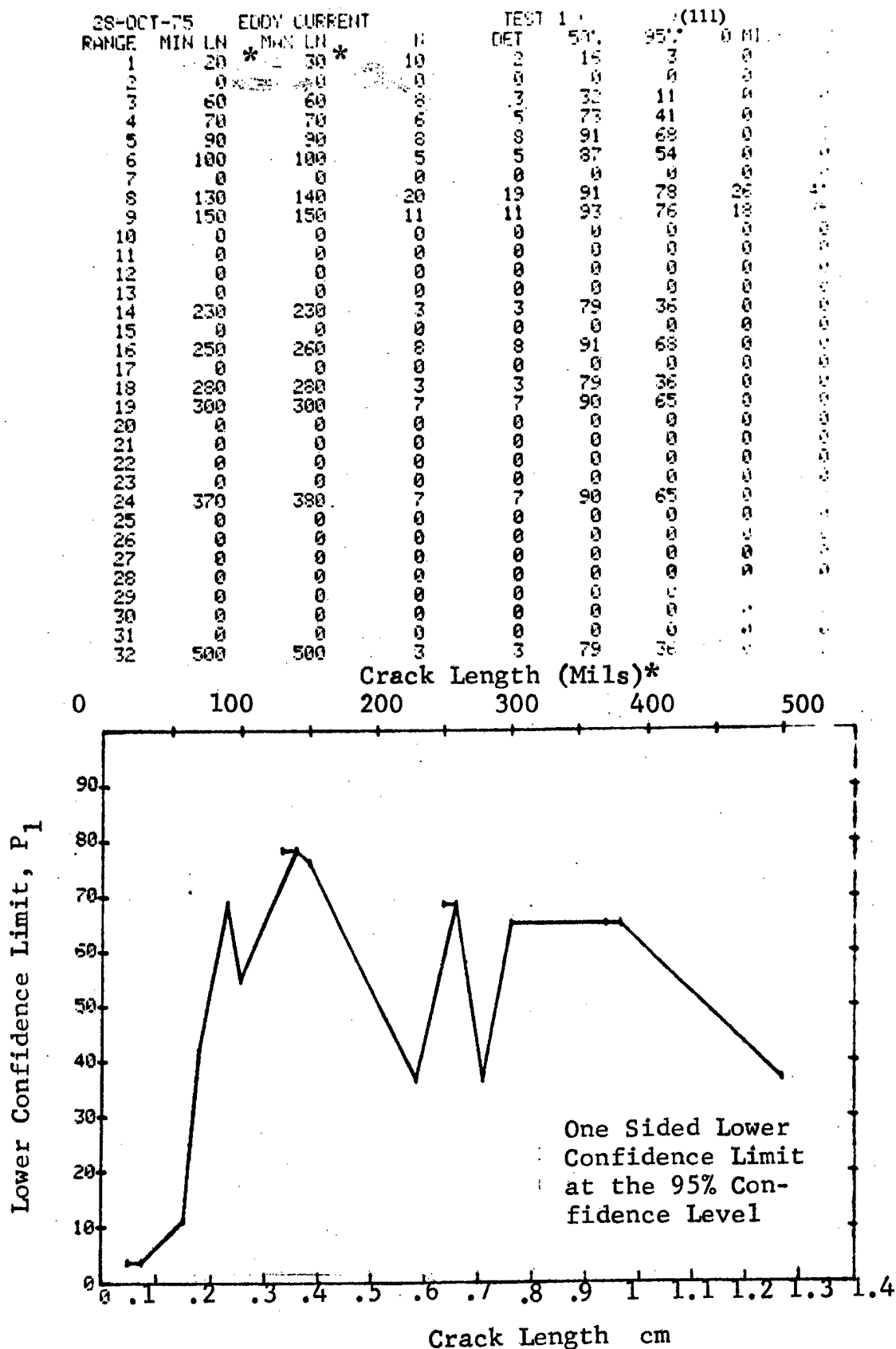


Figure D-111 Probability of Detection for 4340M Steel Using Eddy Current. Compressed Notch Flaws in Solid Filleted Cylinder. Laboratory Environment

