RELIABILITY GROUP NEWSLETTER

JULY · 1970 vol. xv · issue 3

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"Material for the October issue must be in the editor's hands by August 28."

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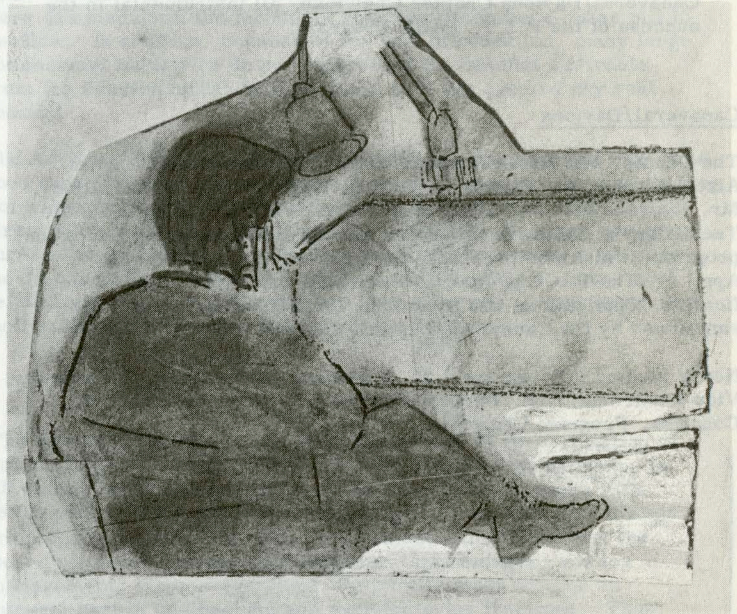
WHITHER RELIABILITY?

Far, far out on the Gaussian curve there lurked an error which IEEE Headquarters discovered only, alas, after all G-R members had been mailed copies of the current IEEE Transactions on Systems Science and Cyberhetics. With perfect distribution symmetry, our Transactions were on their way to G-SSC members.

The long-range benefits of this unplanned cross-fertilization must be left to time and harvested at some future date. Meanwhile, IEEE Headquarters will reprint our issue--at no cost to G-R--and hopes to mail your copy within a matter of weeks.

We apologize for the inconvenience, and with this note tender thanks for your alert help to all who took time to write.

H. E. Reese
G-Reliability Chairman



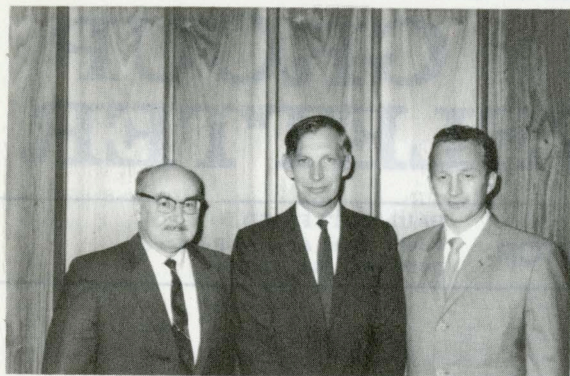
As this issue was going to press, most chapters were preparing for the changing of the guard -- the election of 1970-71 officers. Only a few chapters were able to report election results in time for publication.

The next (October) issue of the Newsletter will, as usual, be membership-oriented; a roster of G-R members, arranged geographically, will be printed. It will be helpful to all hands if chapter officers could be announced, and chapter chairmen's names and addresses listed, for all chapters at the same time.

Chapter officers responsible (secretaries, publicity chairmen) are asked to communicate election results (and plans for the next season) as soon as they are available. You don't have to wait for the deadline.

EDITOR'S NOTES

CHAPTER NEWS



Clifford M. Ryerson, Dr. Miller of F.I.T., and L.R. Webster, Canaveral/Daytona Chapter Chairman, all instrumental in the success of the F.I.T. PACE Program.

