

LOUIS BIRD, WOODS

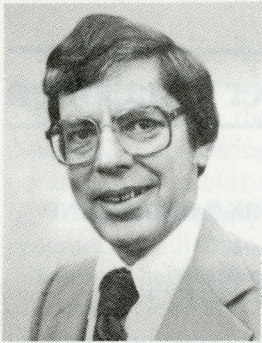
Reliability Society Newsletter

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Editor: Anthony Coppola
Vol. 28, No. 1, January 1982 (USPS 460-200)

President's Report



C.M. Bird

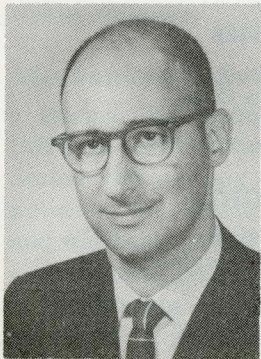
The October meeting of the Reliability Society AdCom was unique and was, in my opinion, a highly rewarding meeting. For the first time in many years, we attempted to have Chapter Chairmen from all of the local chapters present and devoted considerable time to the discussion of chapter activities and problems. I was ecstatic that eleven chapters were represented at this meeting, and an excellent interchange resulted. This provided an opportunity for better understanding of chapter operations by the AdCom

and better AdCom understanding by the chapter representatives.

The one problem that is universal among chapters is member involvement. A small amount of time spent to help organize a chapter meeting, publicize a meeting, or attend a meeting can be very beneficial to your chapter and rewarding to you. Call your local chairman and offer to participate. If you don't have a local chapter, call one of the AdCom officers and offer to get involved at the national level or, better yet, organize a local chapter in your area. There are many advantages to the technical exchanges made possible through local chapter meetings.

Elsewhere in this newsletter is a reservation form for our annual Awards Luncheon. Send it now with a check to be sure you are included in this once-a-year opportunity to recognize our award winners, our most active chapters, and our new officers. You will also enjoy an inexpensive lunch and enlightening conversation with other Reliability Society members. The Awards Luncheon will be held Tuesday, January 26, 1982 in conjunction with the Annual Reliability and Maintainability Symposium in Los Angeles.

The Editor's Corner



Anthony Coppola

Since this issue is scheduled for release just before the Annual Reliability and Maintainability Symposium, it is dedicated to RAMS. It contains a few articles on sym-

posiums which you may find funny, if you have never been on a program committee.

Speaking of Committees, the RAMS is managed entirely by volunteers nominated by the sponsoring societies. These volunteers start work at the close of one symposium and work through the year to bring the next to fruition. It can be a demanding responsibility, but their results have been excellent, and most of the workers, if not all, find it a rewarding experience. Most continue to serve for many symposiums. I am a three-time volunteer myself and hope to continue for many more.

"That's nice," you may say, "but whom do I have to know to join this august group?"

Continued on page 3

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The answer is that you don't have to know anyone. If you are willing to work and have company support (for attendance at four meetings a year at the Symposium site, plus your time, postage, and phone calls), all you have to do is make your availability known to Reliability Society President, Carl Bird, whose address is printed in this newsletter. Your chance of selection depends on the number of volunteers, but, as in any organization, those willing to work will usually get all they want. At present, Carl has a number of volunteers for the 1983 RAMS, but would like a backlog for 1984 and beyond.

This will be my last issue as Newsletter Editor. Susan Eames has agreed to take over, starting with the next issue.

I have enjoyed being your editor. My thanks to all of you who have sent contributions. Please keep them coming to the new editor. Pictures of Reliability Society activities, reports of Chapter Activities, new R&M developments, even topical jokes are all welcome. If it has an interest to the members of the Reliability Society, please share it through your newsletter.

Don't forget the Reliability Society Awards Luncheon Tuesday, January 26 at the Biltmore during the RAMS noon break.

See you at RAMS.

Meet Your New Editor

Starting with the April issue, the Editor of the Reliability Society Newsletter will be **Susan H. Eames**.

Susan Eames is the Reliability Analyst in the Design Assurance Engineering Organization at Data General Corporation in Westborough, Massachusetts. She is in charge of planning, implementing, and managing all reliability programs on all Data General products.

Some of her responsibilities include: working with each of Data General's Manufacturing plants developing reliability programs for each product as it is introduced to the manufacturing environment; monitoring all product reliability testing activities; developing reliability

guidelines on new technologies; and coordinating the dissemination of reliability information to Data General customers.

Susan holds a Bachelor of Science Degree in Mathematics from Lowell Technological Institute (1975) and will be receiving a Master of Science Degree in Environmental Studies from the University of Lowell upon defense of her thesis.

She is a member of the I.E.E.E., Central New England Section, Reliability Chapter, and currently holds the office of Vice Chairman.

AdCom Reports

Technical Operations Vice President's Report

Naomi J. McAfee
October 15, 1981

All committees are actively working toward the objectives that were established in January. A summary of activities follows:

Mechanical Reliability—Henry R. Hegner

During 1981 the Mechanical Failures Prevention Group (MFPG) held two symposiums and completed plans for a Spring 1982 meeting. The first symposium addressed "Innovation for Maintenance Technology Improvements" and was held at the National Bureau of Standards (NBS), Gaithersburg, Maryland, from April 21-23, 1981.

Technology innovation clearly focused on improvements for safety, reliability, durability, maintenance, and operating economy of a wide range of machinery and equipment can provide viable and effective solutions to the problem of mechanical failure, an issue of national scope. The success of this concept demands imaginative management initiatives linking technology advances with

manufacturing, processing, and maintenance operations as well as information systems on a sustained basis. This symposium emphasized such a novel approach to failure prevention. The sessions highlighted management and information, technology and applications, and new materials for improvement of equipment performance. The objective was to establish a focal point and continuing information exchange in order to ensure an effective transfer of research results needed by industry and government to reduce the costs and consequences of mechanical failure, plant down time, and maintenance malfunctions. Several technology demonstrations were also presented to describe advances in machinery diagnostics, rapid repair of composite structure, *in-situ* structural monitoring, and thermal deposition of preventive coatings.

The symposium consisted of five technical sessions as follows:

- Maintenance Technology and Maintenance Concepts
- Technology Improvements for Power Plant Applications
- Maintenance Analysis Systems
- Improved Maintenance Processes
- Innovative Maintenance Diagnostics and Maintenance Indicators

The second symposium was on "Damage Prevention in the Transportation Environment" and was also held at NBS from October 21-23, 1981.

Mechanical failures of transportation systems and their components, and mechanically-induced damage caused by the static and dynamic transportation environment, are responsible for very significant economic losses of freight and cargo. The transportation and insurance industries strive to eliminate or at least reduce these losses through research and development. The application of the results of some of these efforts was discussed in this symposium. The purpose of this meeting was to make the members of the shipping, transportation and insurance industries more aware of the results of these efforts and to apply them in their respective areas of influence.

This symposium consisted of seven technical sessions and a tour as follows:

- Packaging for the Transportation Environment
- Research in the Railroad Industry I & II
- Damage Prevention in the Railroad Industry
- Designing for Transportation of Hazardous Materials (Nuclear Materials and Wastes)
- Highways
- Panel Discussion—Insurance and the Transportation Industry
- Tour of Southern Railway Research and Test Laboratory

The Spring 1981 meeting of the MFPG on Time-Dependent Failure Mechanisms and Assessment Methodologies will be held at NBS on April 20-22, 1982. The meeting will focus on the prevention of failure resulting from time-dependent mechanisms. Emphasis will be on the critical evaluation of input data through the use of in-service inspection and condition monitoring and the comparison of existing assessment methodologies or failure prediction approaches. The objectives will be to: (1) evaluate and present data in such a way that it can be efficiently used to assess the time-dependent failure problem, and (2) identify the necessary changes in design, fabrication processes, or service conditions needed to reduce the chance of failure.

Nuclear Systems Reliability and Safety— David P. Wagner

The Nuclear Systems Reliability and Safety Committee is currently involved in three areas of activity.

