

IEEE



Reliability Society Newsletter

Editors: Gary Kushner and Mark Snyder

Vol. 34, No. 3, July 1988

(USPS 460-200)

Chapter News

Denver Chapter

Our March meeting was a dinner meeting focused on Software Reliability and Safety Analysis. The speakers were Mark Hansen of Ford Aerospace and Ron Watts of DEC.

The Denver Chapter hosted its 5th annual all day meeting on software reliability. It was held at Ford Aerospace on Friday, May 13.

The chapter has also inaugurated a technical committee on software reliability. This committee will meet 1/2 day each month at a different company location in the greater Denver area. The plan is to cover a formal presentation during the first two hours. During this period, Musa's text on software reliability will be used as a basis of the lecture and review. The remaining two hours will be an open roundtable discussion for idea interchange.

Chicago Chapter

1987 was a productive activities filled year for the Reliability Society, Chicago Chapter, while the balance of activities proved to be stimulating to the chapter membership. Below is the chapter's schedule through July, 1988:

- March 23, 1988 Joint Meeting with Fox Valley Section
Speaker: John Johnson (Intel)
Topic: Reduced Instruction Set Computer Architecture

Place: Wilton Manor, Wheaton, IL
Time: 6:00 PM Social, 8:00 PM Bus. Mtg.

- March 24, 1988 Joint Meeting with IES
Speaker: Shahim Golshan (TI)
Topic: Parts Environmental Stress Screening
Place: Arthur's Restaurant, Des Plaines, IL
Time: 6:30 PM Reg., 8:00 PM Bus. Mtg.

- April 13, 1988 Joint Meeting with IES
Speaker: Keith McGee
Topic: Managing Automation for Productivity
Place: Mr. Peters Restaurant, Mt. Prospect, IL
Time: 5:30 PM Social, 7:15 PM Bus. Mtg.

- April 16, 1988 IEEE Recognition/Awards Dinner
Place: Westin Hotel, Rosemont, IL
Time: 6:00 PM Cocktails, 7:00 PM Dinner (Donation: \$30/pers.)

Continued on page 4

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RS Newsletter Inputs

All RS Newsletter inputs should be sent to one of the associate editors, **Gary Kushner**, 499 Brigham St., Marlboro, MA 01752, or **Mark Snyder**, Digital Equipment Corporation, 24 Porter Road (LJ01/C2), Littleton, MA 01460, per the following schedule:

For October Newsletter: by July 15
 For January Newsletter: by Oct. 15
 For April Newsletter: by Jan. 15
 For July Newsletter: by Apr. 15

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Request for IRPS Proceedings

Hardcopy Proceedings of the International Reliability Physics Symposium from 1967 through 1977 are being sought by:

C. L. Hilkey—ISC/87428
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 3700 E. Pontiac Street
 Fort Wayne, IN 46801
 (219) 423-9636

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Workshop Announcement

2nd Annual Workshop: R&M in Computer-Aided Engineering

workstation designers to exchange information on the current capabilities of CAE workstations and the additional capabilities needed to respond to R&M requirements.

Reflecting Reliability & Maintainability Considerations in Designs Generated by Computer-Aided Engineering (CAE) Techniques

Date	September 27-29, 1988
Location	Xerox Training Center Leesburg, Virginia USA
Period	Two and a half days

Based on the outstanding success of the 1987 R&M in CAE Workshop, the IEEE Reliability Society, in cooperation with the IEEE Computer Society, will sponsor a second Workshop aimed at assuring that R&M concerns are addressed when the capabilities of engineering workstations are being defined. Last year's Workshop posed four questions related to what is needed, what exists, and what can be expected. This year's Workshop will explore and update the answers by bringing together R&M engineers and

Further information: Henry Hartt
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 Phone (301) 231-1431

Continued from front cover

- May 19, 1988 Reliability Chapter Planning Meeting
Purpose: Business Meeting/Election of Officers
Place: DeVry Institute of Technology
Time: 6:30 PM

Philadelphia

The Philadelphia Chapter is pleased to report on the following activities for the period:

February 16, 1988

- *Space Station – Work Packages*
Mr. Aievoli, RCA Astro Electronics
- *Super-Resolved Recognition of Radar Targets based on Models of Neural Networks*
Dr. Nakil H. Farhat — University of Pennsylvania

April 19, 1988

- *Gallium Arsenide and the MIMIC Program*
Mr. Walter Schoppe — Naval Air Development Center

April 27, 1988

- On April 27 we had a very successful Annual Reliability Symposium. The symposium included the following topics:
 - Reliability of Electronic Components Estimation and Verification
 - STRIFE Testing
 - Surface Mounting Assemblies for Military Electronics
 - Addressing Software Reliability
 - Panel Discussion on
 - Integrating Different Aspects of the Reliability Function and
 - Two session tutorials that included basic reliability calculations, availability, MTBF, MTTR, etc., and also covered justification of the reliability function to management.

