Thermal stress in bonded joints. W. T. CHEN and C. W. NELSON. *IBM J. Res. Dev.* **23,** (2) 179 (March 1979). This paper considers the stress distributions in bonded materials induced by differential expansion or contraction of these materials. The analytical approach is similar to the lap joint theories attributed to Volkersen and expanded by Goland and Reissner. Several simple and typical analytical models are presented to bring out the relative importance of different geometrical and material parameters and to give some insight into different modes in which the bonds might fail.

Causes of wavesoldering defects. CASIMIR D. BERNARD. *Electron. Prod.* p. 35 (June 1979). This article is concerned with what meets the eye as the wavesoldered printed circuit board emerges from the wavesoldering machine. Successful wavesoldering of a printed circuit board depends upon the pcb being:

- Well designed for wavesoldering.
- Well prepared for wavesoldering.
- Processed under optimum conditions.
- Wavesoldered on the most appropriate wavesolder machine.

Common defects of wavesoldered pcb's are:

- No solder joint or only a partial one.
- Solder bridging two or more conductors or pins.
- Solder may protrude from the board as a sharp icicle-like spike.
- The board may be covered with a webbing of solder.

3. CIRCUIT AND SYSTEMS RELIABILITY, MAINTENANCE AND REDUNDANCY

A design review approach toward dynamic RAM reliability. J. A. ROBERTS. *Microelectron. Reliab.* **19,** 97 (1979). For many equipment manufacturers the selection, test and use of Dynamic Random Access Memories (RAM) has become the prime component problem. Many semiconductor companies have been attracted by the vast market size and this has resulted in a large number of design attempts. Cost, market and performance pressures have forced semiconductor manufacturers into producing designs which have not been fully developed. This paper describes design review techniques that have been used to identify design weaknesses.

Beurteilung der Funktionssicherheit von Nachrichtennetzen mit mehreren Hierarchieebenen (Estimation of the reliability of hierarchical communication networks). GERD MROZYNSKI. *Frequenz* **33,** (3) 62 (1979). (In German.) A comparison of communication networks with regard to their vulnerability through disturbances caused by failure of system components and cable flaws requires a criterion independent of the special structure of the network. This criterion should take into account the traffic load and the traffic distribution of connected sources and sinks. A measure of system failure is introduced and the results are presented by evaluating special examples. As a final conclusion it can be said that under given conditions a bidirectional double ring network is least vulnerable to cable flaws which are responsible for the majority of network disturbances.

An improved algorithm for reliability optimization. KRISHNA GOPAL, K. K. AGGARWAL and J. S. GUPTA. *IEEE Trans. Reliab.* **R-27,** (5) 325 (December 1978). This paper proposes a modification of the Aggarwal *et al.* algorithm for reliability optimization by introducing a new heuristic criterion for selecting the subsystem where redundancy is to be added. This criterion accounts for the relative decrement in unreliability versus the largest of the relative increments in resources. The method applies to multiple separable constraint problems (which need not be linear) and to systems which may be complex or series. The method is simple, fast, and easily programmed. The results are compared with those of the Aggarwal *et al.* algorithm and are better in many problems.

Die Erkennung latenter Defekte in elektronischen Schaltungen durch eine Phasenrauschmessung (The recognition of latent defects in electronic circuits by measuring phase noise). HORST RODER. *Frequenz* **33,** (4) 101 (1979). (In German.) In most cases the test methods, which are predominantly used in quality control of electronic circuits at present, do not allow to recognize those hidden defects which lead to failure only during operation. In this paper, both a method for the measurement of phase noise and the corresponding equipment are described which enables us to detect circuits containing such defects. Experimental results and error analyses on thick-film electronic circuits as well as high-voltage stress investigations on CMOS circuits show the power of this new experimental technique.

The logistics of life cycle cost. JOHN R. PERONNET. *Microelectron. Reliab.* **19,** 23 (1979). Program Support has always been a multifaceted discipline and therefore has exhibited a sensitivity to both the range and depth of available program planning data upon which to project downstream logistic consequences.

This paper addresses the key aspects of Life Cycle Cost (LCC) methodology synthesis and highlights the ease of program application and integration on such programs as the Canadian New Fighter Aircraft (NFA) concept. Also discussed in the paper is the interrelationship between hardware design, ILS resource requirements and program cost impacts of prime support postures as well as alternate support plan concepts.

The illustrations used are drawn from actual Aircraft Program and Ground Based Electronic System applications and, in summary, the paper highlights the effectiveness of this new technology and points out its front end applicability to new programs.

Interactions of industrial integration and standardization. CHARLES A. MILLS. *Qual. Prog.* p. 22 (February 1979). True product integrity results from an integrated program, involving each segment of an organization.

Developing the sampling plans. ALBERT H. BOWKER. *Qual. Prog.* p. 20 (February 1979). The 1977 Shewhart medalist talks about pioneering efforts in applying mathematical statistics to solve sampling inspection problems.

Interactive graphics in new product quality assurance programs. JOHN A. CLEMENTS. *Qual. Prog.* p. 14 (February 1979). A special department at Gillette uses an effective method to manage and report vast quantities of quality control information.

A reliability growth model. G. L. SRIWASTAV. *IEEE Trans. Reliab.* **R-27,** (5) 306 (December 1978). A system can be in one of two states: perfect (s_0) or imperfect (s_1). At any trial, the system can succeed or fail if it is in s_1, but will never fail if in s_0. After every failure, some corrective action is taken which, with a chance α, will lead to a transition to s_0. Even if the corrective action does not succeed, i.e. the system is still in s_1, the probability of failure reduces by a constant multiple at the next trial. Expressions for the probability that the system will be in s_1 at trial n and the unconditional probability that the system fails in trial n, are