1. Several members of the Committee are participating in the IEEE/NRC effort to establish procedures for probabilistic risk analysis of nuclear power plants. We feel that this is a very important program that will have a significant impact on the future of risk analysis in the nuclear power industry.

2. The Working Group on Risk Evaluations of Radioactive Waste Management is involved in critiquing several sets of proposed criteria and standards for radioactive waste management. The Working Group's role is to serve as a third-party reviewer of criteria and standards related to risk evaluations of radioactive waste management and

to make recommendations on acceptable approaches, procedures, and data based for these risk evaluations to regulatory bodies and other groups.

3. The Committee's "Guide for Qualitative Common Cause Failure Analysis of Engineered Systems" (Project 831) is being temporarily held until the next Committee meeting. We have received comments from several individuals representing organizations both inside and outside of the IEEE. These comments may result in revision of the document after the Committee meeting.

The next committee meeting is scheduled to be held during the 1982 RAMS Symposium.

Human Performance Reliability Committee—Arthur I. Siegel

The principal activity has been the organization of a tutorial on human performance reliability. The tutorial will be presented in coordination with the Washington Chapter.

The tutorial has been largely organized, its content structured, the faculty (A. Siegel, K. LaSala, J. Jenkins, and C. Sontz) selected, and a broad mailing which announces that the tutorial will take place within 60 days. The tutorial will take place on March 23-24, 1982 at the Holiday Inn, Crystal City.

Continued interaction with the various human performance reliability committees working on nuclear problems has taken place. A one-week meeting at Myrtle Beach was attended in this regard. The interest of the NRC in regard to human performance reliability vis-a-vis risk assessment/safety continues. Inputs have been provided to various NRC working papers and proposed standards.

Council on Oceanic Engineering— Francois Envent

The 13th Offshore Technology Conference in Houston (May 4-7, 1981) was a success. The attendance was evaluated at 100,000 persons, and 2,800 exhibiting companies were present. The profits will be distributed according to the three preceding years average attendance.

The OTC Executive Committee voted to suspend exhibits in 1985 and 1987. COE expressed its concern on the grounds that other shows would take over the exhibits if this decision should be implemented. COE opposed such a change, and advised by letter of June 1981 the OTC Executive Committee as well as the sponsoring societies. Presently, the subject matter is still being reviewed.

A committee is being formed to evaluate the feasibility of replacing the Council of Oceanic Engineering with a society. In particular, the committee will analyze the realism behind the title *ocean engineer*, as opposed to *electrical/mechanical engineer*.

The Journal of Oceanic Engineering (JOE) editor (Dave Weissman) made a plea to try to get more societies to submit papers. In particular, papers on reliability techniques/considerations within an ocean environment are rarely submitted.

A new format for JOE will provide four issues per year,

one dedicated to the Oceans conference, and three on special issues such as: underwater vehicles, expendable instrumentation, research vessels, ocean energy, etc.

Oceans '81 in Boston (May 4-7, 1981) was a success with about 300 technical presentations and more than 60 exhibiting companies. The topic of the conference was "Outer Continental Shelf."

Oceans '82 will be held in Washington, D.C. (September 20-22, 1982) under the joint sponsorship of IEEE/COE and MTS. The theme for this conference is "Government, Industry, and Academia—Partners in Ocean Progress."

The COE appointed me as their representative to the Committee on Social Implications of Technology. For more information on this committee, please contact me.

International Committee— Marion P. Smith

Principal international activity involves IEC Technical

Committee 56—Reliability and Maintainability. Summary of activity:

October 1982—Stockholm—TC56 Plenary Session

Active Working Groups:

WG1—Definitions-continuing.

WG3—Reliability verification. 80% complete-London meeting October 15-16, 1981.

WG6—Maintainability. 60% complete.

WG9—FMEA. Initial documents prepared.

Proposed Activity:

Liaison with Component Technical Committees for quality provisions.

Guide for design review.

Guide for fault tree analysis.

Software reliability.

The annual meeting of the US National Committee of the International Electrotechnical is scheduled for November 18, 1981, in New York City.

Chapter Reports

Boston

The elected officers for the Reliability Chapter, Boston Section for fiscal year 1981-1982 are as follows:

Chairman: Wilfred Aubert, Sanders Associates, Nashua, NH

Vice Chairman: Susan Eames, Data General, Westboro, MA

Treasurer: Edward Naas, GTE Sylvania, Needham Heights, MA

Secretary: Gary Kushner, Digital Equipment Corp., Marlboro, MA

Scheduled activities for the year include technical meetings in September and December 1981, and January, February, and March 1982. We will also be presenting a Fall Lecture Series on Maintainability in October and November of 1981, and to close out the year, an all-day seminar in April 1982 on Assurance Technology Application.

Wilfred Aubert, Chairman

Los Angeles

For those who missed it last May, the IEEE Reliability Society, Los Angeles Council, again presented a two-day reliability training course on Friday and Saturday, October 30 and 31, 1981. It was held at TRW, 300 N. Sepulveda (corner of Sepulveda and Grand) in El Segundo. Both hardware and software reliability and their interrelationships were covered. Emphasis was on applications on quantitative methods, particularly concentrating on the "how-to," at an intermediate-to-advanced level.

The first topic covered on Friday, October 30, was the basis and use of the proposed new revision of MIL-

HDBK-217 for reliability prediction for both military and commercial equipment. The lecturer, Mr. Sam Lehr of TRW, also discussed and compared the important changes of the new revision, such as environmental factors and the addition of nonoperating failure rate models for all parts.

The second topic covered on Friday was intermediate-to-advanced techniques in modeling, found essential for reliability predictions involving equipment in complex configurations. This lecture, by Mr. Eugene Barnett of TRW, covered such techniques as truth tables, stress-strength models, Markov models and Monte Carlo simulation.

On the second day, Saturday, October 31, the subjects encompassed the fundamentals of computer software reliability including terminology, error sources, and prediction models. Management techniques and tools for producing reliable computer programs were also presented. A thorough discussion was on the relationships between those hardware and software reliability concepts that must be understood in order to deal with reliability and maintainability models of systems controlled by computer processing. Mr. Irving Doshay and Mr. Myron Lipow of TRW presented the topics on software reliability. Ms. Annette Frimtzis, of RFA Associates, covered software quality. Throughout the two-day series of lectures, a set of interesting examples were presented for class participation. A complete set of lecture notes and a text on reliability was supplied to each of the participants.

The Los Angeles Components, Hybrids, and Manufacturing Technology and Reliability Chapters jointly sponsored a technical session on VHSIC Program Advanced Packaging on October 28, 1981 at the Hacienda Hotel, El Segundo CA. The products of VHSIC are expected to provide high performance system reliability improvement and

be affordable, while also compressing the system development cycle. Silicon chips containing over 100,000 active elements and performing system functions at high throughputs are involved. VHSIC will also approach the maintenance-free mode of operation, provide a high level of commonality across both systems and services, and greatly reduce hardware and software system complexity (and thus reliability) as seen by users. Packaging these highly intelligent systems to provide acceptable user interfaces will be a major challenge. This challenge provided a stimulating basis for the meeting. Speakers were: for Gov't Packaging Technology, Dr. Dean McKee, Naval Ocean Systems Center, San Diego, CA; for VHSIC Packaging Development Task, Dr. Glenn O. Ladd, Hughes Aircraft Corp., LSI Laboratory; and for VHSIC Project Key Issues, Dr. Barry H. Whalen, TRW Electronic Systems Division.

The 1981-1982 panel of officers for the Los Angeles Chapter is:

Chairman: Kam L. Wong, Hughes Aircraft Co.
 Finance and Membership: Irv Doshay, TRW-DSSG
 Secretary: Herman D. Rue, Hughes Aircraft Co.
 Technical Programs: Sam Lehr, TRW-DSSG
 Publicity: Don Segel, TRW-DSSG
 Chapter Advisor: Hal M. Weil, Garrett Airesearch Corp.

