

Reliability Society

NEWSLETTER

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Editor:
Bruce Bream

President's Report

Dr. Thad L. D. Regulinski of our Society has been nominated for the position of Vice President of IEEE Technical Activities for 1994. Thad, a Fellow of IEEE and a Past President of the Reliability Society, is an excellent candidate for the position. It is very important that all Reliability Society members vote. I would appreciate your giving Dr. Regulinski careful consideration when you vote. It would be a real feather in the cap of a small society, such as the Reliability Society, to elect one of its members to this office.

The IEEE Policy (see April Newsletter) on the use of the International System of Units (SI metric system) was endorsed in principal by the Technical Activities Board during its June meeting. However, there were concerns on item 2:

- Responsibility for enforcement
- Timing may be too ambitious (use of dual units should be permitted for a while)
- Use of expressions such as: "An ounce of prevention is worth a pound of cure"

For your convenience, item 2 is printed:

"The IEEE will...

2. Use SI units exclusively to express measured and calculated values of quantity in all IEEE publications, * including standards. With respect to existing standards, this policy shall take effect with the next revision; with respect to other publications, no later than January 1, 1995."

* It is recognized that certain exceptions to this policy will be necessary (e.g., where a conflicting world industry practice exists). These exceptions must be evaluated and approved by the appropriate Institute Board on an individual basis, and for a specific period of time and reported to the Board of Directors.

The U.S.A. is an SI metric country. In July 1991, President Bush signed an executive order designating the SI metric system as the preferred system of weights and measures for the United States of America trade and commerce and requiring each Federal agency to use the SI metric system of measurements in its procurements, grants and other business-related activities.

W. Thomas Weir
President, IEEE Reliability Society

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Editor's Column

How many times have you heard someone say that a model is not reality. We have to remember this whenever an analysis (reliability or other) is performed. Uncertainties inevitably creep into the analysis through the parameters and the structure of the model. It takes more than picking up a textbook and applying the standard set of reliability cookbook formulas. We deserve it to our specialty to ensure that the people assigned to the task have adequate training, experience and guidance. Too many times I've seen us shoot ourselves in the foot by dubbing someone a reliability engineer just because the person has an engineering degree - "the person understands engineering and it doesn't take much to pick up on how to do reliability". This kind of "engineers can do anything" assumption is great as long as the person knows the particular field of engineering. Reliability and other "ilities" are not always viewed as needing the same level of experience as a design engineer. Resulting confusion over misuse of distributions, MIL-HDBK-217, failure modes, block diagrams, etc. inevitably occur. It's the job of each one of us to maintain a high level of competency of our profession through proper management and engineering. We need to help each other and ourselves in getting the job done right.

Bruce Bream
Editor

IEEE Reliability Society Newsletter

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Division VI Director: Engineering and Human Environment

Lack of attendance. That is the most frequent complaint I hear from volunteers that I come in contact with. "We just can't get the members to come to the meetings we organize. Why bother?" Why indeed. I have been frustrated by low (or almost non-existent) attendance at meetings I have helped organize which were of high quality, seemingly of interest, timed and sited properly, and still very few showed up. It is frustrating to the meeting organizers, who put in hundreds of person-hours to do the best *they* can, only to find scarcely anyone but themselves at the event. Section meetings and society chapter meetings are particularly hard-hit in some parts of the country. At some universities, student professional awareness conferences (S-PACs) are drawing only 1/3 of the numbers they used to draw.

Not all meetings are poorly attended. I have noticed that, at the meetings of conference organizing groups, of society Ad Coms, of section Ex Coms, the attendance is nearly 100%. Some national conferences are hitting record attendance levels, especially when they are held at a desirable venue or in conjunction with an attractive event. The problem seems to be at the local, more informal meeting level.

At the meeting, the conversations invariably turn to jobs, who's getting laid off, jobs, new career opportunities, jobs. Technical topics seem to have diminished in popularity, particularly in comparison with the avid discussions of new technologies that used to take place at these local meetings. I had attributed the drop off in interest in attending technical meetings to: wide-spread access to copying equipment (It is not necessary to see the author of an article to get a reprint if it can be copied, hence it is not necessary to go to a meeting.), to the INTERNET (I can keep in touch with my colleagues across the country or around the world as easily as those across the hall.), more conferences (Years ago, I would attend the IEEE convention in New York City and one other conference; the arrival of a "big name" in my area was an event.), over-specialization (As our fields of interest became increasingly more narrow, there are fewer people with whom we can in-

teract technically, and any technical topic is not exactly what we are interested in.). But there may be another, more compelling reason that attendance at local meetings is down.

In an effort to illustrate how people can be misinformed about their observations of the world around them, the mathematician Allen Paulos (*Innumeracy*) describes a situation in which a person, depressed for some personal reason, observes, "Everyone I see is happy, except me. Therefore I must be the only one who is having troubles." Clearly the latter part of the statement is incorrect, but we have all had experiences with the feeling expressed in the first part, the psychological equivalent of "The grass is always greener..." From a mathematician's point of view, the explanation is simple. We observe happy people when we go out because we are observing a biased sample — statistically, happy people tend to go out more frequently than sad people, or sick people, or people in mourning, or people working extra hard to hold onto a job, etc. We infer from our observations, incorrectly, that everyone we see is happy because we don't see the ones who are not.

