Reliability Society Newsletter

Editors: Gary Kushner and Mark Snyder
Vol. 32, No. 4, October 1986 (USPS 460-200)

Chapter Reports

Central New England Council:

The 1985–1986 Chapter year was led by Sidney Gorman of Raytheon Company, and it finished with successes in every chapter goal. The planning for the 1986–1987 season has begun and is now in full swing. The new slate of officers is as follows:

Chairman—Gene Bridgers, S. E. A. and Symbollics
Vice Chairman—Jake Bajakian, Raytheon Company
Secretary—Jane Ferguson, Haemonetics Corporation
Treasurer—Norm Smith, Digital Equipment Corp.

The Chapter regrets that Don Simpson has decided not to participate on the Executive Committee this year and wishes to express its gratitude for his many years of service and leadership, most recently as the multi-year chairman of the Chapter Steering Committee.

The first monthly meeting was held on Wednesday evening, September 17, 1986. It was a joint meeting with the IEEE Components, Hybrids and Manufacturing Technology (CHMT) local chapter. The topic was, "Stress Screening Update on Parts." Since individual part failures usually account for more than two thirds of system hardware failures, this was a topic of mutual interest to both groups.

Planning is in the final stages for the Fall Lecture Series. The surveys of member interest indicated that the majority requested a lecture on software reliability. It has taken us a while to find an authoritative presentor who will distinguish and focus on the reliability issues of software rather than quality assurance activities, and we are about to announce the details. We are certain the results will be attractive to potential attendees.

Gene Bridgers
Chairman

Chicago:

The election of officers and Executive Committee members for the Chicago Chapter of the IEEE Reliability Society was held on April 18, 1986 at the Annual Awards Banquet and Election of Officers. The meeting was at the Midway Motor Lodge, Elk Grove Village, IL.

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Vice-Chairman . . . . Michael I. O. Ero 979-1712
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Program Chairman . . Hugh C. Edfors 381-2400 X2574
Membership Chairman . . . . Jim C. Klouda 495-9770
Public Relations Chairman . . Rod J. Garcia 259-0740 X308

CONGRATULATIONS! and best wishes for the coming year.

Contact any committee member for further information about the Chicago Chapter of the IEEE Reliability Society.

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

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Call for Papers—IRPS

1987 INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM

April 7–9, 1987 · Town & Country Hotel · San Diego, California

Call for Papers

The 25th Annual Symposium, co-sponsored by the IEEE Reliability and Electron Devices Societies, emphasizes device reliability as the dominating influence in the development of new VLSI technologies and circuit designs. With the awareness that today high reliability is the norm for VLSI, the 1987 Symposium will emphasize the role of design, processing, packaging, and testing for building-in high reliability. Papers are especially solicited in this area; however, work in all areas of reliability physics will be included in the program.

Papers should deal with work on:

- Physics of Failure Mechanisms—quantitative models and mechanisms of component failure

Hot Electrons	Contact Degradation
Electromigration	Metallization Fatigue
Oxide Breakdown	Soft Errors

- Failure Analysis Techniques—advanced or simplified, as they are applied to specific problems
- Accelerated Testing and Screening—emphasizing the physical mechanisms which validate testing and screening techniques

Burn-in	Wafer Level Testing
Smart Oven Testing	Correlation with Observed Reliability in the Field

- Design and Process Control For Reliability—relating specific design concepts and process controls to part reliability

Latent Defects	Starting Material and Processing Material Controls
Particle Control	Margin Testing and DRAM Repair Criteria
Computer-Aided Manufacturing	Oxide and Metal Process Monitor and Reliability Testing
Statistical Process Control	Design Rules for Improved Reliability

In the following or related areas:

- VLSI (Microprocessors, Memory, PLA, DRAM, Redundancy, and Repair, etc.)—MOS, Bipolar, CMOS, I^2L, SOS
- Semiconductor/Insulator Interfaces, Contacts, and Metallization
- Packaging, Bonding, Die Attach, Coatings, and Encapsulation
- Hybrids (Materials, Processes, and Components)
- Displays, Sensors, and Solar Cells
- Microwave, Optoelectronic, and SAW Devices
- GaAs Devices and Interface Effects on III-V Devices
- New Devices and Technologies
- Passive Components
- Attachment of Leadless Ceramic Chip Carriers and other Surface Mount Technologies
- Medical Electronics
- Automotive Electronics
- Low Temperature Operation

The deadline for submission of abstracts is October 10, 1986. Prospective authors are requested to notify the Technical Program Chairman of their intention to submit an abstract and the topics to be discussed before September, 1986. Authors must submit a 50-word descriptive abstract and 300–500 word summary appropriate to describe a 20-minute paper. Authors are encouraged to obtain presentation releases prior to submission of summaries on October 10, 1986.

In a cover letter to the Technical Program Chairman, the authors must clearly state: (1) the purpose of the work, (2) how it advances the knowledge of reliability physics, (3) the results of the investigation, and (4) any related work published or presented recently by the author. The 50-word abstract, suitable for publication in the advance program, should be typed on a separate sheet. Include the title of the talk, name and affiliation of the author(s), complete return address, and telephone number. A ten-page maximum, camera-ready summary must also be submitted in a single-sided typewritten format on 8-1/2 × 11 in. paper, suitable for immediate reproduction, review, and publication. No photographs are permitted, due to printing restrictions; however, appropriate figures and line drawings are acceptable within the two-page total length restriction. The title, name and affiliation of authors, complete return address, and telephone number should appear on the first page, and the paper title and author's name on the second page. Please forward all technical correspondence to:

Bruce Euzent, Technical Program Chairman
1987 International Reliability Physics Symposium
Intel Corporation, M.S. SC9-06
3065 Bowers Ave.
Santa Clara, CA 95051
(408) 496-9354

A limited number of late news papers reflecting important new developments will be considered on a space-available basis. Deadline for the late summaries is March 2, 1987. Authors will be required to submit a finished paper at the Symposium for publication.

Criteria used by the Program Committee to select papers for the symposium are:

- The work must be new and previously unpublished.
- Evidence of the quantitative results and analytical models of studied phenomena must be given in the abstract.
- The purpose and results of the work and how it advances the state of the art must be clearly described.

Authors of accepted papers will be required to submit their slides and paper manuscripts for review by their session chairman before February 20, 1987. Visual aid legibility is mandatory. Only horizontal format 35mm slides will be permitted. Papers will not be approved for presentation if the slide quality is unacceptable. Final versions of manuscripts for all papers must be submitted at the symposium for inclusion in the proceedings.

For general conference information contact:

David Yaney, General Chairman
1987 International Reliability Symposium
AT&T Bell Laboratories
555 Union Blvd.
Allentown, PA 18103
(215) 439-6118

Call for Papers—IASTED Conference

The International Association of Science and Technology for Development (IASTED) Conference on Reliability and Quality Control is to be held at the Palais de Congres in Paris, France, June 24–26, 1987.

The scope of the conference covers: modeling, simulation, measurement, analysis, evaluation, forecasting, testing, screening, management, availability, maintainability, failure analysis, hazard production, identifying and controlling risk, safety, human factors, quality assurance, methodologies for quality control, quality costs, product liability, microcomputer applications, expert systems, software and algorithms, applications in all fields including engineering, nuclear systems, power systems, manufacturing, microelectronics, transportation, computer systems, software, communication, control, and robotics.

Regular, short, survey, and tutorial papers are requested. Prospective authors are to send a letter to Prof. B. Dhillon, the conference chairman, indicating the title of the paper, the names of the authors and their affiliations, and the topic of the paper. If the subject matter is acceptable, special instructions and material for preparation of the paper will be mailed to the authors. The complete papers are due February 1, 1987. Notification will be mailed by March 1, 1987. For submission of paper titles, write to Prof. B. Dhillon, Department of Mechanical Engineering, University of Ottawa, Ottawa, Ontario, Canada K1N 6N5.