Special Committee Chairmen are as follows:

Annual Seminar: Herman D. Rue
 Meeting Arrangements: Don Segel
 Joint Professional Activities: Kam L. Wong

The tentative 1981-1982 schedule of meetings is as follows:

- Nov. 1981 Design of Hybrid Packages for Efficient Heat Transfer and Reliability (Joint Meeting: CH & MT and ISHM)
- Dec. 1981 No meeting
- Jan. 1982 RAM Symposium in Los Angeles (no chapter meeting)
- Feb. 1982 Reliability and other aspects of Leadless Chip Carriers and Wired Hybrids (Joint meeting: CH & MT and ISHM)
- Mar. 1982 Reliability of Fiber Optic Communications
- Apr. 1982 Parts Screening
- May 1982 Comparison of Plasma and CRT Display Reliabilities

A joint one-day seminar with the Reliability Division of ASQC is being planned: "Japanese vs. American Devices." Also, another one-or two-day activity is being considered: "National Software Reliability Seminar."

Cleveland

Scheduled Meetings

Date	Subject	Lead Person
9/8/81	Research Day	P. Hunter
10/13/81	Reliability Testing	V. Lalli
11/?/81	Computer Instrumentation	A. Peabody
3/?/82	Reliability Simulation	H. Cheng
4/?/82	Computer Controls	R. Catlin

5/?/82 Power Electronics J. Burkhart

We are working with Dayton, Columbus and Cincinnati to build a joint conference with several Michigan Sections. The new conference may be known as OMCON. CECON is to be held on years when OMCON is in Michigan. The officers remained the same in our chapter. We submitted the manuscript for our proposed home study course. The matter was discussed at the last AdCom meeting.

Vince Lalli

Washington

The Washington Chapter opened the 1981/1982 meeting year with an address that is a portent of things to come in the D.C. area by Dr. Arthur I. Siegel.

Dr. Siegel, President of Applied Psychological Services Inc. and internationally known consultant on Human Performance Reliability, discussed the consideration of human performance reliability during equipment design. He presented an overview of the human performance reliability concept and outlined techniques for obtaining quantitative estimates of Human Performance Reliability that can be combined with traditional measures of hardware reliability.

This talk served as an introduction to the material that will be covered in detail in the workshop on Human Performance Reliability sponsored by the Washington Chapter that will be conducted at the Airport Holiday Inn (Crystal City), 1489 Jefferson Davis Highway, Arlington, VA on March 23-24, 1982. In addition to Dr. Siegel, the faculty will consist of Kenneth P. LaSala of the Naval Material Command, James P. Jenkins of the Nuclear Regulatory Commission, and Carl Sontz of Sontz Engineering. Detailed announcements will be mailed soon. However, preliminary information may be obtained from any of the Washington Chapter officers.

Other meetings that are scheduled include:

October 21—Col. Thomas A. Musson, USAF, Assistant for Reliability and Maintainability, Office of the Under Secretary of Defense for Research and Engineering discussed current initiatives in the Department of Defense to improve reliability.

November 6—Col. Ben H. Swett, USAF, Director of Engineering and Standardization at the Defense Industrial Supply Center (Philadelphia) presented various aspects of the DoD policy on R & M including Background, Policy Thrusts in DoD Dir. 5000.40, Issues and Answers in the Military Departments and Status of Implementation.

December 9—Mr. Henry Itkin of the Naval Sea Systems Command will discuss Design Approaches to Alleviate Supportability Constraints. This paper, coauthored by Mr. J. W. Thomas of Evaluation Associates Inc. will also be presented at RAMS 1982.

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Inactive Reliability Society Chapters

On July 8, 1981, the IEEE Service Center has advised us that the following chapters are "Chairman not on record" status: Binghamton, Canaveral/Dayton, and New Jersey Coast. If there is any activity in these chapters, or interest in reactivating, please contact Henry Malec, ITT/ATC, 1 Research Drive, Shelton CT, 06484

Welcome to New Members

The names and addresses of new members, from July 1981 through September 1981 are listed below. For USA members, they are listed by alphabetical order of their state. For members outside the USA, they are listed by alphabetical order of their country's English name.

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London, 14 England

Readers Contributions

OOPS!

Mr. Kenneth R. Thornhill informs us that we made an error in his address, published in the July issue. Our apologies to Mr. Thornhill, and his correct address is listed in the Welcome to New Members in this issue.

Murphy, Parkinson, and McGee

The Laws of Murphy and Parkinson are well-known and often quoted in problems arising from the perversities of nature and bureaucracies. An important theorem which extends these notions was advanced in the 1960's by my

friend, and former colleague, Max McGee. It has come to be known as

McGee's Theorem of Human Entropy:

No project can be done simply.

Proof is by inspection, as is the proof of the **Corollary:**

If it could be done simply, the project would not be funded.

It is conjectural that the Theorem will be elevated to Law by experimental results.

Our thanks to J. H. Wujek

Richard Kowalski

Maintainability Profiles—Part 2

Maintainability Profiles are meant to identify and highlight the activity of varied technical, industrial, and professional organizations that are concerned with maintainability matters. Organizations concerned with solar devices and the automotive industry are our subjects for this issue. Reader suggestions for future profiles are welcomed. Contact Dr. Richard Kowalski at ARINC Research Corporation, 2551 Riva Road, Annapolis, MD 21401, (301) 266-4841.

Solar Reliability and Materials Program (SRMP)

For the past several years, the Office of Solar Applications of the U.S. Department of Energy (DOE) has conducted a national program aimed at evaluating the operating characteristics, reliability, and cost effectiveness of solar energy systems for heating and cooling. As part of this national program, Argonne National Laboratory's (ANL) Solar Reliability and Materials Program (SRMP) is charged with obtaining and evaluating data concerning the reliability and maintainability of operating solar energy systems administered by DOE's Office of Solar Applications throughout the United States. Argonne's SRMP staff also assesses the performance of materials utilized in these systems. The funding for this effort extends through fiscal year 1982.

The reliability and maintainability (R&M) element of the ANL Solar Reliability and Materials Program summarizes and reports operations and maintenance experiences and distinguishes between those R&M problems normally associated with the building industry and those unique to solar energy systems. Since many system failures are a result of component or material failure, it is important to investigate the *in situ* performance of solar energy system materials, including the heat-transfer fluids.

SRMP employs a variety of channels to acquire technical and operational data from demonstration sites, including the resources of the National Solar Data Network (NSDN), site-operations logs, and on-site visits by Argonne personnel. Operational data constitute a portion of the permanent solar energy system documentation; these data are logged into a reliability, maintainability, and materials (RM&M) library at Argonne. After data are collected from the operating systems, they analyze them to identify system-performance problems. Following problem-identification, SRMP develops and publishes solutions to particular problems, as well as general guidelines for improving the design, construction, and operation of solar energy systems.

Argonne publishes the results of the SRMP program as a series of guidelines whose content and technical level are especially tailored to the needs of four different audiences:

Architects and engineers, Solar energy system designers; Operating and maintenance personnel; and Solar energy system users.

For example, a typical SRMP report aimed at architects and engineers includes calculation procedures, statistics on component failures, failure modes and effects analyses, and design examples. In contrast, a report for potential solar energy system users contains a general discussion of solar energy systems, sizing criteria, expected maintenance requirements, and cost information.

The program also makes its findings available by means of conference participation and the publication of technical papers and Argonne reports.

The following publications by members of the ANL Solar Reliability and Materials Program are available to the public.

Preliminary Evaluation of Selected Reliability, Maintainability, and Materials Problems in Solar Heating and Cooling Systems, ANL/SDP-TM-78-2, SOLAR/0900-78/70.

Reliability and Maintainability Evaluation of Freezing in Solar Systems, ANL/SDP-TM-78-3, SOLAR/0901-78/70.

Reliability and Maintainability of Solar Collector and Manifold Interconnections, ANL/SDP-TM-79-4, SOLAR/0902-79/70.

Reliability and Maintainability Evaluation of Solar Control Systems, ANL/SDP-TM-79-5, SOLAR/0903-79/70.