Might it be that there is a perception, on the part of the non-attendees, that everyone who will be at the local IEEE meetings is (choose one or more): happy; doing well on *their* job; earning more; has no family/personal problems? Is it really possible that the IEEE's who actually do come to the meetings are the ones who are not personally troubled by lay-offs, or boss/job problems, or worries over promotion possibility, or health/family/personal problems? Probably not, but the perception remains. And the occasional attendee, with problems, looks around and perceives "everyone ... happy, except me." Thus, for those with "the worries", the biased statistic, might force them to put themselves out of circulation, so they do not have to face all of "those other happy people".

If this is the case, then let's commiserate together. It's better to be with others that are having the same concerns and problems you are having, than to try to work it out alone. It is better to share

horror stories and rumors, and fears, and expectations with others who feel as you do. Gripe sessions are therapeutic and good for the mental health. Now I don't want every IEEE meeting to turn into an organized jeremiad against the system, but I believe it is important to do whatever it takes to convince the non-attendees that they will be welcome, that there will be others there with the same feelings and attitudes, that there will be an opportunity to share your experiences with others.

I know it goes against human nature, but, when you're feeling down, that's when you should *go where everybody knows your name*: an IEEE meeting!

Bruce A. Eisenstein

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All RS newsletter inputs should be sent to:
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The schedule for submittals is:
Newsletter Due Date
January November 19
April February 26
July May 28
October August 27

ADVERTISING RATES

All copy that contains graphics or special fonts must be camera-ready or delivered on computer disk and be received by the due dates indicated.

Ad Size	One Time	2-3	4+
Full Page	\$400	375	350
Half Page	\$300	280	260
Third Page (vertical)	\$240	225	210
Quarter Page	\$205	190	180
Eighth Page	\$120	110	100

Discounted per issue rates are shown for ads run in more than one issue.

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IEEE-USA InfoLine

For quick and current news and information anytime about U.S. activities of The Institute of Electrical and Electronics Engineers, Inc., technology newshounds know to call the Information Line, IEEE-USA's 24-hour recorded-message telephone line. The Information Line can be reached at (202)785-2180.

Updated biweekly by IEEE Public Relations in Washington, the line offers a one-minute summary of a current item of interest to news media and electrical engineers. Recent recordings have included announcements about IEEE-USA's National Information Infrastructure forum, the 1993 IEEE U.S. Salary Survey, and new pension portability legislation. Each message also provides contact name or phone number for further information.

Wanted! A Few Good People to Serve on the RAMS Management Committee

A few energetic volunteers are needed to fill openings on the management committee of the Reliability Symposium. It's a great group of people, its educational and it can be career enhancing.

The management of the symposium is accomplished by sponsor member volunteers, with the concurrence and support of their corporate, government or academic employers. The Advisory Board, which is composed primarily of senior corporate and military management individuals, provides guidance on management of the symposium.

This is an opportunity to work with other professionals in the reliability (and associated) fields and meet senior management from both military and corporate sectors that are concerned with the analytic and practical techniques necessary to improve the reliability/competitiveness of our products.

If you can secure the necessary support to attend 3 or 4 one day meetings a year, attend the symposium in January each year, are a member of IEEE Reliability Society and are interested in further details on how to join this select group on the management committee, please contact:

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1768 Lark Lane
Cherry Hill, NJ 08003
(609)428-2342

Letters to the Editor

Dear Editor,

I note with interest the discussion regarding the inclusion of total quality and so on in the Reliability Society and decided to comment.

My views are based on many years in the high technology business and my experience is captured essentially in a recent IEEE Spectrum article by Rechtin [1]. As he shows, creating a system (e.g., a microcircuit, spacecraft, etc.) is a complex task and specialization is a natural outcome. The basic activities involved are Engineering, Operations, and Management. Within this framework there is an immediate second level of activity summarized below:

Engineering	Design and related specialties (Reliability, etc.)
Operations	Manufacturing and related specialties (Quality, etc.)
Management	Total Quality Management

From the above it is clear that Reliability is closely allied with Engineering and is part of the Systems Engineering process. Maintainability is also an Engineering specialty and strongly associated with Reliability but is hardly ever acknowledged in the Newsletter. It appears that this specialty is the one looking for a home and not Total Quality which is being championed by so many organizations.

In summary, I believe that the Newsletter should support the thrust of the Annual RAM Symposium. Start by renaming the Newsletter and go from there. Perhaps a separate Total Quality Society is required but check with the ASQC first.

[1] Rechtin, E., "The art of systems architecting", *IEEE Spectrum*, October 1992, p.66-69.

Jim Arsenault

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*Reliability Engineering
Quality Assurance*

Dear Editor,

As my letterhead attests, I have always felt strongly about the connection between quality and reliability and therefore welcome any moves by the Reliability Society to link the two in its interest and activities.

I agree wholeheartedly with Mr Kam Wong's letter in the Newsletter's July issue, concerning the link between product yield and product field reliability. This nexus applies both where loss of yield is due to process capability being inadequate for the product specification and where it is due to bad "workmanship".

I believe that the percentage (or ppm) rejects at product screens at various product-in-progress points and on finished product, e.g. at Environmental Stress Screening (ESS), could be used as a "predictor" of future field failure rate of the passed product. This is because the level of rejects discovered by the screen is a measure of the degree of quality marginality and defectiveness existing within the batch and is symptomatic also of the degree of such deficiency which will still exist even in the passed product. No screen is 100% effective in detecting all flaws, - what is found is merely proportional to what remains.