Call For Papers

IEEE Reliability Chapter
Central New England Council

The 25th Annual Spring Reliability Seminar has been scheduled for April 23, 1987. The seminar will be hosted by the IEEE Boston Section Reliability Chapter. The theme of this year's seminar will be "Reliability Engineering in the Age of Automation."

A call for papers is issued in the following broad technology and management topic areas:

- Reliability
- Maintainability/Supportability/Testability
- Availability
- System Safety
- Integrated Logistics Support
- Life Cycle Cost/Design-to-Cost
- Reliability Improvement Warranties
- Software Reliability/Quality Assurance
- Human Factors
- Reliability Growth
- CAD/CAM/CAT/CAE

Interested authors should prepare and submit an abstract of 300 to 500 words, accompanied with a biographical sketch, by November 20, 1986. Selected authors will be notified by January 1, 1987. Completed papers, suitable for reproduction in the seminar Proceedings, will be required by March 1, 1987.

Abstracts and biographical sketches should be sent to:

Miss Vivian Thorsen
Technical Program Chairman
Raytheon Corporation (MET 5-1-210)
528 Boston Post Road
Sudbury, MA 01776

Questions concerning the seminar may be directed to Mr. A. G. (Jake) Bajakian, Seminar Chairman, at (617) 440-2782.

Proceedings Available

Proceedings are available from the Computerized Reliability Prediction Seminar, which was held in Chicago on November 16, 1985.

This 60-page document contains practical information on the latest applications of computer software for performing reliability prediction studies within either the military or the commercial environment. The software descriptions contained in the papers of the Proceedings range from reliability methodology implemented on P.C.s to larger data bases and faster software utilized on mainframe computers.

Authors of these six papers are affiliated with ATT Bell Labs, ITT, Astronautics Corp. of America, Management Sciences, Inc., and Bell Communications Research.

1. RATS: Reliability Analysis Tool Set, G. Thomas Dreckman, ATT Bell Labs.
2. Computerized Reliability Estimation System with Field and Test Data Feedback, David F. Tyler, IIT Research Institute.
3. SUPER: System Used for Prediction and Evaluation of Reliability, Ms. Susan Crocker, ATT Bell Labs., Q/A Center
4. Home Brew Prediction, R. Herman, Astronautics Corp. of America
5. Bellcore Reliability Prediction, H. T. Chen, Bell Communications Research
6. Functional Reliability—A Methodology, K. G. Blemel, Management Sciences, Inc.

Price: $3.95 postage paid (check or money order payable to IEEE Reliability Society).

Order from:

IEEE Reliability Society
H. C. Edfors, Program Chairman
6 South 315 New Castle Road
Naperville, IL 60540

J. J. Naresky Reliability Laboratory

JOSEPH J. NARESKY RELIABILITY LABORATORY

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JUNE 19, 1986
ROME AIR DEVELOPMENT CENTER

The Joseph J. Naresky Reliability Laboratory was dedicated at RADC on June 19, 1986. Representing the IEEE Reliability Society were Alan Plait, Tom Fagan, and Dave Barber. Details of the dedication follow:

Biography

Joseph J. Naresky was born December 27, 1923 in Plymouth, Pennsylvania. He served with the U.S. Army Air Corps in Europe during World War II. Following the war, he was employed by the Army's Watson Laboratories, Red Bank, New Jersey, and remained with that organization when it was transferred in 1951 to Rome, New York, to become Rome Air Development Center.

Naresky began reliability and maintainability initiatives at RADC in 1951 and successfully directed the program into what is now the largest concentration of reliability specialists in the DOD. Today it is the leading DOD laboratory for R&D of reliability and maintainability techniques. Because of Naresky's efforts, RADC is now the lead laboratory for electronics system reliability and maintainability for all Department of Defense agencies.