Canaveral/Daytona

The Chapter met April 1 to hear Clifford M. Ryerson of Hughes Aircraft speak on "Part Specification, Application and Evaluation". Mr. Ryerson also was a principal lecturer in Florida Institute of Technology's PACE (Program for Accelerated Continuing Education) program, which was presented the week of March 31 through April 4. The PACE program, which also was titled "Parts Specification, Applications and Evaluation for Reliability", was fully sanctioned by the Canaveral/Daytona Chapter.

Newly elected officers are J.B. Freeman, Chairman; J.P. Hollaway, Vice-Chairman; E.H. Barber, Secretary-Treasurer; and D.E. Countiss, Program Chairman.

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The Reliability Group Newsletter is published quarterly by the Reliability Group of the Institute of Electrical and Electronics Engineers, Inc. Headquarters address: 345 East 47th Street, New York, N.Y. 10017. Sent automatically and without additional cost to each member of the Reliability Group.

Second-Class postage is paid at New York, N.Y.

Montreal

The 1970 Reliability Training Session was jointly sponsored by the Chapter and the ASQC Montreal Section. Thirty participants from various industries successfully completed the course. Six lectures were presented: Basic Concepts of Reliability (February 4), Reliability Prediction (February 11), System Reliability (February 18), Reliability Testing (February 25), Establishing a Reliability Program (March 4), and Reliability Mathematics (March 11). Messrs. Len Thomas of RCA, Frank Moller of Canadian Marconi, and Dave Kiang of Canadian Marconi shared the load in lecturing. A certificate was issued to each participant at the completion of the course.

Dave Kiang, organizer of the 1969 and 1970 courses, reports that the response from participants was very encouraging. The class attitude changed from last year's "need to know for future reference" to "need to know to do the job." Of the participants, 67 percent are engaged in commercial fields and 1/5 of these in non-electronic products; 40 percent were non-members of IEEE and ASQC. There is a strong indication that local industries are beginning to take an active role in the application of Reliability disciplines to their products.

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Twin Cities

The May 27 luncheon meeting is to be addressed by Robert C. Aakhus, Honeywell, Inc., on "The Effectiveness of Part Pre-Failure Analysis". Pre-failure analysis is used to provide pre-use detection of inadequate lots of electronic components and, through a system of detection, analysis, investigation, vendor feedback and corrective action, can avoid many latent defects in the product.

Chapter officers for the 1970-1971 season are to be announced at the meeting. Nominees are: Gordon Seller, Honeywell, Chairman; V.M. Jordal, Honeywell, Vice Chairman; and Steve Pech, Control Data, Secretary.

The Chapter will sponsor a symposium entitled "Twin Cities Conference on Component Reliability" September 9-10, 1970, at the Minneapolis Auditorium Convention Center. Papers are planned on Component Reliability Improvement, Component Testing, Failure Mechanisms, Failure Analysis, and the Role of Reliability in the Industrial Sector of the Electronics Industry. The symposium will be held in conjunction with the Electronic Components Show to be presented by the Paul Bunyan Chapter of the Electronic Representatives Association.

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Washington

The April 1 meeting, held jointly with the Washington Chapter of G-PMP, heard Jack M. Finkelstein of Hughes Aircraft Co., Fullerton, California, speak on "Effects of Logistics Parameters on Operational Availability". On May 4, a joint meeting of the Washington and Baltimore Chapters of both G-R and G-PMP was addressed by D.S. Peck and Conrad Zierdt of Bell Telephone Laboratories, who discussed advanced screening and specification techniques for semiconductor devices.

The following have been elected as Chapter officers for the year beginning July 1: Vernon E. Gardner, U.S. Navy, Chairman; Dr. Victor Selman, Computer Sciences Corporation, Executive Vice Chairman; William A. Shortt, also of Computer Sciences, Program Vice Chairman; and Thomas T. Jackson, ARINC Research Corporation, Secretary.

