# RAC QUARTERLY

RELIABILITY ANALYSIS CENTER — A DoD INFORMATION ANALYSIS CENTER





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## FEATURES



## DEPARTMENTS






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# The RAC Quarterly

Editor: Anthony Coppola

**This will be the last issue of the RAC Quarterly.**

The **RAC Newsletter** has been expanded in size, permitting us to include in it the in depth technical articles that we have been publishing in the **RAC Quarterly.** This makes the Quarterly somewhat superfluous. Therefore, starting with the next issue, the **RAC Newsletter** and the **RAC Quarterly** will be combined into a single new publication, the **RAC Journal.** Its mission will be to provide practical information to Reliability, Maintainability and Quality professionals.

The **RAC Journal** will be published quarterly and sent to all subscribers of the present publications, at no charge. Those holding paid subscriptions to the **RAC Quarterly** will receive refunds based on the number of issues already received.

We think you will like the **RAC Journal.** As always, we welcome your comments.

## Reliability Analysis Center

**The RAC's mission is to serve as a government and industry focal point for knowledge relating to the reliability, maintainability, and quality of manufactured components and systems. RAC personnel collect, analyze, and disseminate data concerning the reliability of systems and the microcircuit, discrete semiconductor, electromechanical, and mechanical components that comprise these systems. RAC also evaluates and disseminates information on applicable engineering methods. Information is distributed via data compilations, methodology handbooks, special publications, public and in-house training courses, and consulting services.**

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# Rome Laboratory Establishes Software Quality Technology Transfer Consortium

By: Andrew J. Chruscicki, Rome Laboratory

The Rome Laboratory Software Quality Technology Transfer Consortium is the cornerstone of the current Software Quality Program at Rome Laboratory. It is also the largest known in the U.S. and Europe to apply and evaluate software quality models and metrics. It is an aggressive and comprehensive technology-based program since it involves elements of basic science and technology, coupled with direct user involvement and addresses future acquisition and support of proven technology. The Consortium is a collaborative effort between Rome Laboratory and the following organizations: Grumman, SoHaR, TRW, CTA, Frontier Engineering, National Test Bed JPO and Hughes. The goal of the Consortium is to apply, evaluate, refine and develop cost and quality benchmarks for software quality models and metrics developed at Rome. Some of the currently participating programs include Joint STARS, CCPDS-R, F-16, T-45, SDI Level 2 Simulator, and Canadian Air Traffic Control System.

The Consortium was designed and established by Rome Laboratory after many unsuccessful attempts over the past 10 years to transition software quality technology. In the past, organizations were looking for a validated model to apply while Rome Laboratory was looking for projects to validate the technology. This "Catch-22" situation is eliminated by the cooperative effort, considered a monumental step for both the software quality program at Rome and the DoD. The project will provide for the validation of software quality models to transition to DoD/AF Product Divisions.

The key to the success of the Consortium was an incentivization scheme for getting corporate involvement and financial commitment. The Consortium operates on a quid-pro-quo basis, managed through a Cooperative Research and Development Agreement (CRDA) with each company. Rome provides each company with the QUality Evaluation System (QUES), an instantiation of the Rome Laboratory Software Quality Framework (RLSQF). The RLSQF is a model for measuring and predicting software quality. Rome also provides the services required to apply the tool/technology in every step of the process including tool installation, experiment design and data analysis. Participating companies are required to provide their own resources to apply the tool and provide the data collected to Rome Laboratory. Rome will then analyze the data and make it available to all members. For the investment in one program, participating organizations get the data and results from seven other programs (CTA is collecting data on two programs). Participating organizations will be able to gauge their abilities to produce quality software, and create a competitive advantage.

A vital element in the effectiveness of the Consortium and its ability to achieve transfer was the Consortium Support Team concept. The Consortium Support Team provides Consortium members with expert assistance in the application of the RLSQF and QUES, experiment design and data interpretation. The architect of the Consortium, Andrew J. Chruscicki, calls this the concept of knowledge transfer. Chruscicki concluded that technology would be most easily transferred if there were knowledgeable experts available to assist members in the successful application of the technology. Providing maintenance support of QUES was also necessary. A team of leading international experts to assist Consortium members in the application of the technology was therefore assembled.