He was awarded the Air Force Decoration of Exceptional Service in 1968 and the IEEE Reliability Society Award in 1975, and was elected IEEE Fellow in 1976 and Associate Fellow of the AIAA. He was a member of Sigma Pi Sigma, the Physics Honor Society, and was also an Adjunct Professor at Syracuse University. He held B.A. (Physics, High Honors), M.E.E., and M.E.A. degrees from Syracuse University. In 1979, he retired as Chief of RADC's Reliability and Compatibility Division, completing 37 years of Government Service. He then joined the Illinois Institute of Technology as an Engineering Advisor where he continued his professional contributions until his untimely death in 1982.

Program

4:00 P.M.
Conference room (DC), room no. 2005

INTRODUCTION .... Mr. Anthony Coppola
Chief, Reliability Techniques Section

WELCOME .... Col. Charles E. Franklin
Commander, RADC

REMEMBRANCES .... Dr. Fred I. Diamond
Chief Scientist, RADC

REMARKS .... Dr. John S. Burgess
Past Chief Scientist, RADC

REMARKS .... Mr. Alan O. Plait
President, IEE Reliability Society

REMARKS .... Mr. Charles A. Strom
Past Chairman, Mohawk Valley Section IEEE

4:30 P.M.
Joseph J. Naresky Reliability Laboratory

INTRODUCTION .... Col. William S. Tuthill
Chief, Reliability & Compatibility Division

REMARKS .... Mr. John J. Bart
Technical Director, RB Division

UNVEILING .... Mrs. Jean E. Naresky

LABORATORY OPEN HOUSE .... All

5:00 P.M.
Griffiss AFB Officers Club

RECEPTION .... All

Milestones in Reliability at RADC

1951 Reliability initiative began at RADC
1956 "Reliability Factors for Ground Electronic Equipment" report published
1957 Advisory Group on Reliability of Electronic Equipment (AGREE) report ("Birth of Reliability Engineering")
1958 RADC Exhibit 2629 to MIL-R-26484, "Computation of MTBF"
1961 First edition MIL-HDBK-217, "Reliability Prediction of Electronic Equipment"
1961 Physics of failure program initiated at RADC
1962 First annual Physics of Failure Symposium
1965 In-house laboratory for physics of failure device reliability established
1966 RADC Spec 2867, "Quality and Reliability Assurance Procedures for Monolithic Microcircuits," (precursor to MIL-STD-883) and MIL-M-38510
1967 First International Reliability Physics Symposium
1976 "Device Reliability Research" task initiated
1980 VHSIC Phase I reliability project
1983 Gallium arsenide device reliability program initiated
1985 VHSIC Phase I Tester Facility established

Refreshments Courtesy of

AFCEA, Rome-Utica-Syracuse Chapter
IEEE Mohawk Valley Section
IEEE Reliability Society
Annual Reliability and Maintainability Symposium

Reliability Engineering

University of Maryland
College Park, MD 20742

Instructional TV Network and Videotapes

The reliability engineering courses described below are to be available on the University of Maryland Instructional Television network. Availability is based on the demand expressed for a given course. The courses can be available live at your company facility by arrangement with the ITV coordinator, or they may be made available as videotapes. Classrooms for all televised classes are available at both College Park and Shady Grove. For details about these possibilities, contact:

Dr. Susan Kromholz
College of Engineering
University of Maryland
College Park, MD 20742
Tel. (301) 454-7451

Fall 1986 Courses

Course	Description	
ENNU 468A	Statistical Quality Control Tues. and Thurs. at 7:00–8:15 pm Mr. Dev Raheja	On TV
ENNU 468B	Basic Reliability Engineering Wednesday at 6:30–9:00 pm Mr. Ken LaSala	On TV
ENNU 468C	Basic Reliability Analysis Monday at 6:30–9:00 pm Dr. Mohammad Modarres	On TV
ENEE 648N	Physics of Failure of Solid State Devices Mon. and Wed. at 5:00–6:15 pm Dr. Aristos Christou	
STAT 400E	Applied Probability and Statistics Mon, Wed, and Fri, at 10:00–10:50 am Staff	

A curriculum of courses in Reliability Engineering is available at the University of Maryland. Courses can be taken individually or a master of science degree can be earned by the completion of certain core courses, augmented by elective courses selected to meet the specific objectives of the student. A brief description of the courses follows.