SYMPOSIUM ADVISORY BOARD MEETS

Participating in the Advisory Board meeting were (left to right) D.J. Harnett, NASA; George Hage, The Boeing Co.; S.W. Burris, Lockheed; Dr. J.E. Condon, NASA; W.C. Hittinger, RCA; E. Ball, Jr., DOD; Rear Admiral G.E. Moore, II, USN; and Dr. E.T. Ferraro, Singer-G.P.

The following is the verbatim text of a press release of potential interest to the G-R membership:

" 'Are Reliability Engineers a good source of potential managers?' This was a key topic at the recent 1970 Symposium on Reliability, Advisory Board meeting in Washington, D.C. The Advisory Board provides both long and short range direction to the Symposium's Management Committee and consists of select top level executives from both government and industry.

Recognizing that there are many exceptions to any generalization, the Board's consensus was somewhat negative and aimed at the Reliability Engineer himself as being substantially responsible for his own dilemma. 'Too often, the reliability function has not felt itself a part of the team and, it has not sold its product in terms of value,' were comments repeated by many Board members.

Top management's disenchantment with reliability has been prompted by other conditions however -- not necessarily assignable to the R.E. In many instances, Reliability programs (some ill-conceived) were jammed down the throats of industry becoming a bitter pill to swallow. In addition, because of the lack of education, many large commercial industries do not understand the benefits derivable from the function and their customers have not created any real demand.

The Advisory Board considered that while top management may have good cause for their disenchantment -- much was of their own making. For example: Reliability departments have often been staffed with 'drop-outs' from other functions; the Reliability Manager was given unrealistic goals; and, the function itself was relegated to an after-the-fact position. Although faced with such handicaps, many good reliability engineers and managers have emerged, it was noted, but, their task was seen more difficult in the 70's.

The Advisory Board saw the 70's as a decade of re-orientation of national needs and objectives. Emphasis will be on efficiency in all areas, thus management must be expected to do more with fewer people and at less cost. Areas of interest will also change from space to that of our own environment. In this context the Board offered the Reliability Engineer, his manager, and top management, these suggestions: Reliability must become an integral part of engineering and manufacturing functions. Thus, the Reliability Manager's work objectives must be intermeshed with those of other functional managers. The Symposium should encourage top management to address the interface between Reliability and other functions. Reliability must start reporting its accomplishments in terms of, and be measured against its contribution toward achievement of business goals. Management should provide better incentiveness in order to encourage top scientists and engineers to join the Reliability profession. And, finally the Reliability Engineer should consider himself a disciplinarian -- one who must see that a discipline is enforced, not one who implements the discipline himself.

Another segment of the Advisory Board looked at technology. A key training problem was foreseen because of recent emphasis placed on overseas production. Computer 'software' was also seen as a new challenge for the R.E. In a pure technological sense radiation hardened components provide a new frontier for the Reliability professional. But, surprisingly enough, this group (primarily concerning itself with technology) turned to discussions on management. They foresaw reliance on such things as 'traceability' being suppressed in the 70's with greater emphasis being placed on sound management."