(b) Optimum Probability Method of Data Cumulation

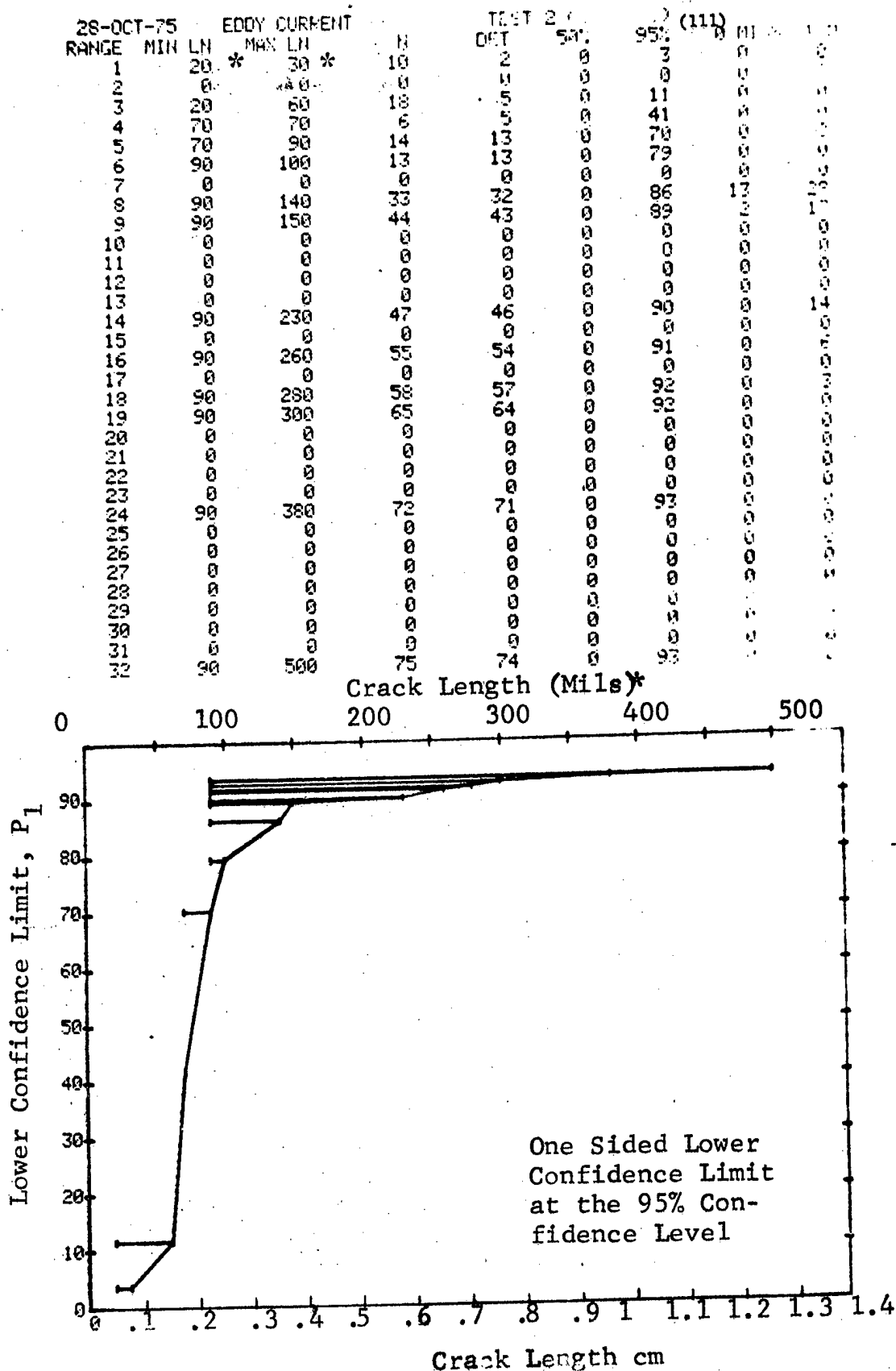


Figure D-111 