May 17, 1988

- A tour of the Boeing Co., Vertol, Pennsylvania.

Baltimore Chapter

The Baltimore Chapter has held three meetings this year. On October 28, Larry Phaller of Westinghouse was the speaker on the topic of "Evaluating ESS as a Tool for Achieving a Specified Reliability Objective." The December 9 meeting was held jointly with IES and was of more general interest, with Dr. Michael Kaiser of Goddard Space Flight Center speaking on "The Voyager-2 visit to the planet Uranus." Dr. Kaiser showed a number of fascinating slides. The May 25 meeting featured Mr. William Siegel, president of Pace, Inc., and he spoke on the subject of "The practical Side of Electronic Design."

Boston Chapter

On April 21, 1988 the Chapter held its Annual All Day Reliability Seminar at the Sheraton Tara in Framingham, MA. The program featured eight technical presentations followed by an awards ceremony and the annual chapter meeting. The newly elected officers for the upcoming year were announced:

Chairwoman - Jane Ferguson, Codex Corp.
 Vice-chairman - Don Simpson, GTE
 Treasurer - Vivian Thorson, Raytheon Co.
 Secretary - Don Markuson, Prime Computer

The monthly Chapter meeting for May, titled "Reliability and Egyptology," was a unique experience. The meeting was held on May 25 at the Boston Museum of Science and featured a prestige viewing of the Ramesses II exhibit, which is currently touring the country.

Below are some scenes captured at the all-day seminar held in April:



Col. Larry D. Griffen, Deputy Director, Weapon Support Analysis, speaking on "R&M and Computer-Aided Engineering. The Coming Challenge."



Vivian Thorsen (Raytheon Company and Seminar Chairperson) presents a plaque with her thanks to Mark Snyder (Digital Equipment Corp.) publicity chairman and co-editor of this newsletter.



Kathryn Sklenak and John D. Riedel of GTE speaking on "Managing Human Factors and System Safety on an NDI Program." Our morning moderator, E. R. Carrubba (right), looks on.

Cleveland Chapter

The Cleveland Chapter is finishing up the 1987-1988 operating year activities. Our Chapter officers are

Chairman: V. R. Lalli, NASA LeRC
 Vice-Chairman: A. M. Peabody, John Fluke MFG. Co. Inc.
 Secretary: Prof. C. W. Thomas, Case Institute of Technology

We have had five meetings so far. Attendance has ranged from 26 to 110. One more meeting is planned.

Date	Topic	Coordinator
5/4/88	Laser Communications	Gaul

A special project we are discussing is a conference in Cleveland. An HD project we are working on is a home study course for membership development.

We here in Cleveland are having fun serving our members and look forward to the coming activities.



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In Memoriam

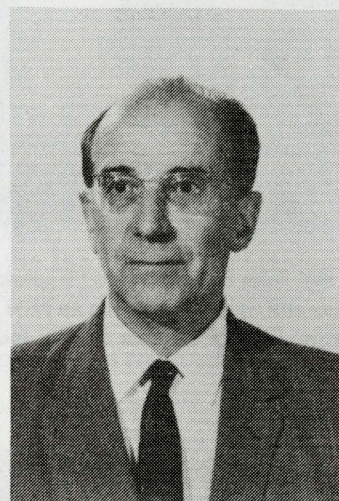
Ernest Jervis, Reliability Pioneer

Ernest R. Jervis (LS), a pioneer in the field of reliability and maintainability engineering, died October 9 at age 82. He had been active in quality assurance since WW II, when, as a member of the Rugged Tubes Committee of the War Production Board, he contributed to specifications for electron tubes capable of surviving high shock levels in U.S. Navy ships. Later he participated in the AGREE study on the Reliability of Electronic Equipment.

He graduated from the University of Milan in 1926 in Applied Mathematics and received the Dr. Ing. degree from the Polytechnicum of Torino in Electromechanical Engineering in 1929. In 1931, he received a fellowship from the Volta Society to study at Harvard University. There he joined a group led by E. L. Chaffee and received an MS in Communication Engineering in 1932. Unable to find employment, he returned to Italy and worked for FIVRE for three years. He returned to the United States in 1935 and, after a period as a research assistant at Harvard, joined the National Union Radio Corporation as a design and development engineer. At National Union, he participated in the development of "Loktal" tubes, including the first use of RF methods for sealing the glass envelopes.