It would be a tremendous contribution to quantitative reliability engineering if component and equipment manufacturers, in conjunction with their users, would attempt to find such yield-reliability correlations, applicable at least to their own product, even if not universally. From such correlations it might in due course be possible to establish a "reliability prediction" methodology more accurate than that currently used.

Yours sincerely,

Henry S. Blanks

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Chapter Activities

Boston

During the spring of 1993, the Boston Chapter held several successful events. The chapter sponsored a lecture series on Reliability Growth Testing through FRA-CAS. It also held its 31st Annual Spring Reliability Symposium, "Reliability: Customer and Corporate Benefits". Michael Rosen, Director of New Products, OEM, for the Bose Corporation was the keynote speaker and papers were presented on a variety of topics. The Chapter concluded its activities for 1992-1993 in May with a family outing to Plymouth, MA where members and their families enjoyed the Mayflower II and a tour and lunch at Plymouth Plantation.

At the annual meeting, held in conjunction with the Spring Symposium, the Chapter announced the election of the following to serve as Chapter officers for the 1993-1994 year:

Anita Cederholm	Chairperson
Ruth Evans	Vice-chairperson
Brian McQuillan	Secretary
Don Markuson	Treasurer

Regular monthly meetings are held from September through May. The first meeting of our 1993-1994 year was held on September 8 at Hanscom AFB, Bedford, MA. Lee Tatischeff, Laboratory Analysis Principal Engineer with Digital Equipment Corporation, presented a technical program on Trends in IC Failure Analysis. Lee spoke about recent technological breakthroughs in failure analysis techniques which have increased the range of problems which can be addressed and have completely altered the role of the IC failure analyst. No meeting was planned for October because we are sponsoring a four-part lecture series on Reliability Growth Management.

Technical Development Workshops continue to be held on the average of every other month. At the latest workshop in September, attendees continued the process of developing guidelines which can be used by reliability engineers when faced with the task of conducting environmental stress screens.

Anita Cederholm

Boston Chapter Chairperson

Cleveland

Our April meeting was on Practical Tools for Continuous Improvement. This meeting was from the George Washington University Satellite Video Conference Seminars. Robert Reid, Diane Sule and Jack Manning talked about:

- Test Patterns
 - Seven Service Tools
 - Customer Surveys
 - Satisfaction Grids
- Every available seat was used.

We do not normally have a meeting in June but the IEEE Learning Channel made a good change for us here. The topic was Manufacturing the Technical Currency of our Workforce. Shakil Ahmed, Keith Gardner and John Barnshaw talked about:

- Why technical obsolescence is occurring?
- How you can take advantage of future growth opportunities?
- What leading organization are doing to educate employees?
- Where you can find additional resources?

This meeting was well received.

Our summer social was held at NASA LeRC Guerin House. Old friends and new members got together for a day of relaxation and a barbecue. No speaker was used. Volleyball, pool, ping pong and square dancing were enjoyed by many.

Some progress has been made on our '94 RAMS Host committee assignment. We need 2 volunteers from each sponsoring society to act as projectionists and ushers. Volunteers should contact Vince Lalli at (216)433-2354.

Three new officers were nominated: Paul Makuh, Treasurer; Angelo Gattazzi, Membership; Bill Ford, Computer. A letter of confirmation and explaining duties is being prepared.

The technical program has been put together for our community outreach workshop. A TQ Team has been formed. A search is being made to determine what are the "hot topics" for this get-together? Send your topics to Dr. Sheldon Gruber, CWRU, EEAP Dept, Cleveland, OH 44106.

All-in-all here in Cleveland we are having fun staying active as volunteers.

Vince Lalli

Chairperson, Cleveland Chapter

Los Angeles

On February 3rd, Nancy Leveson of UCI spoke on Software Safety. This was a joint meeting with SWE and ACM and was well attended. This success has prompted us to potentially conduct a mini-course on this subject for next year.

On March 24th, Dr. Wesley Chu of UCLA, spoke on Estimating Task Response Time for Real-Time Distributed Systems. This was a joint meeting with the Santa Monica Bay Section.

On May 20th, Bruce Krel, an independent consultant, gave a presentation titled: Developing MS Windows Applications: The Hard Way and the Easy Way. This meeting was so well attended the hotel opened up the adjoining room to hold all the people.

July 29th was our second most attended meeting of the year. David Baylor of Hughes Communications spoke on DirecTV to an audience of over 80.

August 26th, Andrew Shapiro of Hughes Electronics, gave us a presentation titled: Integrated Passive Components and Multi-Chip Modules (MCM). MCMs are claiming to be the packaging of the future.

Meetings in planning: In November, we are conducting a mini-course on Expert Systems as well as an evening presentation on Avionics Design for Quality Assurance Systems. We are still planning a Congressional Debriefing by Larry Stern.

Our Bulletin Board is very active with over 400 subscribed members. Membership is free. We offer meeting information, Jobline, E-mail, Video Tape Exchange information, Shareware and Demos. Phone is (818)768-7644, 300-2400 baud. Our Videotape Exchange program currently has over 100 videotapes available. The latest listing can be viewed and downloaded through the bulletin board.

Loretta Arellano

Los Angeles Chapter Chair

New Developments in Human Performance Reliability

A new tool recently published by NASA Langley Research Center is the "MAT - Multi-Attribute Task Battery for Human Operator Workload and Strategic Behavior Research." This gives the researcher the capability of performing multi-task workload and performance experiments. The battery provides a benchmark set of tasks for use in a wide range of laboratory studies of operator performance and workload. MAT incorporates tasks analogous to activities that aircraft crew members perform in flight. It provides a high degree of experiment control, performance data on each subtask, and freedom to use non-pilot test subjects. MAT is written in Quickbasic and assembly language for 80286, 80386, or 80486 IBM PC series and compatible computers running MS-DOS. A joystick and EGA or VGA color graphics are required. It is distributed on a 5.25 360K MS-DOS format diskette. More information may be obtained from COSMIC (University of Georgia) at 706-542-3265.