Required Courses

Applied Probability and Statistics

The concept of point estimation is discussed. Topics such as statistical hypothesis, estimation theory, and sampling theory are covered. Probability and its properties are discussed. Random variables and distribution functions as they are applied in today's industrial needs are discussed. Joint probability distribution functions and limit theorems are covered.

Basic Reliability Engineering

Organization, management, and communication concepts in reliability engineering are discussed. Mechanisms and physics of failure and methods of failure-rate determination are presented. Methods of design for reliability are outlined. Maintainability engineering concepts are covered. Design for reliability and design for maintainability concepts are presented. Life cycle cost and equipment sparing policies are covered. Measures of reliability for improvement are discussed.

Basic Reliability Analysis

The principal methods of reliability analysis are presented, including fault tree and reliability block diagrams. The method of Failure Mode and Effect Analysis (FMEA) are discussed. Event tree construction and evaluation are covered. Methods of modeling systems for reliability analysis are presented. Focus is placed upon systems of concern to all engineers. For example, problems related to process industries, fossil fueled power plant availability, electronic control system reliability, and other similar subjects are analyzed. Methods of quality control and assurance are presented and discussed.

System Safety Engineering

Topics include: system safety in society, the language of system safety, and programs for achieving safety, such as the problem solving process, safety criteria, safety descriptors, checklist-timeless elements, safety training, hazard analysis, and uncertainty in safety measurements. Special attention is given to: time-phase indicators, hazard classification, hazard probability, survival rate, and distributions applied to human performance.

Advanced Reliability Engineering

Topics include: reliability and maintainability concepts in the conceptual, development, production, and deployment phases of industrial products. Costing of reliability, methods of obtaining approximate reliability estimates and confidence limits. Methods of reliability testing, current R&D in reliability design, thermal analysis of circuit boards, common cause analysis, software reliability techniques, and socioeconomic aspects of reliability engineering. A goal tree approach to the integration of diverse and sometimes conflicting requirements is presented.

Reliability Engineering Seminar

Weekly presentations will provide an overview of topics of current interest, emphasizing the latest techniques and developments. Invited speakers will be selected to provide insights from the viewpoint of practitioners noted for their expertise in various facets of industry. Managers of reliability programs will be included along with those who are responsible for setting national policies and requirements. In-depth reviews of current research work underway across the nation will be provided.

Elective Courses

Statistical Quality Control

The use of control charts is presented along with examples. Control charts are described for fraction rejected and for nonconformities. Control charts are related to other statistical techniques. Acceptance sampling methods, the Dodge-Roming system, MIL-STD-105D. Economic aspects of quality decisions. Margin of safety in design specifications.

Advanced Decision Theory

Bayesian approach to the use of sample information in decision making. Concepts of economic loss or benefit, risk, decision criteria, expected consequences, and utility. Applications of these concepts to decision making in the industrial and technological operations in various contexts are considered.

Advanced Product Assurance

Product assurance policies, objectives, and management. Material acquisition management, quality control documents and product assurance costing. Design input and process control. Advanced testing technology, regression methods, and non-destructive testing. Simulation techniques, CAD/CAE, software quality management, documentation, and testing methods.

Physics of Failure of Solid State Devices

This course covers degradation mechanisms of silicon and GaAs devices and circuits. Dielectric integrity (acceleration factors for thin gate oxide stressing, time-dependent models for silicon oxide degradation), GaAs devices and circuits (surface instabilities and degradation of MESFET, MODFET, and MMIC) will be taught. The subjects of electromigration and metallizations will be stressed. Namely, the theory of resistance variations during electromigration, electromigration-induced short circuit failure, wafer level electromigration tests, and passivation material will be reviewed. In the area of metallization, the subjects to be reviewed are stress-induced voids in aluminum interconnects, the Al-Si metallizations, and degradation of gold-refractory metallization, in addition to the degradation mechanisms of multi-level interconnects for VLSI. This course also reviews key elements of reliability statistics and other associated topics, such as assembly and packaging reliability. The topics include reliability of plastic-encapsulated VLSI circuits and thermal fatigue degradation mechanisms in Au-Si eutectic die attach and Pb-In solder interconnects.