Data from these experiments will lead to the largest software quality data base in the DoD for research and development of software quality models and metrics. This data base will provide the foundation for the validation of the relationship between model predictions and the actual level of quality achieved by these systems once deployed. Results to date have shown that the RLSQF reduces the development costs by 35% and maintenance costs, after one year, by 52% with concomitant increases in software quality. These results were obtained from data on Japanese use of the Rome model. The results of the Consortium experiments will make it possible for our Product Divisions to use these models with confidence to reduce the cost of software and increase its quality at the same time.

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# Navy Initiatives in Manufacturing and Repair

By: Robert Cormack, Naval Air Warfare Center

In support of the Naval Air Systems Command, the Naval Air Warfare Center, Aircraft Division, Lakehurst, NJ has been developing MIL-STD-2000, "Standard Requirements for Soldered Electrical and Electronic Assemblies." This document specifies general design and manufacturing requirements for soldering. The document was revised in 1991 to reduce "how-to" requirements and focus more heavily on end-item assembly requirements as a means to foster implementation of new technology and process improvement, and to give the contractor more flexibility in defining his manufacturing process. Some activities, however, felt that there were misunderstandings related to the implementation of the new requirements.

The primary concerns expressed by the military procurement personnel involved misunderstandings related to "process variances." "Process variances" are undesirable hardware characteristics which often arise as a result of process fluctuations and may indicate a process is drifting out of control. In certain operational environments, these undesirable characteristics may create a low risk of hardware failure. The significance of these characteristics depends on the hardware design, the operational environment, and the assembly process. In older electronic assembly documents these undesirable characteristics were treated as defects to minimize risk in all assemblies. Under MIL-STD-2000A, rather than require that these undesirable characteristics be eliminated from all assemblies, we elected to have manufacturers perform both a design analysis to determine if the process variance would cause hardware failure (and if so, treat it as a defect) and eliminate or minimize the occurrence of these undesirable characteristics through process improvements.

Several military procuring activities indicated that they were experiencing inconsistent contractor performance in implementing the "process variance" concept. To achieve more consistent implementation of the MIL-STD-2000A "process variance" concept, we started the development of an update to MIL-STD-2000A. Originally coordinated as a draft MIL-STD-2000B, we developed tighter controls for the handling of "process variances." Comments were received and many contractors expressed concern that the flexibility of MIL-STD-2000A would be lost through the proposed changes to the "process variance" approach.

To alleviate these concerns, the Naval Air Systems Command, our sponsor for this effort, chose to lead a new approach to developing a draft. Rather than focus on a particular update or form of MIL-STD-2000, NAVAIR brought together the contractors doing the largest amount of electronic manufacturing for NAVAIR with the lead military technical representatives. During this meeting we discussed the various needs of the government and industry users of MIL-STD-2000. Through this process both government and industry representatives gained a better understanding of each other's needs. Some of these needs conflicted and a group consensus was reached on trade-offs (without giving preference to either military or industry). Through this consensus, the outline of a new version of MIL-STD-2000A was created. From this outline, a new draft notice of MIL-STD-2000 was developed. It has been reviewed by the group and comments developed. These comments will be resolved and a new draft formulated. Once the NAVAIR team finishes development of this draft, it will be fully coordinated throughout the military and industry to verify it meets the needs of as many users as possible. We anticipate that the full coordination will occur in August 1993.

To support the implementation of MIL-STD-2000 and other soldering documents, we are continuing to develop our military handbook MIL-HDBK-2000, "Soldering of Electrical and Electronic Assemblies." This handbook is being updated to include continuing advancements in electronic manufacturing technology and provide guidance on the implementation of MIL-STD-2000A. Coordination of this next draft is expected in May 1993.