The 1993 Annual Reliability and Maintainability Symposium (RAMS) featured two events that pertained to human performance reliability. The first was a tutorial session on the subject; the second was a paper session. The tutorial was an update of the 1992 tutorial with more detail on the variety of human performance reliability prediction models that are

or have been available. At the present time, there are no plans to give the tutorial at the 1994 RAMS, although it might be given in later RAMS. The paper session was entitled "Integrating Human Reliability into System Analysis & Design." It featured papers on human reliability database characteristics, role in Human Reliability Analyses, error monitoring, and human reliability in aviation medicine. The papers are summarized below. The reader should obtain a copy of the *1993 Proceedings Annual Reliability and Maintainability Symposium* for more information.

Paper summaries:

"The human-reliability database and future systems" by D. Meister. In this paper, Meister discusses many aspects of databases for human reliability, such as requirements, functions, formats, system elements, and use. Particularly noteworthy are his listing of requirements for the database and use of the database. This is an excellent treatment of one of the fundamental issues in human performance reliability - data.

"Crucial role of detailed function, task, timeline, link, and human vulnerability analyses in HRA" by T.G. Ryan, L.N. Haney, and L.T. Ostrom. This paper addresses one major cause for large un-

certainties in human reliability analysis (HRA) results: the absence of detailed function, task, timeline, link, and human vulnerability analyses. The paper examines the potential contributions that the detailed analyses can make in terms of obtaining substantive, traceable analyses that can support root cause analyses. The authors identify an iterative process for doing these analyses.

"Improving human reliability through error monitoring" by A.D. Greenberg and R.L. Small. In this paper, the authors propose an alternative to effective interlocks and automation as a means for obtaining improved human reliability. Error monitoring is proposed as the means for supporting human performance. They show how an error monitor design works for several situations. The architecture of the error monitor is described. The monitor detects procedural errors, policy errors, and wandering errors.

"Enhancing human reliability with integrated information systems for aviation medicine" by C.F. Layton, W.T. Sheperd, W.B. Johnson, and J.E. Norton. This paper shows how integrated information systems can speed the transition from novice to expert in aviation maintenance by providing training, diagnostic assistance, and reference information. Integrated information systems are described in terms of three components: an intelligent tutoring component, a job aiding component, and an information retrieval component. Examples are given for an environmental control system, a gas turbine information system, and an airways facilities information system.

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For June 7 to July 14, 1993, the University of Maryland conducted a course in Human Reliability Analysis as part of their graduate level Reliability Engineering Program. The course addressed the general principles of human factors and approaches for incorporating plant personnel/hardware interactions into safety and reliability assessments of complex technological systems.

Kenneth P. LaSala
Chairman, Human Performance
Reliability Committee

The Changing Role of Military Specifications and Standards

Military Specifications and Standards will soon play a smaller role in the Department of Defense (DoD). It is new DoD policy to utilize, to the maximum extent possible, commercial standards in the design, development and acquisition of defense material. Reducing reliance on military specifications and standards is one of Deputy Secretary of Defense Dr. William J. Perry's top priorities. Mr. Darold Griffin, the Army Standardization Executive, has stated that this transition to commercial standards is a fundamental component of the new Army acquisition approach that includes best value buying, multi-year contracting, reduction of unnecessary requirements, and eliminating barriers between defense and commercial businesses. The DoD can no longer afford to prepare and maintain vast numbers of military unique documents in the current environment of decreasing resources. The development and application of these military unique specifications and standards must be eliminated when commercial documents can be used.

Deputy Undersecretary of Defense (Acquisition Reform), Ms. Colleen Preston, has chartered a team, led by Mr. Griffin, to address the transition to commercial practices, processes, and products. Efforts will include the retention and maintenance of essential military documents, the preparation of commercial item descriptions, the participation with non-government standards bodies to jointly develop and use their standards, and the conversion of other military specifications to performance specifications. Mr. Griffin has also stated that to accomplish this transition to commercial standards the Army must:

1. Participate in the development of non-government standards by ensuring maximum membership of Army personnel on non-government standards bodies.
2. Perform a comprehensive review of all military specifications and standards under the Army's purview to identify those that can be replaced or converted to commercial standards or commercial item descriptions.
3. Convert/replace military specification and standards with non-government standards to the maximum extent practicable.

The Importance of Standards

Specifications and standards play a central role in the development and manufacture of engineered items. Thus, integration of the best commercial and military electronic reliability technology into the reliability standards is critical. Standards represent perhaps the most powerful manner in which technological improvements can be implemented and institutionalized. To appreciate the potential impact of standards, one need only consider the ISO 9000 series of quality standards and the pervasive influence that ISO 9000 is having on both commercial and acquisition processes worldwide.

National standards (i.e., standards common to both commercial and military products) are essential to the goal of facilitating the transition of many U.S. defense contractors into the commercial marketplace. At present, defense contractors have separate divisions that operate quite differently in order to address the very different practices of military and commercial customers. The effort of U.S. defense contractors to transition their defense divisions to compete in commercial markets will be greatly facilitated if the military adopts and institutionalizes the best commercial and military reliability practices in a fashion suited to both DoD and industry.