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

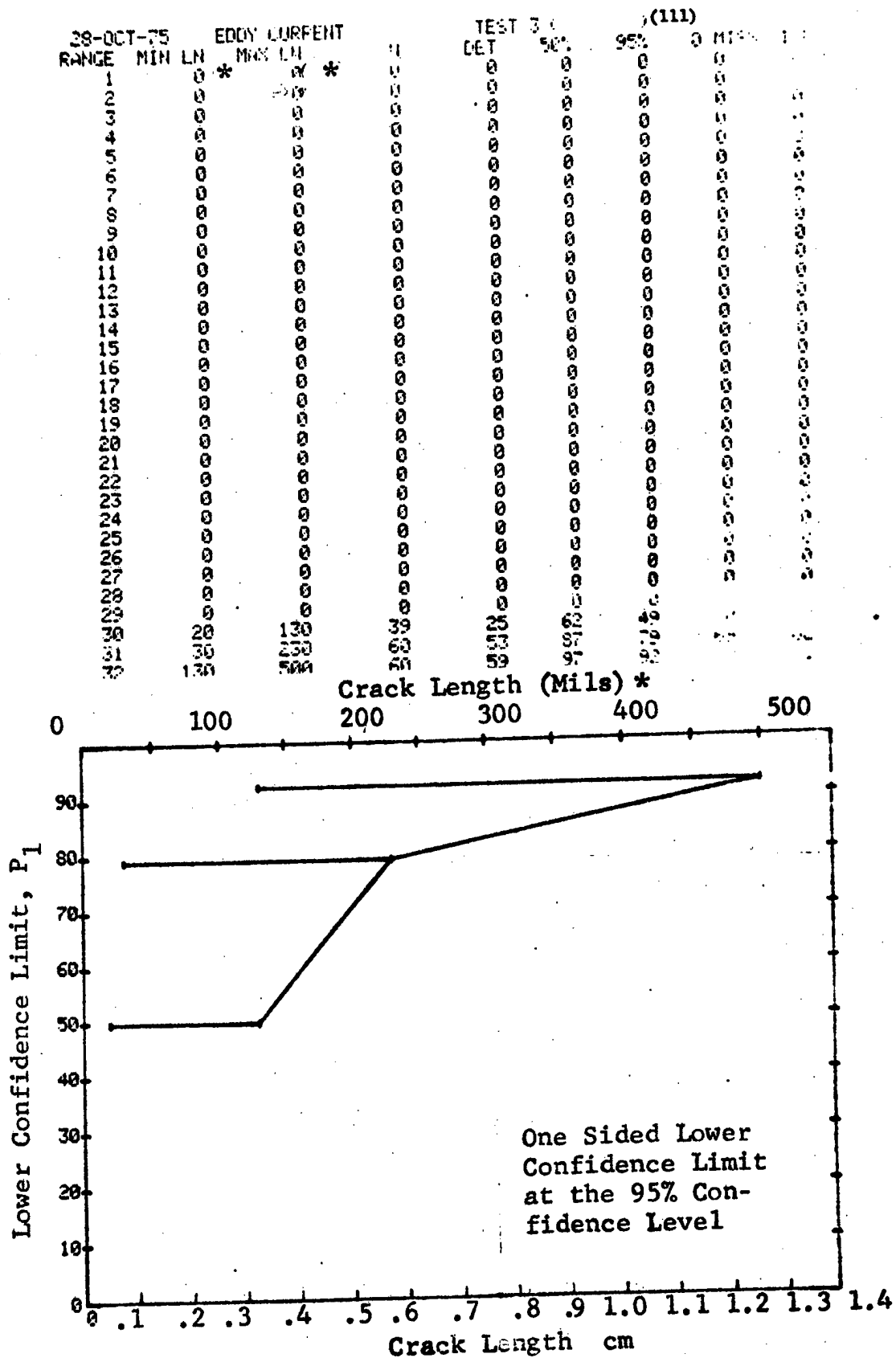


Figure D-111 (Concluded)