In 1941, Dr. Jervis joined Tung Sol Electric Co., where, as chief design engineer, he was responsible for the development of many new tube types. While at Tung Sol, he served on the Subcommittee on Miniature Tubes of the IRE Committee for Receiving Tubes, and on the Rugged Tube Committee of the War Production Board. With J. R. Weske, he developed a feedback-stabilized hot wire anemometer. This was the first application of feedback techniques to the problem of low-inertia hot wires. He returned to National Union in 1948 as section chief of CRT research and developed a dark-trace CRT with controllable decay time.

He joined Aeronautical Radio, Inc. (ARINC), in 1952 as engineering manager of a newly formed reliability project. At ARINC, he participated in a number of landmark studies of the reliability of electron devices. These included studies of the reliability of electron tubes in military equipment and studies of the role of component reliability in system performance.



In 1958-59, Dr. Jervis served as a member of a team selected to study the reliability of ballistic missile systems for the House of Representatives, Committee on Appropriations. In 1963-64, he studied the performance of instrument landing systems in commercial aircraft, demonstrating that accidents attributed to pilot error were often the result of misinformation or information presented to the pilot in confusing formats. This report led to major changes in instrument landing systems.

In 1966, Dr. Jervis retired from ARINC but continued a busy consulting practice for several years. During this period, he developed design techniques for reliable application of microcircuits in military and space systems. He lectured widely on reliability and taught a number of courses on reliability techniques both in Europe and in the United States.

He held several patents, including a microwave dynatron oscillator and a composite CRT phosphor. He authored more than 50 publications and major technical reports on tube design and reliability. He is survived by his wife of 55 years, Dr. Helen Jervis; two daughters, the Rev. Madeline Jervis of Arlington, VA and Dr. Jane Jervis of Brunswick, ME; a son, Dr. Thomas Jervis (SM) of Los Alamos, NM; and four grandchildren.

Message from the President

I would like to take this opportunity to look back at the accomplishments of your Reliability Society over the past 15 months and to highlight some key areas that will be getting attention between now and the end of the year.

Meetings

We have had very successful Annual RAM Symposia and International Reliability Physics Symposia in 1987 and 1988 with high attendance, excellent technical programs, and a surplus for the Society to help support its operating budget. Many IEEE volunteers serve on both Management Committees. However, the RAM Symposium is especially desirous of having additional volunteers for its Management Committee. If you are interested, please contact Bill Thomas at (301) 585-0421.

The first Reliability CASD workshop held in 1987 was extremely successful, with 99 registrants. Plans are well underway for our second workshop this fall in Washington, DC.

Sponsorship

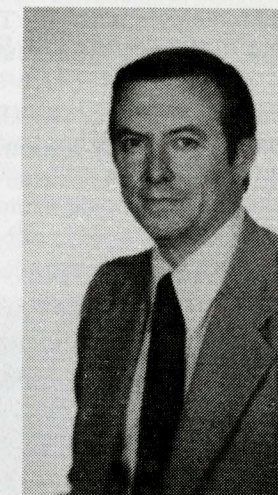
Both the Reliability Society and the IEEE Executive Committee have approved the tax-free donation of \$20,000 to the Air Force Institute of Technology Foundation for the purpose of sponsoring five EE Professors at the Air Force Summer Workshop. Thirty professors who teach design courses will participate in the workshop, with the desired result that they come away with real-world practical examples of Reliability in the design process. The five professors sponsored by IEEE-RS will be available for Chapter/Section Presentations and newsletter articles after completing the workshop this summer.

Students

The Reliability Society is fortunate in having an above average percentage of student members. However, we are always trying to attract students to the engineering profession in general and to the reliability discipline specifically. To this end, we are participating in IEEE's Best Student Paper Award, have placed a Reliability Society Membership ad in the Student Journal, and have prepared a brand new Membership Exhibit that has been used successfully at both RAMS and IRPS. If you have additional thoughts on things we can do to attract good students, please call Dr. Sam Deene at (303) 924-7711. We continue to move forward on a home study course for entry level Reliability practitioners, and hopefully, 1989 will be the year it is issued.

Awards

We continue to seek recognition for our members by election to Fellow Grade or an IEEE Field Award. If you would like to nominate a member, please call Alan Plait at (703) 347-6710/1. We have also recently changed our chapter



awards criteria so that small chapters will have an equal chance of being selected as our larger chapters.

Transactions

This past year has seen a transition in the very demanding volunteer assignment of Editor-in-Chief from Dr. Richard Kowalski to Myron Wilson. Many abstracts and papers, which must be reviewed and refereed, are received each year. As always, we continue to seek practical, non-academic applications of Reliability and case histories. If you have something you would like to contribute, please contact Myron Wilson at (215) 667-3761. Our Special Issues Editor, Past President Dr. Thad Regulinski, continues to turn out several outstanding issues each year, most notably the recent R&M 2000 issue. Our continued thanks to Dr. Regulinski.