CONFERENCES

August 18-21	International Conference on Microelectronics, Circuits and System Theory (IEEE, The University of New South Wales, IREE Australia, IEE), Sydney, Australia
August 24-27	1970 Mexican Electrical Insulation Conference & Exhibition (IEEE Mexico Section, Mexican Society of Electrical and Mechanical Engineers), Mexico City
September 21-24	1970 IEEE International Conference on Engineering in the Ocean Environment (IEEE Oceanography Coordinating Committee and Panama City Section, with participation by U.S. Naval Ship Research and Development Laboratory, Florida State University, Louisiana State University), Panama City, Florida
September 21-25	1970 Intersociety Energy Conversion Engineering Conference (G-ED, G-AES, et al.), Las Vegas, Nevada
September 23-24	1970 IEEE Conference on Electron Device Techniques, United Engineering Center Auditorium, New York City
October 6-8	1970 IEEE Electromagnetic Compatibility Regional Symposium (G-EC Central Texas Chapter, with participation by G-EC and SWIEECO), El Tropicano Motor Hotel, San Antonio, Texas
October 21-23	1970 IEEE Ultrasonics Symposium, Jack Tar Hotel, San Francisco, California
October 26-28	EASCON -- 1970 IEEE Electronic and Aerospace Systems Convention, Sheraton Park Hotel, Washington, D.C.
October 28-30	1970 IEEE International Electron Devices Meeting, Sheraton Park Hotel, Washington, D.C.
November 12-13	1970 (11th) IEEE Symposium on Man-Machine Systems, Winter Park, Florida
November 15-19	23rd Annual Conference on Engineering in Medicine and Biology (IEEE and the other member societies of the Alliance For Engineering in Medicine and Biology), Washington Hilton Hotel, Washington, D.C.
November 17-19	Fall Joint Computer Conference (G-C, AFIPS), Astrohall, Houston, Texas
December 2-4	1970 IEEE Vehicular Technology Conference, Statler-Hilton Hotel, Washington, D.C.
December 7-9	1970 IEEE Symposium on Adaptive Processes: Decision and Control, University of Texas, Austin, Texas
December 9-11	1970 Conference on Applications of Simulation (IEEE, ACM, AIIE, SHARE, SCI, TIMS), Waldorf-Astoria Hotel, New York City
December 14-16	1970 IEEE International Symposium on Circuit Theory, Sheraton-Biltmore Hotel, Atlanta, Georgia
January 12-14	1971 ANNUAL SYMPOSIUM ON RELIABILITY (G-R, ASQC-ED, IES), Sheraton-Park Hotel, Washington, D.C.
January 19-21	1971 Mexico International IEEE Conference on Systems, Networks and Computers, Oaxtepec, Mor., Mexico

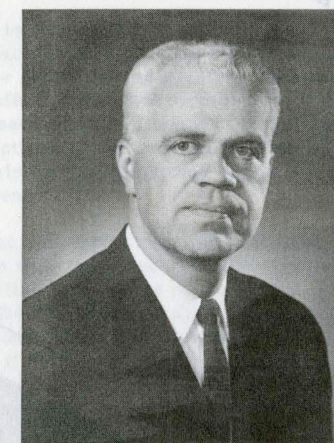
MEET YOUR ADCOM

Dr. John E. Condon is Director, Office of Reliability and Quality Assurance, National Aeronautics and Space Administration Headquarters, Washington, D.C. Before joining NASA, he served in various engineering and operations research positions with the Air Force Logistics Command, National Cash Register Co., and the Ohio State University.

John received his B.S. degree in mathematical statistics from the University of Dayton in 1951, and M.S. in industrial engineering from Ohio State in 1956, and the Doctor of Science degree in engineering administration from George Washington University in 1967. He is a 1969 graduate of the Federal Executive Institute and has served as an instructor and guest lecturer at the University of Dayton, Air Force Institute of Technology, and George Washington University.

John is a Senior Member of IEEE, has served on the management committee of the Annual Symposium on Reliability since 1964, and is General Chairman of the 1971 Symposium. A Fellow of ASQC, he is past Chairman of the Dayton Section and the National Conferences Committee. He has published numerous papers and is the recipient of the NASA Exception Service Medal and the National Security Industrial Association Certificate of Merit.

John, his wife, Dolores, and their five children live in Annandale, Virginia.



E. Donnell Hulme is Manager, Reliability-Quality Control & Technical Services, Electronic Tube Division, Westinghouse Electric Corporation. He previously held positions in Headquarters Manufacturing and the Electronics Division of Westinghouse.