(a) Range Interval Method of Data Cumulation

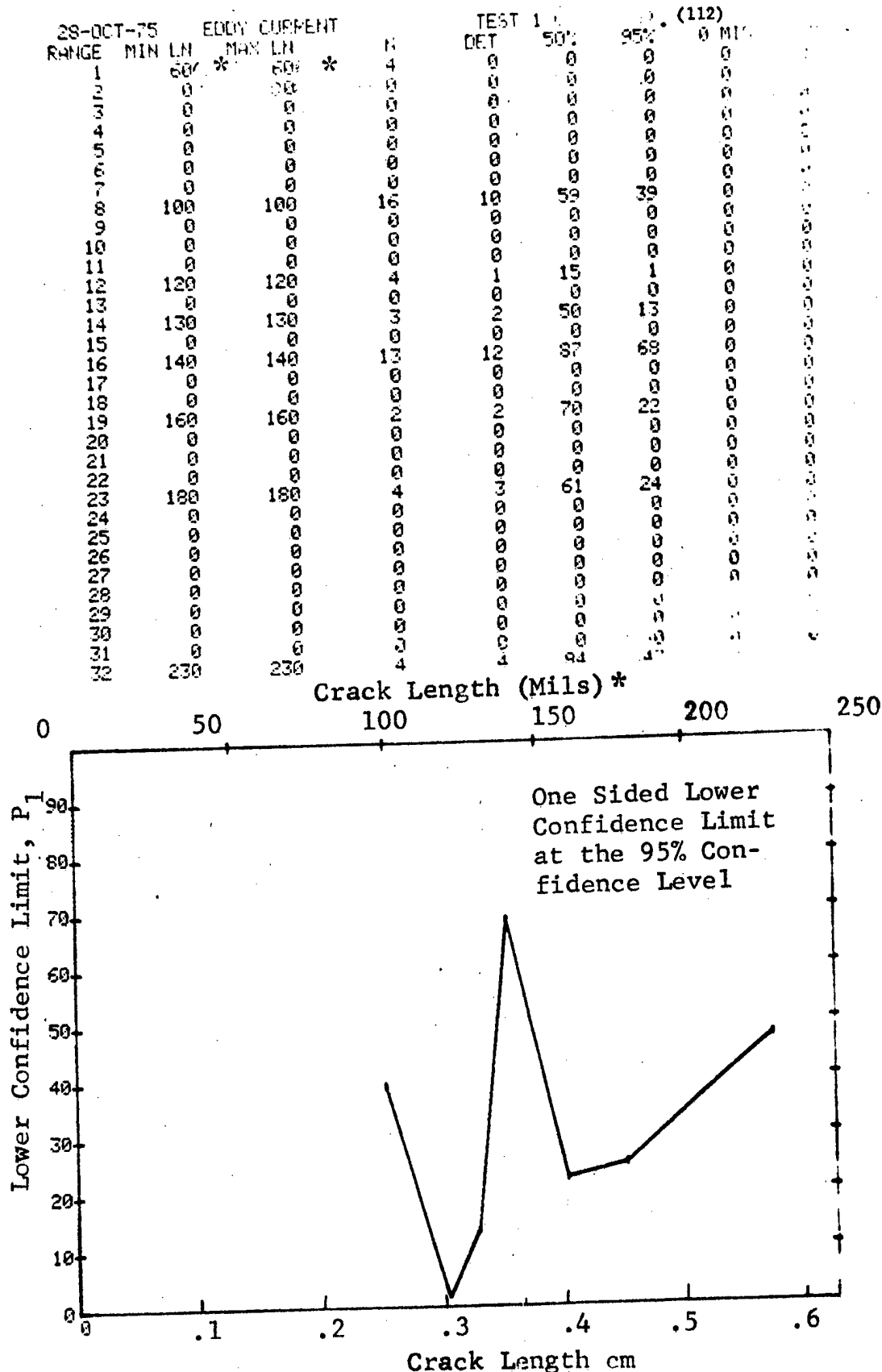


Figure D-112 Probability of Detection for 4340M Steel Using Eddy Current. Compressed Notch Flaws in Hollow Cylinder. Laboratory Environment.