Technical

A number of new committee chairmen have been appointed this past year. They include Dick Jacobs - Quality Interfaces Committee; Howard Kennedy - CAE Initiatives Committee; and Richard Doyle - Mechanical Reliability Committee. If you would like to serve on one of our 18 technical subcommittees please contact Bernie Bang at (301) 765-7340. There is something there for everyone.

Finances

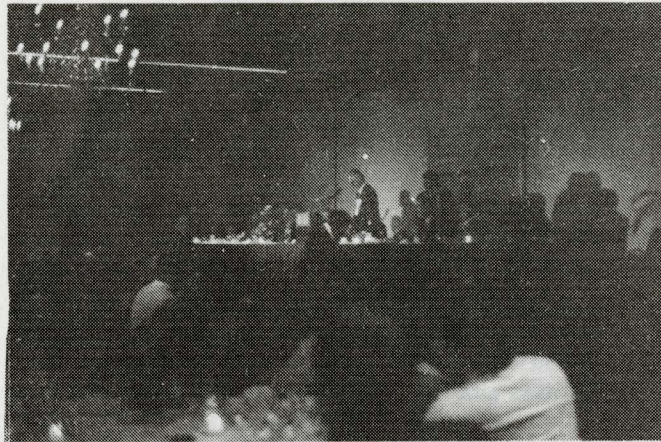
Your Reliability Society is financially sound and has significant reserves. The foresight and planning of our previous Presidents have served us well.

Let me again thank all the 60 members, both AdCom and Chapter Chairmen, for their service and efforts. We have a great group of competent volunteers. Our 3,600 members, the Institute, and the profession-at-large are well served.

Thomas L. Fagan
President

The International Reliability Physics Symposium was held April 11 - April 14 in Monterey, California. There were over 900 attendees, making this year's symposiums one of the largest ever.

The keynote speaker this year was Dr. Gordon Moore, Chairman of the Board, Intel Corporation. Dr. Moore's speech was titled, "It doesn't get any easier: Semiconductor industry trends."



Dr. Gordon Moore addresses the attendees at the awards banquet.



Dr. Gordon Moore (center) with Al Tamburrino (left), secretary of the IEEE Reliability AdCom and representative from the AdCom to the IRPS; and Bob Thomas (second to the left), chairman of this year's IRPS.

Dr. Moore cofounded Intel in 1968, serving initially as executive vice-president. He became president and chief executive officer in 1975 and held that post until elected Chairman and chief executive officer in 1979, and retained this position until 1987. Before founding Intel, Dr. Moore was director of research and development for the Fairchild Semiconductor Division of Fairchild Camera and Instrument Corporation, a company that he co-founded in 1957. Born in San Francisco, California, Dr. Moore earned a B.S. in chemistry from the University of California at Berkeley and a Ph.D. in chemistry and physics from the California Institute of Technology. He is a director of MicroMask, Inc., Varian Associates; and Transamerica Corp. He is also a member of the National Academy of Engineering, a Fellow of the IEEE, and a trustee of the California Institute of Technology.

The awards banquet was preceded by an attitude-adjustment period. During the cocktail period, the verbal communications and mingling was accompanied by a string quartet of extremely talented and lovely musicians.



String quartet with the IRPS banner overhead.

Important Announcement

The Chapter Awards Committee, represented by Ms. Jill Josselyn, Dr. Randal Fleming and Mr. Bob Jaquess, with the knowledge of ADCOM, have changed the method of awarding points for the Annual Chapter Awards Program. The changes which will be in effect for the 1988-1989 awards period beginning July 1, 1988 will result in a more equitable distribution of points over the wide range of chapter size and activities. Previously, the verified points from each of the six award categories were added to obtain a total score. This has been changed so that total score will now be determined by first converting Category #4 (Papers) to a productivity rating. This will be done by determining the number of chapter members per paper. The sum of categories 1, 2,

3, 5 and 6 will then be multiplied by the term 1 plus the productivity factor of category 4 to arrive at the total points.

Another change is that all of the awards will be monetary. The fourth place and beyond have been postage stamps. This has been replaced by an award of \$60.00 for chapters that are judged fourth place and beyond. The revised rules will be mailed to the chapter chairpeople prior to July 1, 1988 so that these changes can be incorporated into the program planning.

Chapter chairpeople are reminded that responses to this year's Awards Program will be due by August 5, 1988.