Don was educated at the University of New Hampshire, where he received the Bachelor of Science in Chemical Engineering. He has done graduate work in mathematics and statistics at M.I.T. and at the University of Maryland. He has lectured at AMA and ASQC seminars.

Don is a member of IEEE, a senior member of ASQC, and a member of the American Chemical Society. He has held several positions with the management committee of the Annual Symposium on Reliability and was General Chairman of the 1969 Symposium. He also has been active on several industry and government committees in the area of quality and reliability.

He and his wife, Betty, have five children (ages 5 to 12) and live in upstate New York.

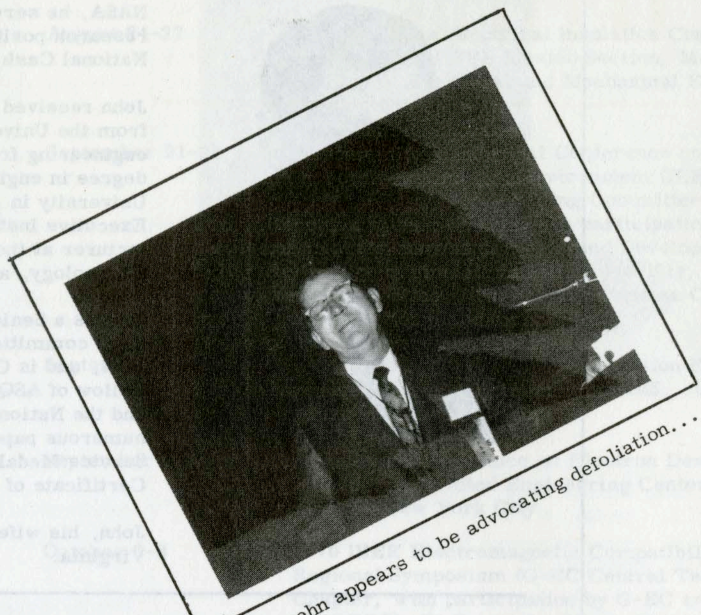
A.R. Park is Manufacturing Manager for Precision Instrument Company. In this capacity, he is responsible for purchasing, materiel, and manufacturing operations of the company. He previously served Westinghouse as Plant Manager of the Orrville, Ohio plant of the Hagan/Computer Systems Division; Manager, Control Instrumentation Product Line; Operations Manager for the Computer Systems Division; and a position on the Headquarters Staff of the Vice President of Manufacturing. These positions were preceded by a tour as Manager of Product Assurance for the San Marcos Division of General Precision and as Reliability Coordinator for the Electronics Division of Westinghouse.

Ridge received his BSEE degree from Johns Hopkins University in 1953 and has done graduate work in Engineering and Business at that institution.

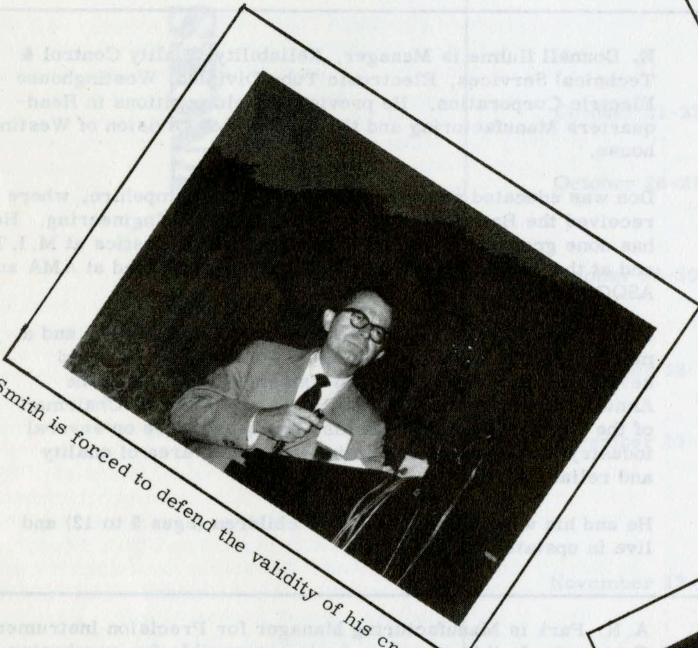
Ridge has participated in various technical committee activities as a member of IEEE and ASQC and has served on the management committee of the Annual Symposium on Reliability for twelve years. He is Vice General Chairman for the 1971 Symposium. He is a member of Eta Kappa Nu and Tau Beta Pi and is a Registered Professional Engineer (Maryland).