We are using four different approaches to assist in the elimination of ozone depleting substances like chlorofluorocarbon (CFC) based solvents from military manufacturing. NAVAIR is currently reviewing and approving contractor initiated Engineering Change Proposals and other contract modifications (requests for deviation, etc.) which delete CFC solvent requirements and impose cleaning and cleanliness test requirements equivalent to MIL-STD-2000A. We are also developing a standard contract modification. This standard modification would establish baseline requirements as a drop-in replacement for the solvent and cleaning requirements in older specifications and standards. It would enable contractors to eliminate CFC requirements without creating production risks. In addition, comprehensive guidance on cleaning processes, which may be published as a supplement to MIL-HDBK-2000, is being developed. This guidance would clearly lay-out the alternatives to CFC cleaning, addressing the advantages and disadvantages of the alternatives. We are writing this to help both experienced and inexperienced

manufacturers rapidly select and implement alternatives to CFCs. Lastly, we have initiated a government and industry test program to study the effects of contamination on electronic circuits. This effort is being conducted by a small group which has gone back to basic electronic design principles. We have identified standard electrical characteristics like current leakage, cross-talk, square wave rise time, dielectric strength and resonance as being relevant design parameters. We are working to develop tests and data which would identify to what degree fluxes and other contaminants cause changes in these characteristics.

As another means to reduce CFC cleaning, Mr. Peter O'Day of the Army Electronics Research and Development Command is publishing an update to MIL-F-14256, the procurement document for fluxes used on electronics. In this update, water soluble fluxes and low residue fluxes will be added to the standard rosin fluxes.

Today, a limited amount of electronics is repaired by contractor organizations. When electronics is repaired by organic military activities, we feel that our standard technical repair manuals provide adequate controls. As DoD operations are reduced, however, we anticipate that more electronic repair will be performed at contractors and common depots across the three services. To establish greater commonality in the methods and requirements for repair, we are developing minimum requirements for repairs. We are developing both minimum performance requirements and guidance procedures for the repaired assembly. The requirements will be very general since the items to be repaired will vary greatly in original design and operation. The guidance procedures will define preferred methods for accomplishing the repair. We are planning to initially publish the requirements and guidance as a technical report. We will then attempt to implement the document at a couple of Navy repair depots later this year. After evaluating the trial implementation, we will determine whether we should begin developing a military standard or military handbook, updating our technical manuals, or simply updating our technical report.

Additional information on these projects may be obtained by contacting Mr. Robert Cormack of the Naval Air Warfare Center Aircraft Division, Lakehurst, NJ at (908) 323-7475.

# Electrostatic Discharge: C3I Risk Evaluation and Protection

By: Thomas M. Bilodeau, Rome Laboratory/ERPT, Griffiss AFB, New York

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## Abstract

Electrostatic Discharge (ESD) is a reliability risk for solid-state components used in $C^3I$ applications. In this paper, the basic characteristics of ESD phenomena are reviewed and conventional ESD reliability analysis methods are discussed. In addition, laboratory data on the ESD sensitivity of GaAs MMICs are presented to illustrate the role of ESD evaluation in $C^3I$ system design.

## Introduction

Electrostatic discharge (ESD) represents a serious threat to the reliability of solid-state microcircuits used in military radar/communications and other $C^3I$ applications.[1] This is especially true for new devices recently developed for modern surveillance systems, such as GaAs monolithic microwave integrated circuits (MMICs), since previous research has indicated that GaAs may be ten times more susceptible to ESD damage than Si structures of similar dimensions.[2] Therefore, it is essential for designers and users of $C^3I$ equipment to be aware of the ESD threat and the means of evaluation and counteraction.

## Background

An electrostatic discharge is a transient electrical discharge occurring between two objects that are charged to different electrostatic potentials. Common examples include the spark that may "jump" from your fingertip when reaching for a metal door knob or a cloud-to-ground lightning stroke.

Triboelectricity, that is friction between two different materials which results in a net transfer of electrons to the object with the higher electron affinity, causes the charge accumulation leading to ESD. The charge and energy transfer associated with an ESD event can damage or destroy solid-state components. For example, a person with a typical body capacitance of 200 pf can be charged up to 25 kv while walking across a synthetic carpet. If such a person touches an integrated circuit (IC), about 30 mJ of energy will

be transferred (and ultimately dissipated) to the chip. This is sufficient to damage or destroy many types of semiconductor components.[3] In addition to human contact, ICs can also be exposed to ESD during automated manufacture and shipping.[4]

There are two primary mechanisms for the failure of a solid-state device due to ESD stress: Oxide breakdown and Joulean Heating.[3]

The latter is the most prevalent cause of failure, as breakdown generally occurs only in metal-oxide semiconductor (MOS) devices.[3] Typical ESD sensitivity levels range from several hundred volts (GaAs, CMOS) to several thousand volts (TTL, EEPROM). In addition to sudden catastrophic failure, ESD can also cause "soft" failures that appear as gradual degradations in performance, such as reduced switching speed or false bit generation.