Bob Jaquess

Chapter Awards Program Chairman

ADVANCED RELIABILITY TECHNIQUES

Committee Activity Report

P. H. Eisenberg, Santa Barbara Research Center

There appears to be a flurry of activities centered on changing MIL-SPECS for monolithic integrated circuits. A major driver is the increased complexity of devices resulting in reduced part type usage. Application specific integrated circuits (ASIC) plus rapidly changing fabrication technology have also contributed to the need for change. Reliability prediction techniques and reliability testing requirements must change to accommodate the more complex devices. Furthermore, activation energy related prognostication methods may have reached the point of diminishing returns.

Since the population of a given complex part is small the confidence in sample testing results would not be high. Also, the part to part variances could further confound the data. Variances could possibly be reduced using design of experiments techniques, currently very popular in the automotive industry in Japan and the United States. They are known as the Taguchi Variability Reduction Program from the American Supplier Institute and Dorian Shainin Empirical Variations Research from Shainin Consultants. For example, these techniques could utilize test vehicles in the form of test elements that evaluate multilevel metallization for dielectric strength and metal migration. Other in-situ test elements could include discrete diode, transistor and gate functions.

Functional and parametric electrical testing of complex devices is inhibited by reduced inputs and outputs and test equipment development inability to keep up. Two potential solutions are built in test function on chip and the tester independent concept being investigated by RADC. The built in test method has been accepted by the microcircuit fabrication industry and is being designed at the chip or wafer level.

The built in chip function evaluates the process conformance to the established baseline. It is postulated that if the process is under control, and the device logic is correct, there is a very high probability of a maximum yield.

Recent pronouncements from the Department of Defense (DOD) indicate that they want to eliminate sample testing that allows a percent defective. Policy letters from high ranking DOD executives stating this policy are brief and require clarification. DOD is considering generating a model microcircuit specification that would look more like an industry document. The Advanced Reliability Committee is concerned that microcircuit reliability prediction methodology may not catch up with the effects of the changes described above to include empirical evaluation based on field data.

1987 RAMS Best Paper

The P. K. McElroy Award for 1987 Best Paper

“Generic Automated Model for Early MTTR Predictions”

Rhine Jager and George S. Krause Jr.
Westinghouse Defense and Electronics Center, Baltimore

Abstract — This paper describes a computer model that can be used to predict the Mean Time to Repair (MTTR) of a system or subsystem during the initial design cycle. The model takes advantage of generic data compiled from design experiences gained on similar types of equipment. This modeling technique can be utilized very early in the design of a system/subsystem and is easily updated when more detailed data become available. Procedure V of MIL-HDBK-472 serves as the basis for the calculations performed in the model. The model is written in FORTRAN and is constructed to be both user friendly and interactive. The outputs generated by the model constitute backup data that support the MTTR predictions in addition to the actual MTTR predictions. The use of interactive and generic data inputs is unique to this model, and will result in time savings, particularly early in the program when input data are difficult to obtain because design details are too sketchy. [1987, pp 280-285]

Rhine Jager is a Senior Engineer in the Westinghouse Defense and Electronics Center. He has a BSEE degree from the University of Michigan and a MEA degree from George Washington University. Mr. Jager has been with Westinghouse for 27 years, the last 9 as a member of the Specialty Engineering group. Previous Westinghouse experience was as a member of the Systems Analysis group of the Defense and Electronics Center.

Mr. Jager has performed maintainability, testability, and safety analyses on several systems, including avionics systems, ground-based radar systems, and automatic test equipment. He has been involved in all phases of the design cycle from the early conceptual phase and proposal writing through maintainability and testability demonstration.

George Krause is a Senior Engineer in the Specialty Engineering section at the Westinghouse Defense Center in Baltimore. Mr. Krause has been employed with Westinghouse for the past seven years. His responsibilities have included maintainability and testability design and analyses for several large ground based radar systems. He has also been involved in many large proposal efforts for the Defense Center. Mr. Krause earned his BSEE from the University of Maryland in 1980 and has just complete his Technical Management degree from the University of Maryland. In 1985 May Mr. Krause was presented with the Westinghouse Engineering Achievement Award and then in 1986 May was presented with the Westinghouse Signature Award of Excellence.

Reliability Society Award

On April 29, 1988, Dr. Julia Bukowski, Professor of Electrical Engineering, Villanova University, received a Reliability Society Award from Thomas L. Fagan, President of the Reliability Society, for her hard work and dedication in serving as Guest Editor of the IEEE Reliability Society Transactions Special Issue, “Fault Tolerant Computing.” The ceremony at Villanova University was also attended by Dr. S. S. Rao, Chairman of Villanova’s EE Department. Dr. Bukowski is a 1974 graduate of the Moore School of Electrical Engineering, University of Pennsylvania.

Approval Voting

IEEE has joined several other professional societies in adopting Approval Voting in order to provide members with greater flexibility in expressing their preferences. Approval voting permits you to cast one vote for each candidate you approve of or find acceptable. Each vote counts equally, and the candidate with the most votes (i.e., approval) wins.