Influence of Solar-Fluid Properties on Thermal Performance Based on Nominal and Measured Values, ANL/SDP-TM-79-6, SOLAR/0904-79/70.

Preliminary Evaluation of Rate of Solar-Fluid Scaling on Thermal Efficiency, ANL/SDP-TM-79-7, SOLAR/0905-79/70.

Reliability and Materials Performance of Solar Heating and Cooling Systems, ANL/SDP-TM-79-8, July 1979.

For copies of these reports or for further information, contact Mr. Ronald M. Wolosewicz, Manager, Solar Reliability and Materials Program, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439; (312) 972-7706.

Society of Automotive Engineers—Diagnostic Subcommittee

Pioneer automobile engineers founded the Society of Automobile Engineers in 1905. In 1917, SAE's name was changed to "Society of Automotive Engineers." The word "automotive" was used to reflect the Society's interest in all self-propelled vehicles.

The Diagnostic Subcommittee (DS) is one of nine which comprise the SAE's Electronic Systems Committee. Formally established in 1978, the DS is chartered to establish a recommended approach to diagnose automotive electronic

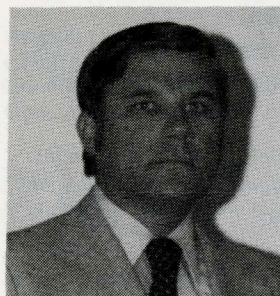
systems. The objectives of the Diagnostic Subcommittee include: developing standard terminology for diagnostics, defining areas for SAE standards, and recommending concepts for development/evaluation of field service diagnostics.

The members of the DS are mainly from test and service equipment industry and from the automotive industry. The Diagnostic Subcommittee is currently working in two areas: to identify and define automotive service or fault code formats and diagnostic equipment interfaces so that

products can be designed and tested in compatible ways, and to develop recommendations for color-coding automotive vacuum hoses (in much the same way electrical wiring is coded). Formal output can take one of three forms: an SAE standard, a recommended practice, or an information report.

Mr. Walter Doelp is the chairman of the Diagnostic Subcommittee. He can be reached at Ford Motor Company, 18751 Oakwood Boulevard, Dearborn, MI 48124, (313) 337-6928.

Meet Your AdCom



Richard A. Kowalski

Richard A. Kowalski received a B.S. degree in mathematics from Northeastern University in 1962, and his M.S. and Ph.D. degrees in mathematics from Case Institute of Technology in 1963 and 1967, respectively. He is a member of the technical staff of ARINC Research Corporation's Aircraft and Vehicles Division. He is responsible for new business planning and for directing projects to support military program managers in developing, applying, and improving innovative system acquisition methods.

Typical programs have included the F-16 aircraft, the U.S. Navy cruise missile, and U.S. Army avionics systems.

Before joining ARINC Research, Dr. Kowalski was a fellow engineer at the Westinghouse Electric Corporation, Defense and Electronic Systems Center, reporting to the manager for reliability, maintainability, and safety (R/M/S) engineering. He was responsible for determining R/M/S requirements for a number of ground, shipboard, and airborne electronics programs and for planning and directing R/M/S programs for equipments in various stages of development from concept through field test.

Dr. Kowalski has given several papers at the Annual R&M Symposia, and is a member of the American Mathematical Society, the IEEE, the Mathematical Association of America, and Sigma Xi. He was chairman of the Baltimore Chapter of the Reliability Society in 1972-73 and is a member of the Reliability Society Administrative Committee and chairman of its Maintainability Committee.

A New Direction for Reliability Engineering?



In the 1981 January Reliability and Maintainability Symposium, a paper entitled, "Unified Field (Failure) Theory—Demise of the Bathtub Curve," was presented by Kam L. Wong, who is the new Chairman of the L.A. Chapter of our Society. This paper won the P.K. McElroy Award for the best paper presented at the Symposium. Mr. Wong refuted the long cherished theory of constant failure rate during the useful life of electronic equipment. The notion of decreasing failure rate through life is not new. MIL-Standard-1600 was issued in 1972, under the sponsorship of Bill Wallace of the Navy, depicting decreasing failure rates for monolithic integrated circuits. However, the information in MIL-STD-1600 was too far ahead of

Mr. Kam L. Wong (on right) received the P.K. McElroy Award from Mr. Kurt Greene, 1981 Reliability and Maintainability Symposium General Chairman, for best paper, "The Unified Field (Failure) Theory—Demise of the Bathtub Curve," presented at the Symposium.

time and the standard was retracted after two years as it was in direct conflict with the prevailing theory. Besat and Montague of Honeywell also published an excellent paper in 1979 on their Air Data Computer showing the decreasing failure rate through the many years of use of the equipment in commercial aircraft. Recognition of nonconstant failure rate would necessitate the complete reworking of MIL-Handbook-217 as Handbook 217 was based on the

concept of constant failure rate. It will require a lot of efforts to put this new failure rate concept into practice not to mention the supporting data required. The new concept proponent, Mr. Kam L. Wong, Hughes Aircraft Company, Centinela & Teale Streets, Culver City, CA 90230, (213) 391-0711, extension 4104, welcomes any help or ideas from our readers to establish a new failure rate base for making reliability estimates.

Symposium Specials

Success with Conference Presentations without Really Trying

Trav Walton

A. Getting Your Paper Accepted When It Says Nothing

1. Always write paper on something hard to contest such as

- vague theoretical concept
- results of narrow experiment.

2. Stay away from popular topics—there are too many knowledgeable people around.

3. Unbeknownst to him, nominate one of your associates as a session chairman.

4. Never submit abstract on time. Those get reviewed by several people, at least one of whom is likely to know something. Submit late directly to desperate session chairman. Works well with #3.

5. Always pick a conference in a resort area. People don't go to hear papers anyway.

6. Always include some words from the session title in your paper title and abstract.

7. Corollary to #6: all you have to do to submit to different conferences is change those key words.

8. Pick a coauthor from some of your foreign friends and submit from his address. Conferences need your paper to stay "international."

9. If you really have done something worthwhile, pick conference, session, and order of your paper carefully. For example, see that your paper follows two others that failed to achieve success.

B. How to Avoid Saying Anything during Presentation

1. Mumble in monotone. Nobody will care what you say.

2. If anything remotely connected with your paper moves, make a short movie or loop. It still goes over great, just like junior high.

3. Use acronyms that mean something different than what everyone thinks; take time to explain each, again and again.

4. Make reference during talk to ambiguous given and nicknames which sound similar to those of conference leaders or others of note.

5. Always make your talk too long. You will be cut off before you have to reveal you have no real conclusion.

6. Make some print on all slides too small to read. Take some time repeating these unimportant words.

7. Use word labels on graphs—no numbers. This allows ambiguous meanings.

8. Learn to have microphone trouble. You can blow a good minute or two of your assigned time fixing (hello, hello—can you hear me?), and making it feedback.

9. Always throw in one or more slides designed to give the projection crew fits. These include:

- The slide that cannot be focused.
- A slide from some other paper.
- The ambiguous side up slide.
- Odd size slide mixed with rest.

(e) Late arriving slides—don't give them time to sort them.

10. If projection crew or machine keyed by button, always say "next slide please" before you push the button. Everyone thinks crew or machine is giving trouble.

C. How to Avoid Answering Questions on Your Work

1. Always emphasize the opposite of what the paper title and abstract imply. If hardware is implied, get lost in equations. If theory or software, show endless slides of hardware. Since listeners expected the opposite, they won't ask questions.

2. Ask for time slot next to lunch or happy hour. Since sessions always run long, only nerds stay around.

3. Refer all meaty theory questions to previous work in the most obscure, limited circulation journal possible. This requires some previous effort, but once done, can be used for years.

4. Always have a coauthor who is never available. Should any tough questions filter through, it can be claimed that this is his part of the project.

5. In case your delaying effort fails and you have time for questions, plant loud friend near front (best bet is a marketing guy after three drinks) to ask preplanned questions requiring long but meaningless answers.