(b) Optimum Probability Method of Data Cumulation

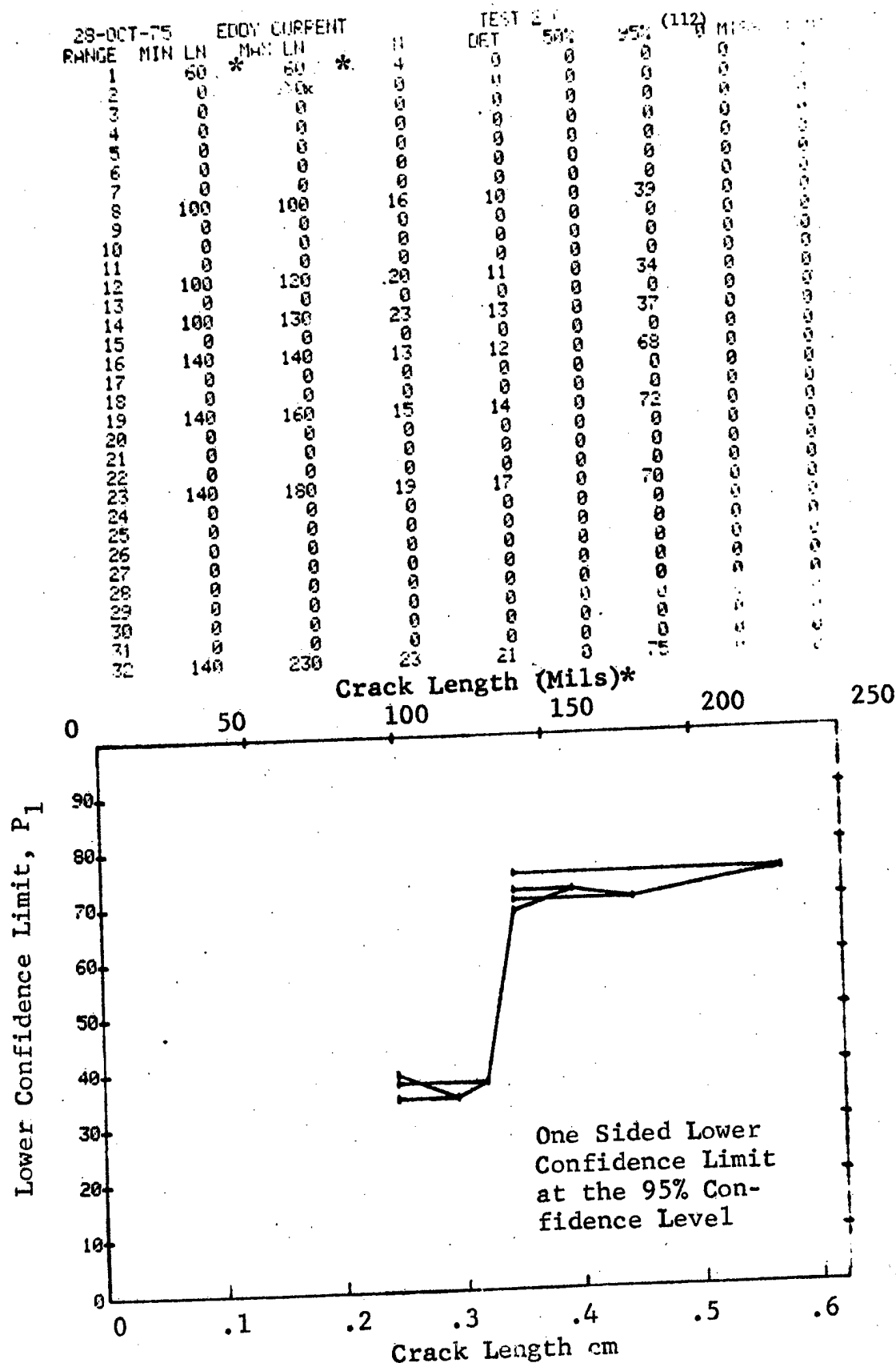


Figure D-112 (Continued)