If you approve of all candidates, you may vote for all. If you approve of none, you may vote for none. A vote for all or none of the candidates may express your view, but it will not affect the outcome.

To have the greatest influence in the election, you should generally vote, as nearly as possible, for half of the candidates. In a two-candidate contest for one office, you should vote for one. In a three-candidate contest for one office, votes for one or two candidates are equally effective. Your decision to vote for one or two candidates should be determined by whether you perceive your first choice to be much better than the other two, or your first two choices to be much better than the third.



Left to right: T. L. Fagan, Dr. J. Bukowski, and Dr. S. S. Rao.

In a four-candidate contest for one office, a vote for your top two choices will generally have the greatest influence on the outcome. However, if you believe your first-choice candidate is much better qualified than the other three, you may choose to vote for only one. Similarly, if you believe each of your first three choices is much better qualified than your last choice, you may choose to vote for three.

IEEE’s continuing success depends on the quality of the leaders elected by its members. Approval voting gives you greater flexibility to express your views. Please exercise your voting privilege thoughtfully.

MSI ANNOUNCES

RAM TOOL-KIT

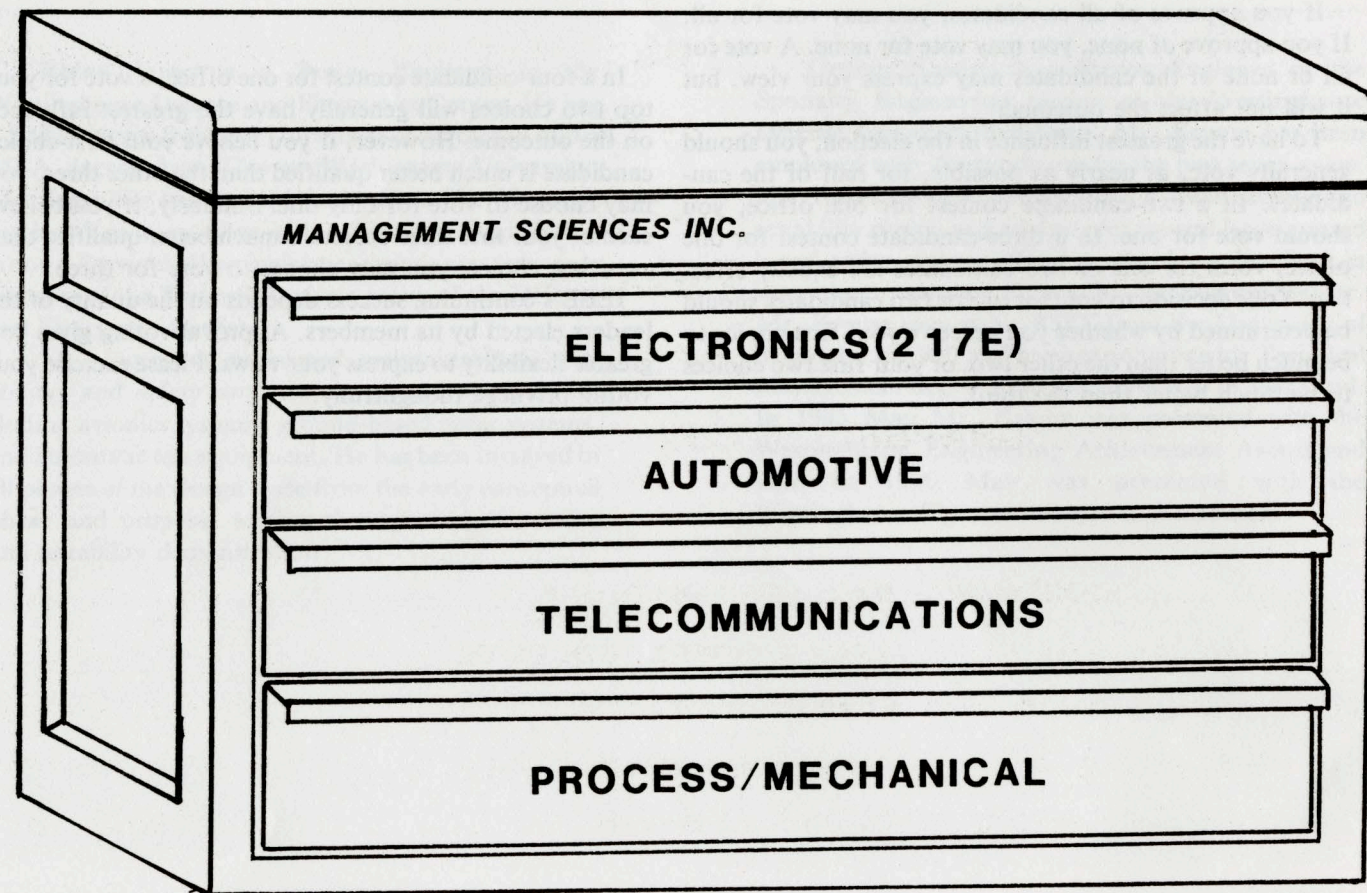
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LSA SPREAD SHEET