6. To prevent being trapped after session, pretend a colleague is someone important and get involved in long-winded discussions. People with real questions will get tired of waiting and leave.

Reprinted from IEEE Geoscience Electronics Society Newsletter, March, 1979. and Engineering Management Society Newsletter, Nov. 1980.

Recollections of a Reliability Conference

To conduct a successful conference, the organizing committee must operate like a flock of ducks on a lake: smooth, quiet and placid on the surface, but paddling madly underneath. Even so, the large national symposiums, with documented guidelines and experienced personnel, can be produced without raising the adrenalin of the committee members to dangerous levels. It's a little more tense when a *ad hoc* conference is arranged by amateur talent. Case in point: A reliability conference organized in the late 50's by the fledgling reliability group of a government laboratory, for which I was the arrangements chairman.

Though half of the management committee hadn't even been to a conference, much less helped organize one, somehow it came together, just in the nick of time. The printer managed to get the proceedings there before the end of the conference, despite a half dozen late papers and a mixup in shipping labels which sent the entire stock on a side trip to Sandusky, Ohio. The speakers all made it, and the one who lost his baggage got it back ten minutes before his session, just in time to extract his slides. The slides themselves were passible. Though several exhortations by the committee for slide simplicity and visibility seemed to have been ignored, at least no one tried to reproduce the editorial page of the New York Times on one slide. All in all, things went relatively smoothly, if not exactly as planned, until the banquet.

For the second night of the conference we had scheduled a dinner at the Officers Club and had engaged a noted authority in Reliability as a speaker. At the start of the pre-dinner happy hour, I stationed myself by the front door of the Club to greet our illustrious guest, spirits buoyant with the triumph of having obtained a big gun to cap the conference. A half-hour later I was still waiting, and not quite so buoyant. As the clock ticked on, a definite sinking feeling took over. Frantic calls to our Visiting Officers Quarters, where we had reserved his room, brought no reassurance. He hadn't checked in.

We extended the happy hour to an hour-and-a-half. Fortunately, no complaints from the crowd, though some were getting a little too happy. Still no speaker.

Another half hour extension was invoked. Still no complaints, but the effects of the long bacchanal were beginning to show. After we found one visitor asleep in a chair we decided there would be no more extensions. Dinner would start promptly at eight, speaker or no.

At seven-forty-five our man arrived. With a sigh of relief that blew open several doors, I rushed to greet him. As I ushered him past the chair occupied by our unconscious visitor, I tried to divert his attention by assuring him that the slide projector he had requested was set up and waiting.

"That's good," he said, "How about the 16 millimeter projector?"

Pause, resurgence of sinking feeling, and—"what 16 millimeter projector?"

"I have a little film I wish to show, I'll need a 16 millimeter projector."

My hands were halfway to his throat before the brain regained control. Be calm, it said, and paddle like hell.

I foisted our guest off on another committee member with instructions to buy our guest a drink and start dinner on time.

The next few minutes should live in history as a testimonial to the quick reaction of the American Military. I ran to my boss, he to the Officer of the Day, he to the base photo lab with his set of master keys, and as the dinner came on at eight, one each 16 millimeter motion picture projector was being set in place next to the slide machine.

Dinner didn't agree too well with the budding ulcer in my stomach, but at least the crisis had passed.

After dinner, following an effusive introduction, our guest began his speech. I don't remember too much of it, however, because I was too busy trying to stare down an overenthusiastic happy hour participant who felt compelled to add his comments to the speaker's.

Then came the time for the movie. It was an old animated cartoon which the speaker tortured into an illustration of one of his points. I forgave him all his sins however, because when the film ended the heckler was peacefully asleep.

The rest of the conference was satisfactorily dull. The next week, however, we received a call from the VOQ. Seems our guest speaker had left a telescope in his room. We offered to send it back to him, which was OK with the VOQ. However, they were not about to release it to us until we came through with four dollars. Seems our guest also forgot to pay his bill.

We solved that problem with the aid of the Conference treasury, which was, fortunately, fat. After paying all our bills we found we had about \$30 left over. What to do with the surplus? My boss spent a full day trying to find someone to officially accept the funds, but there wasn't anything anyone could find in the regulations for disposing of the money.

Finally, he decided to add another event to the Conference—a party for the Managing Committee. But that's another story.

Next Slide Please

David Davies

I thought that in the eight minutes I've got I'd bring you up to date on what our group has been doing in the last year. In a sense this is a progress report which updates the paper we gave here last year; I won't go over the nomenclature again; could I have the first slide please—oh, I think you must have someone else's box—mine is the grey one with my name on the top; no, wait a minute, not my name, whose name was it now? Ah yes, you've found it; there's a red spot on the top right hand side of each slide that is the side that becomes the

bottom left when you project it; OK, you've got it now? Let's have a look; no that's the last slide not the first; yes, now you've got the right one but it's on its side. What about the red dot? There are two? Well, anyway, turn it through 90°, no, the other way; yes now we're there. Perhaps we could have the lights off? Well, I'm sorry there are probably too many words on this slide, and the printing is a bit thin; can you read it at the back? You can't; well, I'd better read it out; no, I won't, it's all in the paper which should be published within a month or so, and anyone who wants I'll give a preprint to afterwards; anyway, for those who can read it, this slide is a block diagram of the purification process we used and before I go any further I should mention that there are a couple of misprints: On the third row, fourth box from the left, well, of course that's the second box from the right, if you can read it, it says alkaline, now that should be acidic; also you can perhaps see the word mebmrane, that should of course be membrane; now if I can have a look at the next slide—now which one is this? Ah, yes it's the scatter diagram; I haven't marked the quantities but we are plotting concentration against particle size; if I remember rightly this has been normalized; perhaps I could have the lights for a moment to check in the text; yes, here we are, well it doesn't actually say—we could work it out but it's probably not worth the time, so if I could have the lights off, let's have a look at the plot; well I think you can see a sort of linear relationship—there's a fair bit of scatter, of course, but I think the data are at least suggestions; perhaps if I hold up a pointer your could see the relationship more clearly—I expect there's a pointer around somewhere; no I won't need the lights; yes here it is, now you can see the trend and there's just the hint of another

trend running subparallel to it through this other cluster of points; you may see that more clearly if I slide the pointer across to the other—no, I wasn't saying next slide, just that I would slide the pointer; anyway now the next slide is up let's keep it on the screen; now this is the sort of evidence on which the data in the last slide were based; this is a thin section—it could take just a bit of focusing—yes, that's better; it's difficult to get the whole slide in focus at once; now the scale is, well that bar is one micron long, hang on what am I saying? It's 10 microns long—oh dear, the chairman is giving me the two minute warning; it's difficult to give you a clear picture of this work in only eight minutes, but let's plough on. What was I saying? Ah yes, that bar is 10 microns long; now if we turn to the next slide, please; this is the result of a chemical analysis of the dark region that is near the center of that thin section; is it possible to go back a slide? Well not to worry, you can see in the analysis how dominant—sorry what was that? Oh yes, the errors are plus or minus a percent or so—that's the standard deviation; no it can't be, it must be the standard error of the mean—oh dear, the chairman says my time is up, can I beg half a minute—are there any more slides? Really? Well let's skip the next two; now this one is pretty important; it brings together several of the threads that you've probably been able to discern running through this talk, but rather than go through it in detail perhaps I should have the lights and just put up one or two key numbers on the blackboard—the chairman says there's no chalk; well it's all in the paper I was mentioning anyway; perhaps I've been able to give you the gist of what we've been doing: I guess that's all I've got time for.

Originally published in Nature, vol. 272, 27 April 1978.