SYMPOSIUM SNAPSHOTS

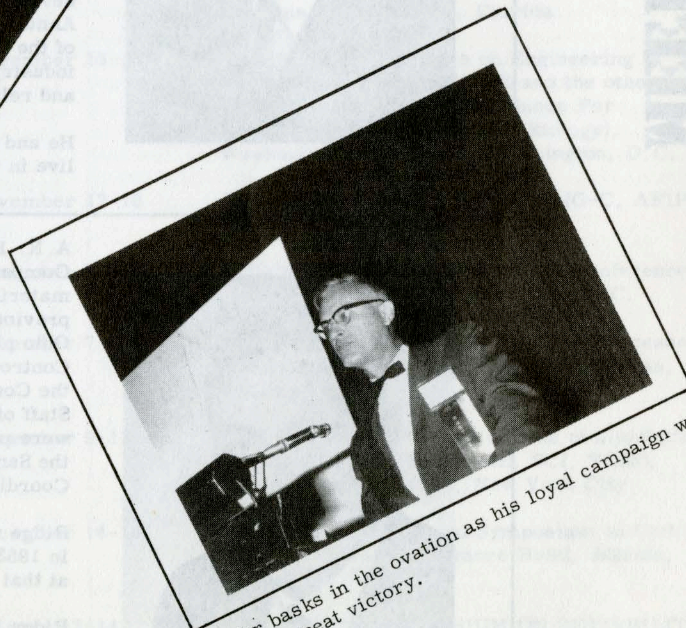
As you sink deeper into your seat in the Symposium audience, the eyes glaze, the mind begins to wander, and suddenly the familiar face at the rostrum merges with that of a public figure. Thus



Ralph Kuehn appears to be advocating defoliation......



Marion Smith is forced to defend the validity of his credentials......



and Ed Jahr basks in the ovation as his loyal campaign workers celebrate the great victory.

LETTERS

Dr. Evans has responded to two communications concerning his Letter to the Editor in the January issue; Mr. Solberg's comments as published in April, the Editor's remarks in the form of a private communication. The latter are reproduced below.

****

Dr. Evans is correct in asserting that the concept of a "wearout" distribution often is not clearly defined and even misunderstood. Peehaps this confusion is due, once again, to failure to distinguish between group behavior of devices and phenomena occurring in individual devices. We ordinarily infer life and hazard-rate distributions from observation of failure patterns in a group. If, as is usual, we are unable to distinguish among unfailed members of the group, we—properly—impute to each member hazard or life expectancy characteristics deduced from group behavior. This does not imply that individuals are in fact alike; it merely means that we cannot tell them apart.

Dr. Evans also asserts that "It is reasonable to define a wearout process as one in which the hazard rate is continually increasing." Hazard rates, as just noted, are group characteristics; wearout processes, on the other hand, affect individual members of a group. The rate at which wearout proceeds and the amount of wear that can occur before failure may be functions of the initial condition of the individual device. A wide variety of situations may occur (for simplicity, we assume constant stress):