Risk Assessment for Engineers

Topics covered are: why study risk?; sources of risk; probabilistic risk assessment procedure; factors affecting risk acceptance; statistical risk acceptance analysis; psychometric risk acceptance; perception of risk; comparison of risks; consequence analysis; and risk-benefit assessment. Several examples, such as risk analysis performed for passenger aircraft, refinery complexes, chemical plants, nuclear reactors, radioactive waste disposal, conventional energy sources, and dams are presented. Several problems of current interest are analyzed and studied in the form of class projects on risk management concepts.

Bayesian Reliability Analysis

The topics include: foundations of Bayesian statistical inference, Bayesian inference in reliability, performing a Bayesian reliability analysis, and Bayesian decision and estimation theory. Prior distribution such as non-informative, conjugate, beta, gamma, and negative log gamma is discussed. Estimation methods based on attribute life test data for estimating failure rates and survival probabilities are presented. System reliability assessment and methods of assigning prior distribution are outlined.

Human Reliability Analysis

The topics included in this course are: explanation of human engineering, tolerance, error, performance, and physiological and psychological stress. Methods of solving practical human reliability problems, the THERP, SLIM, OAT, and SHARP methods, performance shaping factors, man-machine system analysis, distribution of human performance and uncertainty bounds, skill levels, source of human error probability data, examples and case studies.

Electronic Component Failure Analysis Laboratory

This laboratory course will concentrate on the physics of failure in electronic components; how failure mechanisms are manifested in parts; and how the analyst determines the cause of failure. State-of-the-art failure analysis tools and techniques will be discussed. Areas of focus will include electro-mechanical, passive, and semiconductor technologies. Failure analysis techniques will be demonstrated in the areas of troubleshooting, decapsulation, non-destructive testing, and process control.

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1987 ANNUAL RELIABILITY AND MAINTAINABILITY SYMPOSIUM

January 27, 28, 29, 1987

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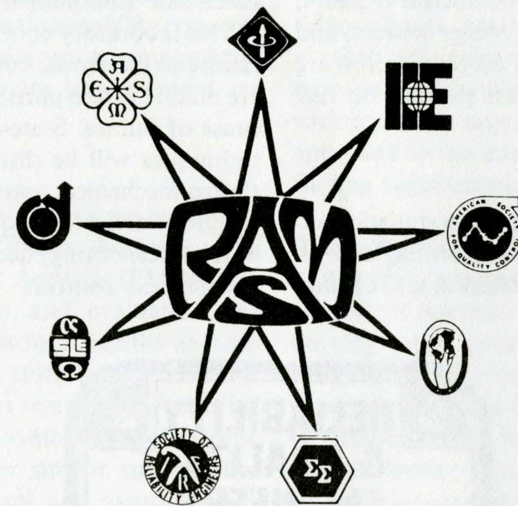
Philadelphia, PA USA



THEME

Assurance Technologies In The Automated Engineering Environment

- Environmental Stress Screening
- CAD/CAM
- Software for R & M
- Advanced Technology in R & M
- Combat Resilience
- Military Initiatives
- Maintainability/Testability
- R & M Tutorials