Plan Now To Attend the Annual Reliability Society Awards Luncheon

WHEN: January 26, 1982 at Noon
WHERE: The Biltmore Hotel, Los Angeles CA
(Location of 1982 ANNUAL R&M SYMPOSIUM)
WHY: Honor the recipients of the Reliability Society Awards
Meet your Society Officers
Enjoy fellowship with Society Members
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Advance Registration Form Reliability Society Awards Luncheon

NAME _____
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This form and a check for \$7 payable to the "IEEE Reliability Society" should be mailed to:

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P.O. Box 295
Goodyear AZ 85338
(602) 932-7321

Environmental Stress Screening Guidelines Available

Published for government and industry-wide use for the optimization of hardware performance verification and dependability and distributed at the 2nd National Conference and Workshop on Environmental Stress Screening of Electronic Hardware (ESSEH), September 1981, San Jose, CA, this document contains reports covering electronic assemblies (modules, units, systems). These reports contain a bibliography and describe: the background work performed, a summary of the information acquired which forms the basis of the task group's decision, what the stress screening recommendations are for each assembly level, cost trade-offs which should be made, and how the stress screening recommendations can be applied.

ISBN: 0-915414-66-X

Order from: Institute of Environmental Sciences
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Telephone: (312) 255-1561

Nonmember: \$75.00 plus \$5.00 s/h

IES member: \$60.00 plus \$5.00 s/h

Volunteers Needed

Special Papers Chairman

Needed is a practical-minded and persistent individual with broad contacts to solicit more practical papers for the IEEE Transactions on Reliability (see Call for Papers for type of material desired). Special letterhead provided. Duties require incumbent to be alert to developments with practical paper potential and bug potential contributors for submissions. Contact A. Coppola, RADC/RBET, Griffiss AFB NY 13441.

IEEE Power Engineering Society Power-Life Award

The Institute of Electrical and Electronics Engineers (IEEE) Power Engineering Society annual Power-Life Award recognizes those members who have made significant contributions in bringing man into harmony with his environment. This year's recipient was Dr. Merrill Eisenbud, Professor of Environmental Medicine and Director of the Laboratory for Environmental Studies at New York University, for his outstanding contributions to the understanding and control of terrestrial, atmospheric, atomic and electrical power facilities radiation to the benefit of human health world-wide. The award was made at the Power Societies summer meeting held in July 1981 in Portland, Oregon.

New Rules for Fellow Nominations

The deadline for Fellow grade nominations to be considered by the 1982 Fellow Committee is April 30, 1982.

The IEEE Bylaws define the Fellow grade as one of unusual professional distinction to be conferred only by invitation of the Board of Directors upon a person of outstanding qualifications and extraordinary experience in the fields of electrical engineering, electronics, computer engineering, and computer sciences, and the allied branches of engineering and related arts and sciences, and who has made important individual contributions to one or more of these fields. A nominee must be a Senior Member of the Institute, and have been a member in any grade for at least five years prior to January 1 of the year of election.

The Fellow Committee bases its evaluation on the nominee's showing in each of the following eight categories. Listed in the approximate order of importance, these are:

- (1) Individual contributions as Engineer/Scientist/Originator, Technical Leader, or Educator;
- (2) Evaluation by an IEEE Society (or more than one of them);
- (3) Tangible and verifiable evidence of technical accomplishment such as technical publications, patents, reports or published descriptions of products, facilities and/or services performed;

- (4) Confidential opinions of Fellow references who know of the work of the candidate personally (where possible, these should be associated with other than the candidate's own organization);
- (5) Service to IEEE (and AIEE and IRE);
- (6) Professional engineering service other than IEEE;
- (7) Opinions of endorsers; and
- (8) Total years in the profession.

Selections, based on the consensus of committee judgments, are submitted to the Board of Directors for consideration and election. Fellows elected for 1982 will be announced in December 1981.

The Nomination Form has been revised; only the new Nominations Form having the year code "1982" will be accepted by the Fellow Committee. The nomination kit may be used for new submissions as well as resubmission of nominations.

All members are encouraged to actively participate in the nominating process. The new kits are available upon request to the Staff Secretary, IEEE Fellow Committee, 345 East 47 Street, New York, NY 10017.

Reprinted from The Institute, Oct. 1981

1982 International Reliability Physics Symposium

March 30-April 1, 1982

Town Country Hotel
San Diego, CA

The Twentieth Annual Symposium, cosponsored 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 many technology decisions are based on the trade-off of one reliability physics concern vs. another reliability concern, the 1982 Symposium will emphasize the reliability physics of LSI and VLSI devices from design through processing, packaging, and testing; however, work in all areas of reliability physics will be included in the program.

For general conference information contact:
Dr. Murray H. Woods, General Chairman
1982 International Reliability Physics Symposium
Intel Corporation
3065 Bowers Avenue
Santa Clara, CA 95051
(Mail Stop SC11-C241)
Tel: (408) 987-8802

Enhancement of Quality through Environmental Technology

The Application of Environmental Technology through the Production Cycle

Institute of Environmental Sciences' 28th Annual Technical Meeting

Marriott Hotel
Atlanta, Georgia
April 20-23, 1982

Topics:

Environmental Stress Impact: Standards and Practices (210C, 781D, 785D, 810D); Recommended Practices, Reliability/Environmental, Environmental Stress Screening, Combined Environment Testing, Reliability Analysis and Environmental Integration, Reliability in the Production Cycle, and The Payoff of Quality Enhancement.

Environmental Engineering Methods: Low Cost Testing, Successful Test Tailoring, Reliability Growth, New Techniques in Testing, Digital Analysis and Control, Severe Environmental Stimulation, Unique Facilities, and Acoustic Emissions Testing.

Energy and the Environment: Energy and Economics, Dealing with Regulations, Potential of Alternate Energy Sources, Energy Facility Problems and Solutions, Recycling and Resource Recovery, Climatic Impact, Hazardous Materials Control, and Effects Assessment.

Contamination Control: Standards and Practices (209B), Education and Training, Clean Room and Equipment Design, Clean Room Garments/Gloves and Wipers, Contaminant Identification and Analysis, Defining and Measuring Cleanliness, Filtration of Fluids, Pharmaceuticals and Biosciences, and Contamination Effects (Case Histories).

Contacts: Edward A. Szymkowiak
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P.O. Box 5508, L-463
Livermore, CA 94550
415/422-0407

Reliability Chapter IEEE Boston Section

The Twentieth Annual Spring Reliability Seminar has been scheduled for April 29, 1982. The Seminar will be hosted by the IEEE Boston Section Reliability Chapter. The theme of this year's seminar will be "Assurance Technology Application in the 80's."

Contact: Mr. Sid Gorman, Seminar Chairman, at (617) 358-2721, Ext. 2200 or 2864.

Phoenix Conference on Computers and Communications

May 9-12, 1982

Technical sessions will cover solid-state electronics in computers and communications, computer science and computer-aided process for design and manufacture, and related software issues. For more information regarding the conference, contact E. David Metz, Motorola Inc., MD B136, P.O. Box 2953, Phoenix, AZ 85062.

32nd Electronics Components Conference Electronic Industries Association

May 10-12, 1982

San Diego

Major Topics:

Semiconductor Processing Technology: Silicon device fabrication, compound semiconductors, laser annealing, computer-aided design/manufacturing, and E-beam/X-ray lithography.

Opto-Electronic Devices: New designs, developments and applications for converting, detecting, and transmitting.

Manufacturing Technology: New developments and techniques in processing, assembly, and testing of components.

Materials: New or improved organic or inorganic materials for components (e.g., encapsulants, thick film materials, thin film materials, etc.).

Hybrid Microcircuits: Design, development and applications of r-f, linear, and logic circuits.

Discrete Components: New or improved resistors, capacitors, connectors, magnetic devices, relays, switches, and semiconductor devices.

Interconnections: New designs or developments for interconnecting and packaging electronic and hybrid assemblies (e.g. wire bonds, beam leads, flip chips, etc.).

Reliability: Evaluation, failure analysis, characterization, reliability assessment, physical analysis or qualification testing of components.

Connectors: New or improved devices or techniques of interconnecting circuit packs with backplanes, daughter/mother boards, and cable connections to backplanes.

Circuit Packaging: New designs or developments in circuit packaging from active device to systems level including associated topics such as electrical and thermal performance of package and systems configuration.