Reliability Society's Role

Now is the time for the IEEE Reliability Society, the leading engineering society for electronic reliability, to become more involved in national and international reliability standards. Reliance on US military standards is going to become impossible. To address this issue, the IEEE Reliability Society has formed the Standards and Definitions Committee that can serve as a mechanism to convert military standards to commercial standards. The Reliability Society Standards and Definitions Committee will review US military specifications and standards to identify those that can be replaced or converted to commercial standards or commercial item descriptions.

FREE PROCEEDINGS

Your Reliability Society has a large number (several hundred) of surplus copies of the 1992 IRPS and the 1993 RAMS proceedings on hand. We also have a small number (less than 100) of 1992 RAMS and 1993 IRPS Proceedings.

Reliability Society members who did not get a copy of any of these and want one, may request a copy by writing the following address. Request should identify the proceedings desired and confirm that the requester is a member of the Reliability Society. Requests will be filled only so long as supplies last. Send to: Anthony Coppola, IITRI, 201 Mill Street, Rome, NY 13440-6916.

Multiple copies of proceedings may be requested for educational purposes by Academic Institutions. Such requests will be honored so long as supplies last, and after individual Reliability Society member requests are filled.

Reliability standards, including definitions and terminology, will be recommended to the Reliability Society ADCOM.

In the international standard's arena, IEC 300 is the reliability counterpart of ISO 9000. Encouraged by the impact of ISO 9000, efforts are underway in Europe to revise the IEC 300 series of standards. This presents an opportunity and a challenge for the IEEE Reliability Society. The challenge is that if the Reliability Society does not take the initiative now, we will be followers, not leaders, our interests may not be attended to and our companies will be placed at a competitive disadvantage. The opportunity is the possibility of collaboration with the Europeans on improvements to electronic reliability technology. Consequently, the time for the IEEE Reliability Society to participate in an effort to implement the latest electronic reliability technology through national and international standards is now.

Individuals interested in becoming a member in the IEEE Reliability Society Standards and Definitions Committee, please contact Committee Chairman Michael Cushing, (410) 278-8808, or Thomas Stadterman at the address below.

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Electromagnetic Environment Effects Testing Using Built-In-Test (BIT)

Future military systems are expected to employ large numbers of Very Large Scale Integrated Circuit (VLSIC) and Very High Speed Integrated Circuit (VHSIC) devices capable of performing complex, high speed signal processing functions. In order for these advanced systems to accomplish their missions reliably, the IC devices must be able to operate without electromagnetic interference (EMI) from the intense electromagnetic environment to which they will be exposed.

Due to the diversity of effects that can result when VLSIC/VHSIC devices are exposed to EMI and the lack of existing data on their susceptibility thresholds, it is essential that an EMI measurement capability be developed for assessing the susceptibility characteristics of advanced technology IC devices.

Conventional test techniques for performing susceptibility measurements on VLSIC devices involves modifications to Automated Microcircuit Test Equipment (AMTE) to enable RF signals to be injected into specified pins during functional evaluation of the device. This conventional approach has severe limitations including excessive test hardware and software costs, short-term obsolescence of the digital test hardware,

and the need for a complex tester interface.

Rome Laboratory conducted a comprehensive research effort to analytically and experimentally assess the feasibility of using BIT and Design-For-Testability (DFT) techniques to determine the RF susceptibility of advanced technology IC's and PC boards. Using BIT, the digital test and the tester interface are drastically simplified. Test complexity is reduced because the test patterns are internally generated and the output responses are compressed to give a simple indication of the pass/fail status of the test. The tester interface is simplified because only a limited number of pins must be interfaced to the external test equipment. For these reasons, the BIT technique is an attractive approach for simplifying RF susceptibility testing of complex IC's and PC boards.

Based on direct comparisons of susceptibility threshold levels measured using conventional and BIT techniques, it appears that EMI test approaches exploiting BIT techniques can be used to provide accurate characterization of the device.

Michael F. Seifert
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Rome Laboratories/ERPT
525 Brooks Road
Griffiss AFB, NY 13441-4505

Sometimes It Takes More than Words

One of the greatest illustrators and inventors throughout history was Leonardo da Vinci. According to Professor Ronald Kline, Cornell University, who worked on establishing the IEEE's Center for the History of Electrical Engineering, "da Vinci left some 1,500 sketches and technical illustrations, but hid them throughout his lifetime from intruding eyes, from the critical view of the sanctimonious, and from church censors. Only through his *Milanese Codex Atlanticus* and his sketches held by individuals do we glimpse da Vinci's ability to draw what had been nature's secrets.

To further ensure that no hostile eyes would fathom his work, da Vinci encrypted his notes by writing them from right to left. This was not too hard for a genius left-hander. His technique required a mirror to read them.

Great engineering advances have always been accompanied by visual or mathematical aids. In fact, according to Prof. Kline, there is a common denominator of great inventors. They have made extensive use of illustrations in their work. So much so that art was once a required course in engineering curricula.

My field is software reliability, and it is plagued by the ambiguities of natural language. When the Darlington nuclear plant in Canada was built, procedures were written covering actions to be taken in the vent that the cooling water fell below a specified level. The problem was compounded by the fact that the water level constantly changes. Implementers of the code that will trigger response to the off-nominal water level had to decide when to invoke the procedure: when the maximum water level fell below the critical level (mean, median, mode). Because of the critical nature of this nuclear control application, there were two independent contractors building redundant code for this job. Both implemented the wrong assumption on the water level. The specification was then redefined in terms of a mathematical expression, and the ambiguity was removed.