> Wear may proceed at a constant rate, so that time to failure is simply the time required to reach "failure" dimensions from initial dimensions at that rate. In this case, the distribution of initial dimensions is transformed—without change in distributional form—into the time domain; e.g., if the initial dimensions are normally distributed among devices the times to failure will be normally distributed. As a function of manufacturing processes only, and not of the mechanism of wear, the distribution of times to failure then may take various forms including uniform, bimodal, or even Weibull.
>
> Wear rate may be a function of dimensions or state at any time. The effect may be catalytic or inhibitory: unit loading may increase as wear proceeds, thus promoting an increase in wear rate, or oxide formation may inhibit further oxidation and thus reduce the rate. (Throughout this letter, "wear" may be interpreted broadly to include any physical or chemical deteoriation of properties or dimensions). If the effect is catalytic, the time-to-failure distribution will exhibit greater dispersion than the distribution of initial dimensions; if inhibitory, the converse is true. In either case, the distributional form may change.
>
> It is possible for wear rate to be a function of initial dimensions of one property with the wear occurring with respect to another property. An example might involve wire nicks leading to localized heating which causes insulation deterioration; the nick size does not change, but the initial size of the nick determines the rate of insulation degradation. It can be shown that, under somewhat idealized conditions, normal distributions of nick size can lead to LogNormal insulation time-to-failure distribution.
>
> A first-order process may lead to an improvement in properties before deterioration and failure set in. Thus, bearing surfaces may become smoother in initial stages of use, and, as is well known, the insulation resistance of certain capacitor types under constant electrification increases dramatically over a long time span before deterioration commences.

Device deterioration processes can be accompanied by life distributions of virtually any form. The observation of a continually increasing hazard rate strongly suggests that such a process is present and, in that sense, may justify the term "wearout distribution", the converse does not deny, however, that the failure process may be one of deterioration or "wearout". Dr. Evans and I might agree that "wearout distribution" should be dropped from our covabulary—without prejudice to the term "wearout" as a descriptor of physical processes or of the interval in the life of a group of devices in which deterioration processes are the predominant cause of failure. We disagree as to the definition of a wearout process in hazard-rate terms.

Paul Gottfried

******

The differences between my thinking and your and Solberg's replies are largely based on the difference between individuals and the distribution. The last sentence of my first paragraph, "It is reasonable to define a wearout process as one in which the hazard rate is continually increasing," was poorly worded since it seems to refer to what is happening to an invidual of the population. The word process should be replaced by the word distribution. The sentence would then read: "It is reasonable to define a wearout distribution as one in which the hazard rate is continually increasing."

On a statistical basis, we are not concerned about what happens to the individuals in the population but only what is happening to the population as a whole. We ignore things like annealing and coaxing (in fatigue) wherein the individual parts actually get stronger as they are used. As soon as one goes into the details of what is happening to an individual, he can then distinguish that individual from others and he no longer has his original population but a quite different one. I do not agree with Solberg on the generality of his definition of an individual part's wearing out; he has gotten too general too fast, and it is not clear that it encompasses such things as pipes clogging due to corrosion products, fatigue, creep, and deterioration of aluminum stripes on semiconductors.

It is quite possible, and indeed likely, that in a Ponce de Leon distribution (hazard rate is decreasing—the longer an individual lives the less likely he is to die) the individuals are indeed wearing out; that is it is obvious from physical considerations that the remaining life in each individual is less than when it was put in use. Thus, it is extremely important to distinguish between wearout of individuals of a population and a wearout distribution. All of my remarks were intended to refer to the wearout distribution, and it is in that sense that it is mostly misused in the literature, i.e., referring to the distribution, not to individuals. The Ponce de Leon distribution is also misused in the literature: authors have claimed that it implies that individual parts are getting stronger.

Perhaps as long as we remember that my remarks apply to the distribution and not to individuals within that distribution, you, Solberg, and I would agree.

Ralph A. Evans

PUBLICATIONS

From the National Bureau of Standards, available through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402:

NBS Technical Note 520, "Methods of Measurement for Semiconductor Materials, Process Control, and Devices" (SD Catalog No. C13.46:520) March, 1970, 65 cents.