Contact:

D. J. Bendz, IBM Corporation, Dept. 649/014-4, 1701 North Street, Endicott, NY 13760.

**MELECON '83
Mediterranean Electromechanical Conference
May 24-26, 1983
Athens, Greece**

The IEEE Region 8 invites you to participate in MELECON '83 in Athens. The Mediterranean Electrotechnical Conference 1983 will cover topics in Energy and Information Systems with special emphasis on applications of interest to the Mediterranean countries. It will provide an opportunity for interaction among the electronic, computing and power communities in the area.

The conference will concentrate on the following three areas of interest in parallel:

- I. Solar Energy and Electric Power Systems
Photovoltaics
Solar-thermal electricity and solar ponds
Wind power systems
Economic modeling of energy systems
Reliability, monitoring, and flow control in power systems
- II. Communication Systems
Transmission systems (codecs, modems, channels)
Communication switching and traffic theory
Transmission, transportation and communication networks
Computer communications and data transmission
Communication needs in the Mediterranean countries
Microwaves, antennas and optical communications

- III. Computers
Microprocessor applications
Control and industrial automation
Computer modeling and evaluation of performance
Distributed processing and data bases
Trends in software development
Simulation and mathematical foundations of computing
Computer applications of government, medicine, and office automation

Two-day tutorials in the above fields, conducted by distinguished instructors, will be organized to follow the technical program of the conference.

Contact: MELECON '83 Secretariat
c/o Prof. E. N. Protonotarios
National Technical University
42, October 28th Street
Athens (147), Greece

**EUROCON '82
June 14-18, 1982
Copenhagen, Denmark**

The theme for the Fifth European Conference on Electrotechnics is "Reliability in Electrical and Electronic Components and Systems."

The Conference is arranged jointly by IEEE Region 8 and EUREL (The Convention of National Societies of Electrical Engineers of Western Europe), and the Conference Steering Committee expects to welcome some 1000 participants from all over the world on the opening ceremony performed by His Royal Highness Prince Henrik of Denmark.

Almost 300 papers have been offered for EUROCON '82, which has resulted in the following 6 "main streams" in the technical program:

- Reliability Theory and Modeling (15% of the papers),
- Reliability Testing and Data Analysis (10%),
- Reliability Planning and Management (15%),
- Reliability of Electric Power Systems and Components (25%),
- Reliability of Electrical and Electronic Systems (25%),
- Reliability of Components for Electrical and Electronic Systems (10%).

A scientific and technical exhibition is taking place, while the Conference lasts, highlighting the reliability theme of the Conference. And the Conference will feature a tutorial course on Reliability.

Further information on all aspects of EUROCON '82, the Technical Program, the Tutorial Program, the Technical Exhibition and the Social and Ladies Programs, is available from Conference Office, DIEU (Danish Engineers' Post Graduate Institute), The Technical University of Denmark, Building 208, DK-2800 Lyngby, Denmark, telephone 45-(0)2 882300, Mrs. Aase Sonne.

Training Courses

Probabilistic and Statistical Methods in Mechanical and Structural Design

To be presented by the University of Arizona College of Engineering at the Ramada Inn, 404 North Freeway, Tucson, Arizona on January 11-15, 1982.

The objective of this short course and workshop is to review the elements of probability and statistics and the recent theoretical and practical developments in the application of probability theory and statistics to engineering

design. Special emphasis will be given to fatigue and fracture reliability.

3.0 Continuing Education Units Awarded

For Technical Information Contact Dr. Paul H. Wirshing, Aerospace and Mechanical Engineering, Building #13, Room 101, The University of Arizona, Tucson, AZ 85721, (602) 626-3159.

For registration information contact Special Professional Education, Harvill Building #76, Room 237, College of Engineering, The University of Arizona, Tucson, AZ 85721, (602) 626-3054

Call for Papers

The **IEEE Transactions on Reliability** has a continuing need for practical papers.

Examples are:

1. Case histories.
2. Reliability techniques which were actually found to be useful on a job, and those which were not useful or were too expensive.
3. How you set realistic R&M requirements for a system or equipment.
4. What kinds of reliability testing were actually cost-effective.
5. Use of reliability data from the field instead of from special reliability tests. Comparison of field data with reliability tests.
6. Comments on the worth of standards such as the many

- international or US military standards on reliability.
7. Ideas, from experience, on the major obstacles to setting and achieving worthwhile reliability requirements in commercial, military or other fields.
8. Where to find information. For example, a list of trade and professional journals of value to electronics reliability and quality control practitioners.
9. Information summaries. For example, annotated lists of computer programs for analyzing electronic circuits or for generating fault trees; tell what the programs do, how big a computer they need, and where they are available.

Send submissions or ideas to Ralph A. Evans, Editor, IEEE Transactions on Reliability, 804 Vickers Ave., Durham, NC 27701.

Reliability Society Album

The AdCom and RAMS



The first of four Annual Meetings of the Reliability Society AdCom takes place at the RAMS Symposium. Shown here is the 1981 Meeting.



The Society's Annual Awards Banquet is also held in conjunction with RAMS. In 1981, J. H. K. Kao, C. M. Ryerson, and B. Epstein were honored for pioneering contributions to Reliability.



In July 1981 the Nominating Committee, shown here, met to select candidates for new members of the AdCom. Those elected will begin their service at the AdCom Meeting held with the 1982 RAMS Symposium.

Technology and Society: The Future

Articles in future issues of *Technology and Society Magazine* will deal with a similarly broad range of engineering subjects having important social implications. Several examples of specific matters under consideration are described below.

Reliability (probabilistic risk) assessment and cost/benefit analysis accomplished either by formal techniques or intuitive common sense underlies every modern engineering project. Such analysis involves assumptions equivalent to a mathematical reciprocity between cost (or benefit) and probability of occurrence. Certain current practical applications require that the methodology be applied to circumstances with infinitesimal *a priori* probabilities and associated costs with no well defined upper-bound. The classical statistical treatment is indeterminate under these conditions with a finite time frame. This difficulty is repaired by ad hoc assumptions which implicitly represent strong social value judgments. The considerable extent to which these mathematical contrivances influence public system development priorities is only dimly perceived.

Microprocessors have made practical the redesign of existing equipment to incorporate programable features. Medical devices, test instruments, home appliances,

games, and a rapidly growing assortment of other products have been marketed. One distinctive characteristic of these products is, of course, the essential stored program (rather than hard-wired) control. Software certification has presented difficult problems even in the relatively controlled circumstances of large computer facilities. A topic deserving careful study is the possible need or revision of product safety and performance standards to reflect the fact that device performance is no longer solely determined by physical components.

Engineering professional organizations have long played an active, useful role in the development of product safety and performance standards as well as in providing expert technical testimony in courts of law and before legislative bodies. This is a service of great social importance and a role for which these associations appear well qualified. However, it is also a matter in which there may be strong commercial self-interest on the part of individual volunteer officers. There is, then, some danger that the implicit public trust may be betrayed. Problems of this nature have arisen in the past. A recent notable instance has involved the American Society of Mechanical Engineers (ASME) in a court suit in which it has been fined a sum reportedly in excess of seven million dollars as treble damages for con-

spiring in the misapplication of a boiler safety standard. The ASME lost at trial and on initial appeal, with the case now submitted to the Supreme Court.

The IEEE, among other organizations, has filed an amicus curiae brief. In general terms, the IEEE brief advances the argument that not-for-profit organizations should not be held liable for unratified acts of volunteer members which are not in the interest of the organization, even if they are performed by the volunteer in some capacity as a representative of the organization. (The IEEE brief is actually limited to the application of Sherman Act strict antitrust liability.) This position is buttressed by reasoning that since (in the case at hand) the ASME did not, and could not, benefit in any simple direct manner from the unsupervised actions taken by two among its ninety thousand volunteer members, then it cannot be said to have supported or conspired with them. A contrary view, more consistent with the trial record, is that by creating the standards authority, and opportunity for its abuse, the professional society must share responsibility for the consequences.