(c) Overlapping Sixty Point Method of Data Cumulation

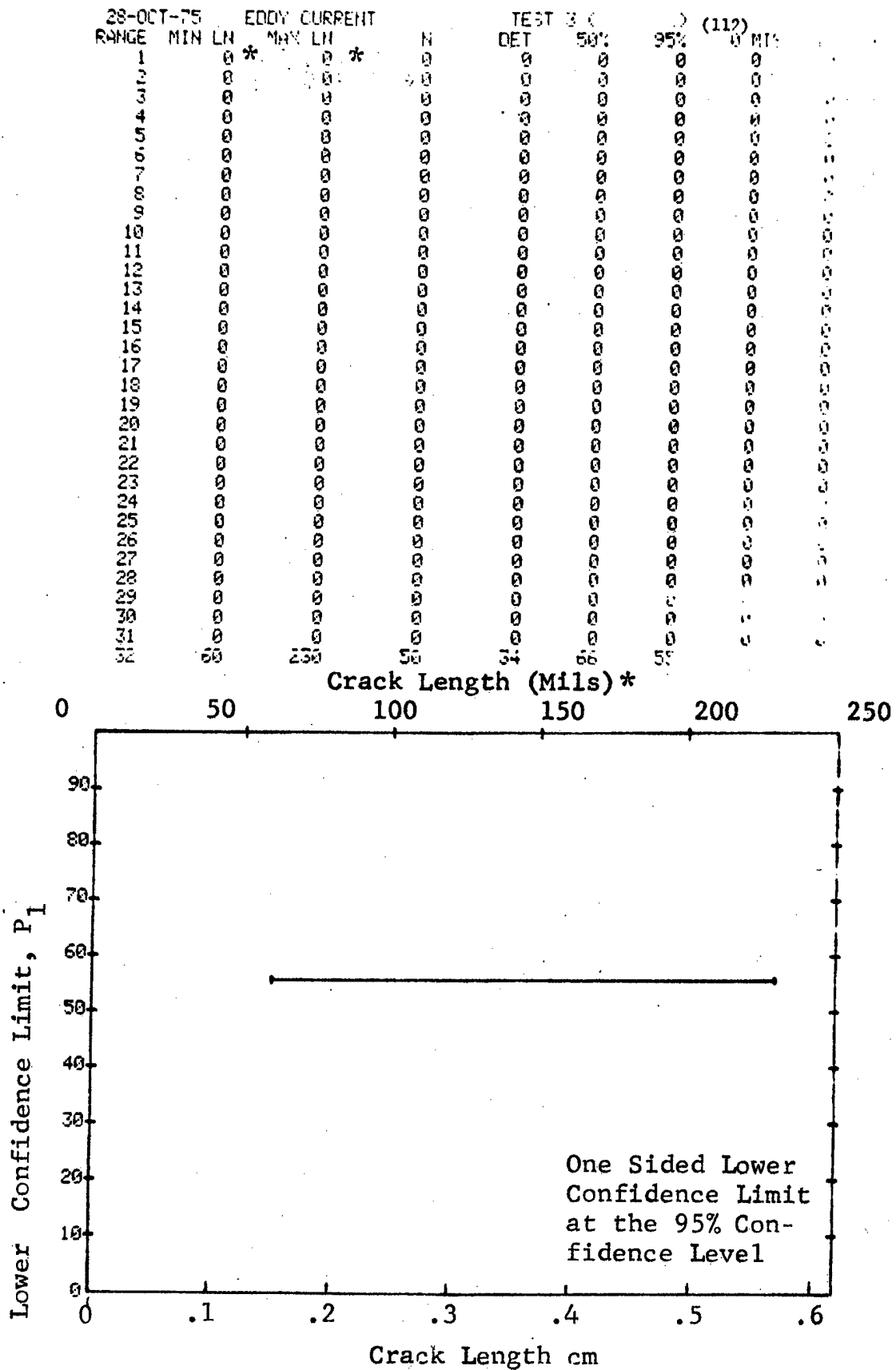


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	AUTHOR(S): B. G. W. Yee, F. H. Chang, J. C. Couchman, G. H. Lemon, and P. F. Packman			
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