From the American Institute of Chemical Engineers, 345 East 47th Street, New York, New York 10017:

IECEC Proceedings (4th Intersociety Energy Conversion Engineering Conference -- 1969). $30 for members of sponsoring societies, including IEEE; others $40. Add $5.70 for first class postage, $.50 for book rate postage.

CALL FOR NOMINATIONS

G-R Bylaws state that "A slate of nominees for members-at-large vacancies of the AdCom shall be prepared by the Nominating Committee. Recommendations for such nominees shall be solicited by a letter to the Chairman of all Sub-Groups and Standing Committees. In addition, the Chairman of the Nominating Committee shall cause to be published and distributed to the entire group membership a call for nominations: A nominating petition carrying a a minimum of 25 names of Group Members, excluding students, shall automatically place that nominee on the slate to be presented to the AdCom."

Six positions are to be filled. Those whose 3-year term expires at the end of 1970 are:

E. F. Jahr *
V. R. Monshaw
A. M. Okun
L. J. Paddison *
H. E. Reese *
W. T. Sumerlin *

* Incumbent has served two consecutive terms and is not eligible for re-election until after a lapse of one year.

The membership is hereby invited to submit nominating petitions in accordance with the Bylaws.

SHORT COURSES

Newsletter policy with respect to short-course announcements, as established by the AdCom, is to provide publication for information only. No endorsement is implied, and no check on course content or instructor qualifications has been accomplished.

Polytechnic Institute of Brooklyn

Optimal and Computer Aided Design of Engineering Systems: August 17-21. One week $175. Contact: Office of Special Programs, Polytechnic Institute of Brooklyn, 335 Jay Street, Brooklyn, New York 11201

ECAP-Electronic Circuit Analysis by Computer: August 24-28. One week, $175.

UCLA

Economics of Reliability: August 24-28. One week, $310. Contact: Engineering and Physical Sciences Extension, University Extension, UCLA, P.O. Box 24902, Los Angeles, California 90024

Integrated Logistic Support: September 14-18. One week, $320.

CALL FOR PAPERS

A special issue of the Reliability Transactions is scheduled for the fall of 1971 on the subject of Computer Aided Design and Analysis for Reliability and Maintainability. The issue will contain both invited and submitted papers.

Prospective authors are invited to submit abstracts of 300 to 500 words on pertinent subjects. Papers pertaining to the actual application of computer techniques as well as theoretical models which can be applied by the designer and analyst will be welcome.

Please send abstract on or before September 11, 1970, to the guest editor:

Clint Purdue, 2442
Sandia Laboratories
Albuquerque, New Mexico 87115

UPDATED RELIABILITY TRAINING CONFERENCE

The Reliability Training Conference, a short course in Reliability co-sponsored by the IEEE Reliability Group and the ASQC Electronics Division, will be offered this fall in streamlined and completely revised form.

Initiated in 1959 as a basic course in Reliability, the Conference has been reoriented toward the more experienced practitioner. The course will be an intensive, problem-oriented, intermediate-level presentation. Emphasis will be placed on the acquisition, interpretation, and utilization of data with due regard to data limitations and inadequacies in the commercial/industrial areas.

The Reliability Training Conference will be held at the Nassau Inn in Princeton, New Jersey, October 12-14. The Course Director and principal lecturer will be Dr. Martin L. Shooman, Associate Professor of Electrical Engineering at the Polytechnic Institute of Brooklyn and author of the text "Probabilistic Reliability: An Engineering Approach". An evening lecture on the Bayesian approach will be presented by Dr. Ralph A. Evans of Research Triangle Institute, Editor of the Transactions.

The conference fee will be $225. Course announcements and applications will be mailed automatically to all members in the eastern U.S.; others may request information from Alan O. Plait, Computer Sciences Corporation, 6565 Arlington Boulevard, Falls Church, Virginia 22046