This is also the case on the space shuttle program, where many specifications are reduced to mathematical expressions

to assure clarity of interpretation. The space shuttle is the most reliable code ever built. IBM Houston is the prime contractor for the shuttle code.

Mathematical specifications are excellent because they avoid the ambiguity of natural language. Prototypes of the desired product help to do the same thing. A picture or model is worth 1,000 words. OS2/2.0 has had a very successful release, winning accolades of *PC Magazine* as the best operating system of the year. It has excellent reliability and performance, and it has to overcome some deficiencies in its predecessor product. The software did this in part by making 5 Beta releases, prototypes, to the field. It also based its original design on a Quality Functional Deployment analysis. QFD is a graphical approach that matches engineering solution parameters against customer requirements. In other words, it is a pictorial correlation of requirements and solutions.

A colleague conducts strategic planning seminars in Boulder. Since many manhours go into the seminars, he believed the outcomes worth preserving in all forms. The seminars are set up with walls that can be written upon. People going through the week-long sessions create a lot of illustrations, and discussions are captured on cassette tape. Minutes are also kept and a graphics illustrator tries to capture the strategic thrusts in symbolic illustration.

In my office I have a large white board, which I use extensively in meetings. I find it invaluable to clarify and assure understanding. In fact, I find myself handicapped without the use of a board to capture thoughts and to assure understanding of the principles and relationships involved.

I push myself to put more of my ideas in figures and sketches, because I believe this will contribute to better formulation of ideas and solutions, as well as to higher creativity. I am currently preparing for an IEEE video broadcast on the subject of delivering software products to the global marketplace. The live audience will number about 5,000 people. Then it will be rebroadcast for another 25,000 around the world. The television company handling this production has challenged the three presenters to use graphics containing illustrations only — no words at all.

Sam Keene

Put the "Engineers" in National Engineers Week 1994 (NEW'94)

Have you ever wondered why the profession's annual celebration is called "National Engineers Week" instead of "National Engineering Week?" Neither have we. But it's a telling distinction: the name highlights the fact that technology in the abstract doesn't do anything at all, that it takes people - engineers - to make technical know-how work for the good of society.

The same is true of National Engineers Week itself. The concept is great, the plans are impressive, the goals are noble indeed. But it takes more than P.R. flacks to turn those ideas into reality, to paraphrase our slogan. More than event catchy newspaper ads, presidential proclamations or Washington press conferences, engineers have to sell the profession to the American public.

But don't tell that to hundreds of society sections and local NEW'94 committees spread throughout the land: they're too busy making their yearly fests bigger and better than ever before. Your gang looking for some new ideas for '94? Last year's local groups have some suggestions:

- Drop Some Dominos
Engineers worked with school children in Herndon, Virginia, to lay out and set off a 30,000 domino pattern with engineering themes; three local TV stations covered the event.
- Take a Hike
San Diego engineers strolled the land - conducting tours of engineering sites - and walked on water - on shoes they designed for a local contest.
- Throw a Party
They engineered quite a celebration at a Chicago gala attended by over 400 and emceed by a prominent TV anchorwoman.
- Take to the Airwaves
An Iowa society section underwrote Public Television's February broadcasts of "NOVA," which included their Engineers Week message.
- Hang out at the Mall
A group of Phoenix societies sponsored a weekend technology expo at a popular mall, featuring dozens of hands-on exhibits, demonstrations and interactive displays. (This will be a special nationwide project of NEW'94; as us for further details!)

And there are dozens of others. If you have any questions, contact Chris Currie or Pender M. McCarter in IEEE-USA's Washington office at (202)785-0017. They'll tell you it's going to be tough to top last year's accomplishments.

Good thing engineers love challenges.

Christopher Currie
Public Relations Consultant
IEEE-USA

IEEE HOTLINE

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membership assistance, IEEE publication orders:**

1-800-678-IEEE

- IFIP Working Group 10.4 "Dependable Computing and Fault-Tolerance"
- IEEE TC on Fault-Tolerant Computing
- EC-ESPRIT CaberNet Network of Excellence on Distributed Computing System Architecture
- EWICS Technical Committee on Safety, Reliability and Security (TC7)

Organizations and individuals are becoming increasingly dependent on sophisticated computing systems. In differing circumstances, this dependency might for example center on the continuity of the service delivered by the computing system, the overall performance level achieved, the real-time response rate provided, the extent to which catastrophic failures are avoided, or confidentiality violations prevented. These various concerns can be subsumed into the single conceptual framework of dependability, for which reliability, availability, safety and security, for example, can be considered as particular attributes.

This, the first European Dependable Computing Conference, aims to provide a venue for researchers and practitioners to present and discuss their latest research results and developments. Papers are solicited on theory, techniques and tools for the design, validation, operation and evaluation of dependable computing systems.

Major topics include, but are not limited to:

- Fault-Tolerant Systems and Components
- Safety Critical Systems
- Validation and Verification
- Secure Systems
- Test and Evaluation
- Dependable Software

EDCC-1 is the successor of two European conference series on fault tolerance and dependability as well as on aspects of testing and diagnosis. The first series, known as the "International Conference on Fault-Tolerant Computing Systems" was organized (from 1982 up to 1991) by the German Technical Interest Group "Fault-Tolerant Computing Systems". The other series, known as the "International Conference on Fault-Tolerant Systems and Diagnostics", was annually organized (from 1975 up to 1990) by Universities and academic research institutions in the former Czechoslovakia, Poland, Bulgaria and the former GDR. EDCC will be organized every two or three years in different European countries.