LIFE CYCLE COSTING



AVAILABILITY ANALYSIS



ELECTRONIC STRESS ANALYSIS



MAINTAINABILITY (472)



FAULT TREE ANALYSIS (881)



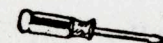
MONTE CARLO ANALYSIS



ELECTRONIC PARTS DATABASE



STATISTICAL ANALYSIS



THERMAL (3D) ANALYSIS



CAD-INTERFACES



GRAPHICS INTERFACE

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Most programs are available on IBM PC compatibles,
Mainframes and Workstations.

Prices will vary depending on option.

Conference Calendar

DATE	CONFERENCE	PLACE	CONTACT
1988			
July 7-9	Second Symposium on Reliability Design in Civil Engineering	Lausanne, Switzerland	Dr. P. L. Bourdeau EPFL-ISRF CH-1015 Lausanne
July 13-14	AQUA '88	Chicago, IL	Bruce Brocka AQUA '88 1005 Mississippi Ave. Davenport, IA 52803
Sept. 27-29	1988 VHSIC Qualification Reliability and Logistics Workshop	Scottsdale, AZ	John Recine Analytics, Inc. 766 Shrewsbury Ave. Tinton Falls, NJ 07724 (201)530-5335
Oct. 10-12	Reliability in Power, Transport, and Process Control	Vasteras, Sweden	Dinna Ahlin Vattenfall AED/4 S-162-87 Vallingby, Sweden

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Jan. 26-28	Annual Reliability and Maintainability Symposium	Atlanta, GA	Richard Sackett RAMS Program Chairman ERC International 1725 Jefferson Davis Hwy. Suite 300 Arlington, VA 22202
	Inter-RAM	San Francisco, CA	
Sept. 26-29	V International Conference on Performance Evaluation, Reliability and Exploitation of Computer Systems, Relcomex '89	Ksiaz Castle, Poland	Relomex '89 Institute of Engineering Cybernetics Wroclaw Technical Univ. Janiszewskiego Str. 11-17 50-372 Wroclaw, Poland Prof. Wojciech Zamojski (Tel. 21-26-77) Dr. Ireneusz Jozwiak (Tel. 20-28-23) Telex 0712254 PWR PL 0712559 PWR PL

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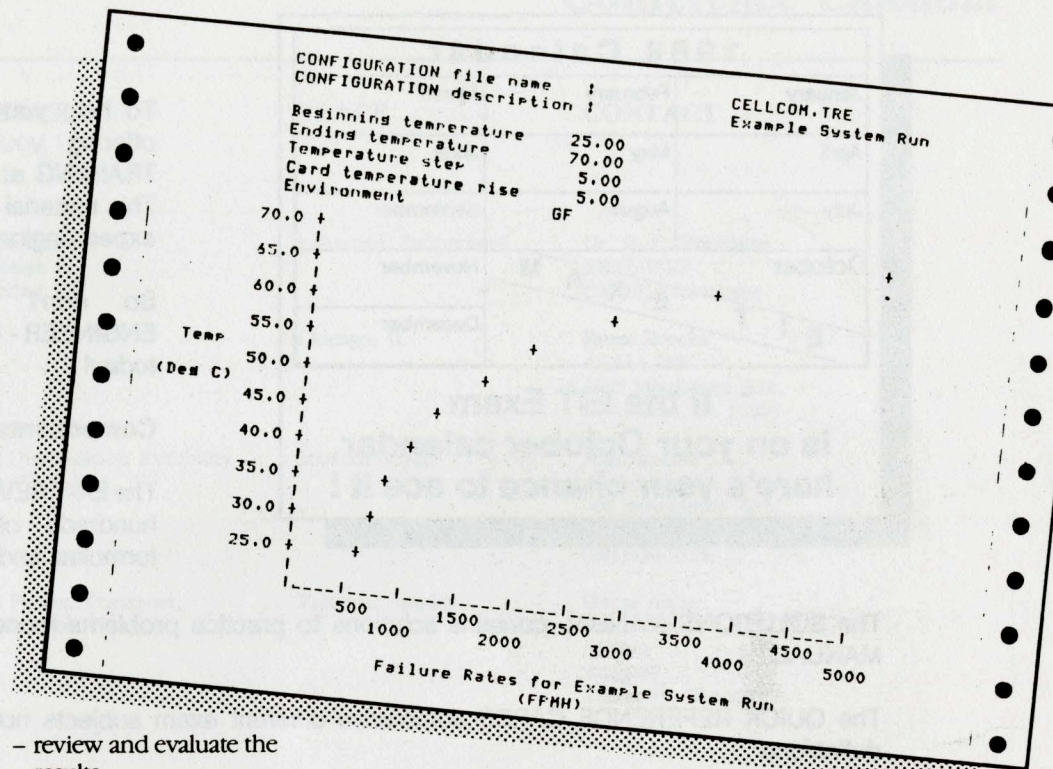
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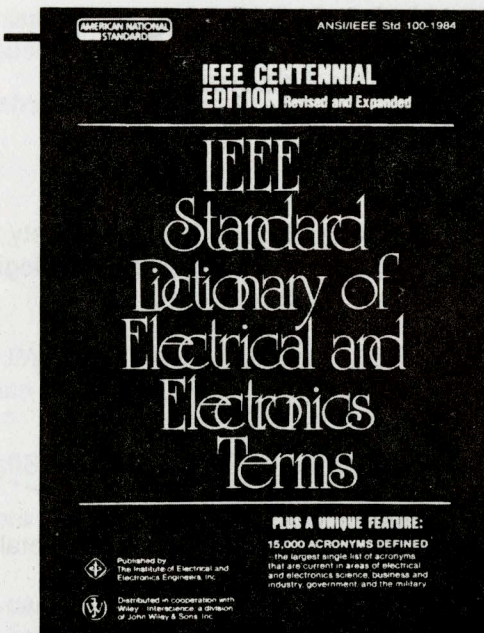
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- For the 1989 Symposium, the Proceedings will be available at the beginning of the conference. To allow for this, all complete manuscripts must be received by February 24.
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Mail abstract and summary to:

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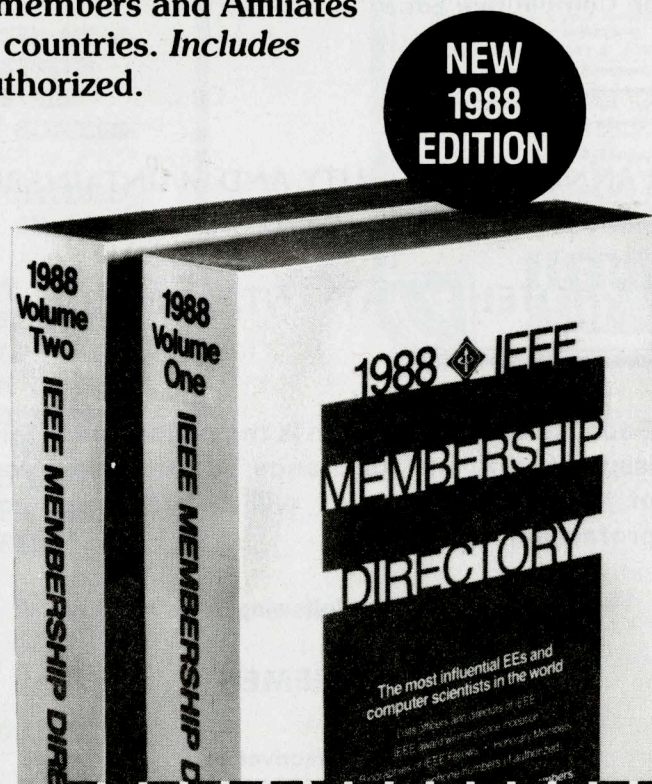
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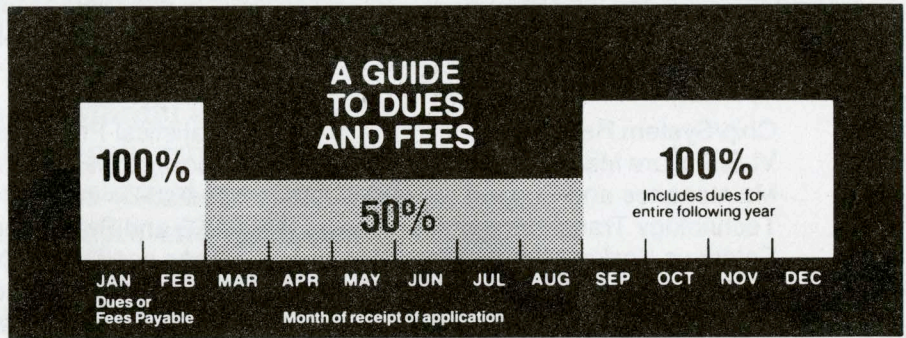
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