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WATCH THIS PUBLICATION FOR INFORMATION UPDATES

DATE	CONFERENCE	PLACE	CONTACT
1986			
Oct. 19-22	Wafer Reliability Assessment Workshop	Lake Tahoe, CA	Dr. O. D. Trapp Technology Associates 51 Hillbrook Dr. Portola Valley, CA 94025
Oct. 28-30	Mechanical Failure Prevention Group	Patuxent River, MD	T. Robert Shives A113 Materials Bldg. National Bureau of Standards Gaithersburg, MD 20899
Dec. 1-4	IEEE Global Telecommunications Conference 1986	Houston, TX	Dr. Kwei Tu LEMSCO/B12 2400 NASA Rd. 1 Houston, TX 77258 (713) 333-6545 Telex: 4620667
1987			
Jan. 27-29	1987 Annual Reliability and Maintenance Symposium	Philadelphia, PA	V. R. Monshaw RCA Astro-Electronics P.O. Box 800 MS 55 Princeton, NJ 08540
Mar. 17-19	6th Symposium on Reliability in Distributed Software and Database Systems	Williamsburg, VA	Prof. Edwin C. Foudriat University of S. Florida College of Engineering Dept. of Comp. Sci & Eng. Tampa, FL 33620
March 31-April 2	International Reliability Physics Symposium	San Diego, CA	H. C. Jones Westinghouse Corp. M.S. 3664 P.O. Box 1521 Baltimore, MD 21203 (301) 765-7387
CALLS FOR PAPERS			
April 23	25th Annual Spring Reliability Seminar	Framingham, MA	Miss Vivian Thorsen Technical Program Raytheon Corp. (Met 5-1-210) 528 Boston Post Road Sudbury, MA 01776
April 27-29	Third Annual Conference on Electronic Packaging and Corrosion in Microelectronics	Minneapolis, MN	Prof. Morris E. Nicholson Corrosion Research Center 1776 N. Pascal Avenue St. Paul, MN 55113
May 26-29	INTER-RAM	Toronto, Canada	Dr. M. S. Grover Ontario Hydro 700 University Avenue H14-G4 Toronto, Ontario, Canada M5G1X6 (416) 592-7728 Telex: 06-217662

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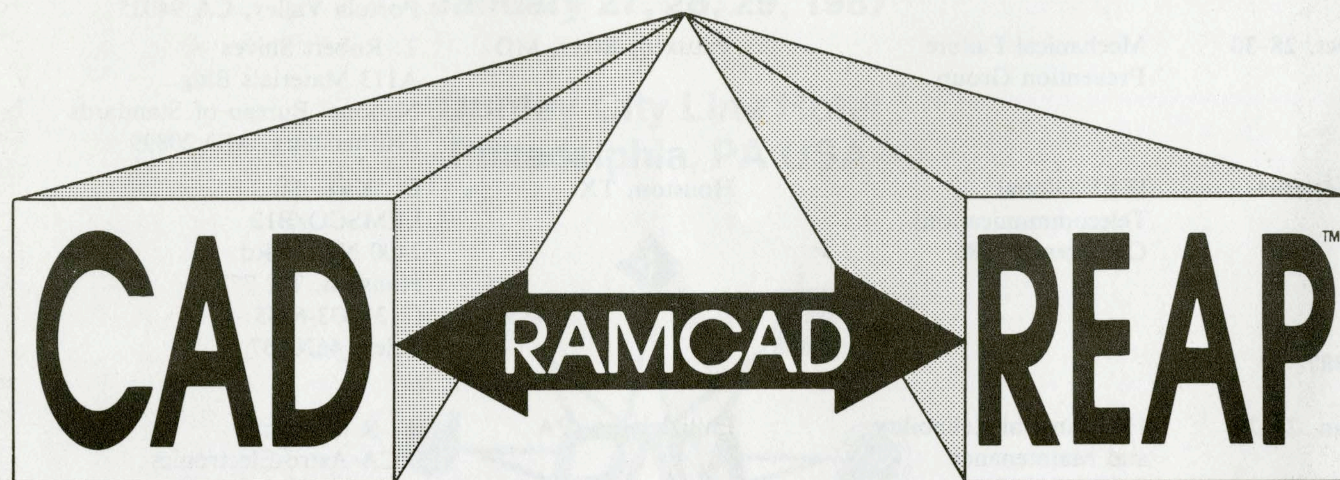

- Part numbers
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