Information For Authors:

Six copies (in English) of original work should be submitted by January 10, 1994, to the Program Chair: Dr. David Powell, LAAS-CNRS, 7 Avenue du Colonel Roche, 31077 Toulouse, France, Tel: +(33) 61 33 62 87, Fax: +(33) 61 33 64 11, E-mail: David.Powell@laas.fr.

Papers must be limited to 8000 words, full page figures being counted as 400 words. Each paper should include a short abstract, a list of keywords indicating subject classification and an approximate word count. Papers will be carefully refereed. Notification of acceptance will be sent by April 30, 1994, and camera-ready copy will be due on June 20, 1994. The proceedings of the conference will be published as a volume of the Springer-Verlag series "Lecture Notes in Computer Science".

CONFERENCES

1993

17-21 Oct. **1993 International Joint Power Generation Conference**
Kansas City, MO USA

The Reliability and Availability (R&A) Committee of the American Society of Mechanical Engineers (ASME) Power Division is sponsoring the 1993 International Joint Power Generation Conference (IJPGC). Topics for the conference are:

- Availability of repowered older power plant units
- Operating availability of cogeneration and waste-to-energy plants
- Plant betterment program impacts
- Practical applications of RCM
- Economic benefits of improved availability
- On-line equipment performance monitoring
- Data for RAM modeling analysis
- Availability of overseas and emerging technologies
- Availability impacts of the Clean Air Act
- Predicting, tracking, optimizing availability at unit or component level
- Practical application of statistical methods for decision making

For information, contact: Mr. Jim Lofe (Bin B412), Paper Review Coordinator, ASME Reliability and Availability Committee, Southern Company Services, Inc., P.O. Box 2625, Birmingham, AL 35202, Tel: (205)877 7929

24-27 Oct. **1993 International INTEGRATED RELIABILITY WORKSHOP (Formerly the WAFER LEVEL RELIABILITY WORKSHOP)**
Stanford Sierra Lodge
Lake Tahoe, CA USA

For info contact: Harry A. Schafft, NIST, Bldg. 225 Rm. B360, Gaithersburg, MD 20899, Tel:(301)975-2234, Fax:(301)948-4081, Email: schafft@sed.eeel.nist.gov

1-5 Nov. **4th International Symposium on the Physical & Failure Analysis of Integrated Circuits**
Singapore

Organised by the IEEE Singapore Section in co-operation with the Centre for Integrated Circuit Failure Analysis & Reliability, National University of Singapore.

The Technical Committee is now inviting the submission of papers for presentation at IPFA 93. Papers should deal with work on: Failure Mechanisms, Failure Analysis Techniques, EOS/ESD Studies, Reliability Testing, Design and Process Control for Reliability in LSI/VLSI, Semiconductor-insulator interfaces, contacts and metallisation, Packaging, bonding, die attach and encapsulation, Opto-electronic devices, Power devices

Authors are requested to submit two copies of a 500 word summary and a 50 word abstract to:

Technical Committee Chairman, c/o IPFA 93 Secretariat, IEEE Singapore Section, PO Box 1066, Kent Ridge Post Office, Singapore 9111. Tel: (65) 291-9690 Fax: (65) 292-8596

Final date for submission of summary and abstracts: 1 March 1993.

A four day exhibition of FA & Reliability related equipment and services will be held concurrently with the Symposium.

Contact: SWEE Yong Khim, IEEE Singapore Section, 200 Jalan Sultan, #11-03, Textile Centre, Singapore 0719, Tel: (65)291-9690, Fax: (65)292-8596
or: IPFA, 93, Daniel Chan, National University of Singapore, Electrical Engineering Department, 10 Kent Ridge Crescent, Singapore 0511, Email: ELECSHD@NUSVM.BITNET

1994

24-27 Jan. **Annual Reliability and Maintainability Symposium**
Anaheim
Marriott Hotel
Anaheim, CA USA

The theme for next year is "How You Can Make It Happen" - Share your knowledge and expertise with your colleagues at the world's premier forum for the assurance technologies. Plan to attend.

16-18 March **International Society of Science and Applied Technologies (ISSAT) Conference on Reliability and Quality in Design**
Seattle, Washington USA

The ISSAT Conference is an international forum for presentation of new results, research development, and applications in reliability and quality in design. Papers may address any aspect of reliability and quality in design. Papers dealing with case studies, experimental results, or applications of new or well known theory to the solution of actual reliability and quality problems in engineering design are of particular interest. Suggested topics are:

- Modeling, Analysis and Simulation
- Fault Tolerance
- Software Reliability and Testing
- Quality Cost
- Maintainability and Availability
- Data Collection and Analysis
- Human Factors and Reliability
- Concurrent Engineering and Design
- Experimental Design for Quality Control
- Software Algorithms
- Safety-Critical Systems
- Risk Assessment Modeling
- Network Reliability
- Design Issues in Manufacturing
- Process Control and Management
- Quality Planning and Measurement
- Quality Engineering
- Total Quality Management Techniques

For information contact: Program Chairman: Dr. Hoang Pham, Dept. of Industrial Engineering, Rutgers University, P.O. Box 909, Piscataway, NJ 08855 USA, Tel: (908)932-5471, Fax: (908) 932-5467, Email: hopham@princess.rutgers.edu

20-24 March **PSAM-II International Conference Devoted to the Advancement of System-based Methods for the Design and Operation of Technical Systems and Processes**
San Diego, CA USA

The purpose of PSAM is to provide a forum for the presentation of scientific papers covering both methodology and applications

of system-based approaches to the design and effective, safe operation of technological systems and processes. These include nuclear plants, chemical and petroleum facilities, defense systems, aerospace systems, and the treatment and disposal of hazardous wastes. The objective is to share experience to the benefit of all industries.