The Supreme Court decision, when rendered, will provide a legal precedent that may affect the operation of all engineering associations. A basic question is the extent of the special liberties which should be granted, in the public interest, to an avowedly beneficent association of in-

dividuals, each of whom may have strong personal self-interest in matters over which the association has some control. Clearly, this must in part be measured by the demonstrated ability of such organizations to transcend narrow commercial perspectives. CSIT has well served the IEEE in this regard through its efforts to broaden the range of views expressed both in internal Institute correspondence and debate and through Institute publications. It is expected that SSIT will continue this tradition.

Other standards-related matters worthy of detailed analysis are the proposed IEEE program for accreditation of commercial laboratories engaged in the testing and certification of safety equipment used in nuclear power plants and the COMAR position paper on human exposure to microwave electromagnetic fields.

These and other topics of comparable social significance will be analyzed in forthcoming issues of *Technology and Society Magazine*. This is your invitation to participate. Editorial administration of the magazine, publicity, and additional SSIT activities will provide a great many challenging opportunities. It is our hope that IEEE members and others concerned with social implications of technology will enlist for the task ahead.

Reprinted from Sept. 1981 Technology & Society Newsletter.

A Question of Credibility

Donald N. Zwiep

The issue of credibility, which is crucial to the status of the engineering profession, will come under increasingly intense scrutiny and controversy in the months and years ahead. If our competence can be successfully questioned and our professional ethics bent and distorted, then we will soon become the handmaidens of any number of outside alien interests and pressures. Furthermore, our independence and integrity will be undermined and our authority diminished. Protecting our hard-won and irreplaceable professional credibility, therefore, becomes a matter of the utmost priority. We must answer our critics rationally, firmly, and irrefutably. We must continue to work to strengthen our professional practices and code of ethics. And perhaps the most important, we must stimulate widespread debate and discussion among our members on what steps we can take to maintain the high prestige and respect traditionally accorded the engineering profession.

In 1949, a British writer by the name of George Orwell published a chilling novel called *Nineteen Eighty-Four*. The book portrayed an extreme version of a fictional totalitarian state and its devastating impact on the lives of its inhabitants. His story introduced into the English language such expressions as Big Brother, Newspeak, and Doublethink. When it first appeared, *Nineteen Eighty-*

Four troubled millions of thoughtful readers throughout the world, who feared that totalitarianism might be the wave of the future. Well, the year 1984 is almost upon us and the specter of totalitarianism does not seem to be so overwhelming or so inevitable as it did perhaps 30 years ago. However, several of Orwell's make-believe predictions are suddenly beginning to loom very large and very real. First and foremost is the question of credibility.

The most serious immediate and obvious problem that the nation faces is the energy crisis. Presidents Nixon, Ford, and Carter have repeatedly told the American people in compelling and unequivocal terms that the energy crisis is a reality—that it is upon us—that we must do something about it forthwith—that it threatens our standard of living and even our way of life. Yet the latest polls show that the majority of Americans still believe that the energy crisis is contrived. And the sad thing is that no one really knows how to bridge this credibility gap.

The engineer has historically enjoyed a relatively high standing in the eyes of the public. The reason is that engineering is practically an exact science and therefore can guarantee results that most of the other professions cannot begin to match. A lawyer cannot predict the outcome of a court case for a client. A doctor cannot promise to cure his patient's ailment. But an engineer can guarantee to design and build a piece of equipment that will meet a customer's rigid set of performance specifications. We

have demonstrated to the world over a span of many years that we have the ability and the know-how to develop and manufacture a bewildering array of engineered products that, by and large, have given satisfactory service. This record of accomplishment is the bedrock on which our credibility rests. And our main concern now is how do we protect our hard earned credibility from the onslaughts of an increasingly litigious and skeptical society?

Of one thing we can be very certain! Every time we make a mistake in judgment—every time a piece of equipment fails and lives and property are lost or endangered, every time that blame for a breakdown can be assigned to faulty machinery—we will come under harsh scrutiny and criticism. And whenever our competency is questioned or cast in doubt, our credibility will be placed in the balance. Today we enjoy high credibility; but tomorrow we could very easily be at ground zero along with the politician and the used-car salesman! Let me briefly outline the potential threats that I perceive to our credibility and profession and my suggestions for how we should deal with them.

At the top of the list is the controversy over nuclear energy. The nuclear industry, which employs many of our members, has flatly stated, time and again, loud and clear that nuclear power is completely safe. But that old dog won't hunt after Three Mile Island! The near catastrophe in Pennsylvania has severely, if not irreparably, damaged the credibility of the nuclear industry. And I submit that until such time as credibility is reestablished and it is proven to the general public beyond the shadow of a doubt that nuclear power plants are safe and reliable, the further commercialization of nuclear energy will remain in a state of suspended animation.

There was a time, some 60-odd years ago, when boilers were exploding like firecrackers at a Fourth of July picnic! When the system reached epidemic proportions, it was finally decided by the boiler-makers, the users, the municipal authorities, and ASME to get together and take concerned action. By carefully building a system of stringent self-imposed codes and standards, and by vigorous self-imposed codes and standards, and by vigorous self-policing and strict enforcement, without any push from the federal government or other outside agencies, they succeeded in eradicating the scourge of boiler explosions. Why not the same medicine for nuclear power plants? Just as it is technically possible to construct a nonexploding boiler, so it is technically feasible to engineer and manufacture a foolproof nuclear power plant and to set up procedures to have it continue that way. A cooperative relationship among all of the concerned parties—manufacturers, utilities, government regulators, environmentalists, consumer advocates, and engineering societies—working toward a common goal, could, in short order, restore a modicum of credibility to a troubled industry. I, for one, am thoroughly convinced that some form of nuclear power is imperative in our immediate future energy equation, and I strongly urge the engineering societies to use their credibility, experience, and human resources to help breathe new life into the nuclear power program.

One of the more colorful buzzwords to emerge from the Watergate fiasco is the phrase "cover-up." Cover-up, of course, is the antithesis of credibility. The connotation is of hidden evil or skulduggery. In this world of instant media coverage, enterprising investigative reporters, and the commercial market for scandal, there is almost no possibility of keeping a secret buried for very long. Nor is there any quicker way to commit credibility suicide than by being caught in a cover-up situation. The only responsible path I know to avoid being tarred by the cover-up brush is to blow the whistle as early in the game as possible.

What I have in mind for the engineering profession is the provision of a public forum for engineers who are prepared to blow the whistle whenever they see or are inadvertently involved in technical programs and projects that violate the engineering ethics of sound practice. We should give a high priority to the establishment of a mechanism whereby engineers who are caught in this situation can, without fear of retaliation and anonymously, if necessary, bring their case into the open for judgment by their professional peers. In order to ensure the future overall credibility of the engineering profession, such a public forum is a vital necessity.

And there is where the new federation of engineering organizations—the American Association of Engineering Societies (AAES)—can play a leading role for all engineers. Within its framework, we would construct an Engineers' Forum. We must see to it that procedures are formulated that will allow engineers to be the final arbiters of safe and responsible engineering practice.

Regrettably, many of our most respected institutions and professions have already been damaged because they have allowed their credibility to become compromised. Even the engineering disciplines have suffered when they have bent to the demands of nontechnical considerations, such as the profit motive and similar commercial expedients. Let me underline that there is no need for this to happen if we are prepared to fight to uphold our principles. However, if we permit our credibility to be gradually eroded away, we can look forward to becoming increasingly subservient to all kinds of outside forces and special interests. And in the end, we will lose our cherished identity—just as George Orwell warned in *Nineteen Eighty-Four*.

In the final analysis, it is the individual engineer who must accept the responsibility for the credibility of his/her work—and ultimately for the credibility of the profession. Individual engineers are the linchpins that make and maintain the complex whole. I have faith that engineering societies and their individual members are strong enough to persevere, to do what is right no matter what the circumstances and the conditions, irrespective of the temptations and the pressures. And when called upon, they will unanimously generate the necessary strength of character and the courage that will hold up in the face of the trials and attacks on our credibility that almost surely lie ahead.

Condensed from an article in IEEE Antennas and Propagation Society Newsletter, April 1981.