The following is a list of topics within the scope of the meeting:

- Risk management and decision making
- Risk-based regulation
- Reliability-base design
- Probabilistic and deterministic models for process safety management
- Uncertainty and sensitivity analysis
- Uncertainties in physical and chemical phenomenology
- Exper judgement in assessment studies
- Cognitive models of human behavior
- Design and evaluation of man-machine systems
- Human factors and human reliability
- Risk-based methods for improving operator performance
- Computerized control systems and operator aids
- Organizational factors and safety culture
- Automatic fault detection and diagnosis
- Redundancy Management
- Artificial intelligence in support of process safety management
- Software dependability
- Earthquakes, fires, tornadoes, and other natural phenomena
- Survivability and vulnerability
- Safeguards analysis
- Aging of systems, structures, and components
- Communicating the results of risk assessment and management to peers, decision makers, and the public

Technical Program Chairman: Professor George Apostolakis, Mechanical, Aerospace and Nuclear Engineering Department, 38-137 Engineering IV, University of California, Los Angeles, CA 90024-1597 USA, Tel: (310)825-1300, Fax: (310)206-2302

22-24 March **IEEE INTERNATIONAL CONFERENCE ON MICROELECTRONICS TEST STRUCTURES**
Catamaran Resort Hotel
San Diego, CA USA

The conference, sponsored by the IEEE Electron Devices Society, will bring together designers and users of test structures to discuss recent development and future directions. The conference will be preceded by a one-day Tutorial Short Course on Microelectronic Test Structures on 21 March. There will be an equipment exhibition relating to test structure measurements. Original papers presenting new developments in both silicon and gallium arsenide microelectronic test structure research, implementation, and application are solicited. A Best Paper Award will be presented by the Technical Program Committee. Suggested topics include:

- Test Structures for Material & Process Characteristics
- Dimensional & Electrical Integrity of Replicated Features
- Test Structures for Device & Circuit Modeling
- Product Failure Analysis from Test Structure Data
- Test Structures for Reliability Analysis
- Wafer Fabrication Process Control Test Structures
- Test Structure Measurement Utilization Strategy

For information contact: Robert A. Ashton, AT&T Bell Laboratories, 9333 S. John Young Parkway, Orlando, FL 32819 USA, Tel: (407)345-7531, Fax: (407)345-6904, Email: raa@aluxpo.att.com

21-24 March
Jupiter Beach
Resort
Jupiter Beach, FL
USA

**CARTS 94
14th Capacitor and Resistor Technology
Symposium**

The Capacitor and Resistor Technology Symposium is an annual forum for the presentation of information on new components, improved applications and solutions to current problems. The Conference is designed to exchange information between manufacturers, users and academia on the following components:

- Capacitors
- Magnetics
- Filters
- Resistors

This year there will be the usual technical and product sessions and a special session is planned on International Standards. Papers are requested for the technical sessions on the following subjects:

- Applications Experience
- Quality Assessment Programs
- Problems and Solutions
- Failure Analysis Procedures
- Failure Experience
- Test Techniques
- Reliability Performance
- High Reliability Practices
- Derating Practices
- Usage Experience
- Screening Methods
- Future Trends and Projections

ABSTRACT DEADLINE SEPTEMBER 29, 1993
Please submit a 200 to 300 word abstract which clearly describes

the nature, scope, content and key points of the proposed technical paper. The title, authors name, affiliation, complete address and telephone number should appear on the same sheet of paper with the abstract. Forward three (3) copies of the abstract to reach this address by September 29, 1993: CARTS, 904 Bob Wallace Ave., Suite 117, Huntsville, AL 35801, USA, Tel: 205-536-1304, Fax: 205-539-8477.

Product Session: manufacturers will have the opportunity to present descriptions of their products and capabilities with an emphasis on new products, improved capabilities and new applications. This session will be separate from the technical papers and is designed to help component engineers keep abreast of the available components and new capabilities of the suppliers. Manufacturers interested in giving a talk in this session must provide an outline of the talk clearly identified to the product session.

Authors of papers selected for presentation will be notified by October 28th and asked to prepare an illustrated paper of approximately 2000 words by January 12, 1994 for inclusion in the Symposium Proceedings, which will be published and available for distribution at the symposium.

Sponsored by Components Technology Institute Inc, in cooperation with IEEE CHMT.

11-14 April
Fairmont Hotel
San Jose, CA
USA

**International Reliability Physics
Symposium**

See the advertisement for this conference elsewhere in this issue.

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- Parts Count Reliability ★ MIL-HDBK-217/E1
- Maintainability Prediction ★ MIL-HDBK-472
- FMECA ★ MIL-STD-1629A ★ FMD-91
★ MIL-STD-2165 ★ AMC-P 750-2
- System Reliability ★ MIL-STD-756B ★ MIL-HDBK-338
- Industrial Reliability ★ Bellcore TR-NWT-000332
- Mechanical Reliability ★ MIL-HDBK-472



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