To guard ICs from ESD, external and internal (i.e., on-chip fabrication) protection schemes are used. The former include transient overvoltage suppressors (e.g. varistors and spark gaps), shielded printed circuit boards and conductive plastic packaging. The latter generally consists of on-chip diode clamps with a low value resistor (~100 ohms) to limit the ESD in-rush current to a safe value as illustrated in Figure 1.

Unfortunately, many IC manufacturers are reluctant to incorporate ESD protection into their designs because of increased die size, lower packaging density and reduced frequency response. This is especially true for high speed digital logic chips and radar/communications devices.[3]

The sensitivity of solid-state components to ESD damage can be quantitatively evaluated via several test methods that simulate an ESD event. The two most popular techniques are the human body model (HBM) and charged device model (CDM).

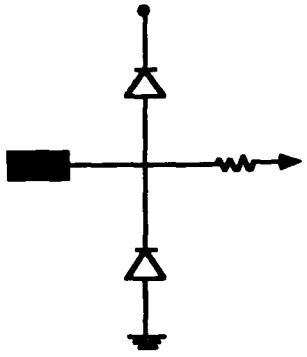

**Figure 1: Basic On-Chip Diode Clamp**

The HBM model, shown in Figure 2, simulates the ESD stress delivered from a human body and is defined under MIL-STD-883C, Method 3015.6, Notice 8. The 150 pf capacitor and 1500 ohm resistor in Figure 2 represent the average body capacitance and resistance, respectively. The HBM test is carried out by applying ESD pulses ranging from 200 to 15,000 V to various pins of the test object. HBM discharge current pulse waveforms have peaks of 1 to 10 A, risetimes of 5-20 ns and 150 ns decay times.[3] Failure is defined as any change in device operating parameter exceeding 10%.

The CDM model simulates the ESD stress that may occur during automated handling when an IC acquires a charge from friction with an insulator surface and then discharges due to contact with a grounded metal fixture.[4] Although no standard CDM test format has been established to date, several private manufacturers use their own methods. A typical CDM test set-up is shown in Figure 3.

Operation is as follows: The IC is capacitively charged via a nonconductive probe, then all of its pins are connected to a grounded metal probe.[4] The CDM discharge current waveforms have very fast risetimes (<1 ns) and narrow pulse widths (several ns).

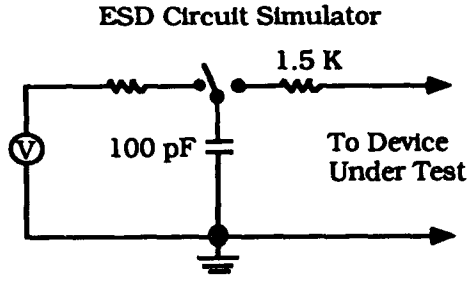


**Figure 2: Block Diagram of the HBM Test Set-Up**

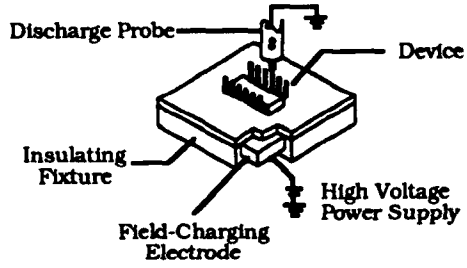


**Figure 3: Block Diagram of a Typical CDM Test Set-Up[4]**

## ESD Sensitivity of GaAs MMIC Amplifiers

The ESD sensitivity of several GaAs MMIC Low Noise Amplifiers (LNAs) designed for aerospace radar receivers was evaluated at Rome Laboratory according to the HBM model. The experimental method and results are discussed below.

The LNAs were housed in a nine pin ceramic dual-in-line package with two 50 ohms impedance rf signal input/output (I/O) ports.[5] The nine pins were used for dc bias and rf gain control. A dc leakage curve typical of the dc bias/rf gain pins before HBM ESD stresses were applied is shown in Figure 4. A sample group of seven LNAs was tested.

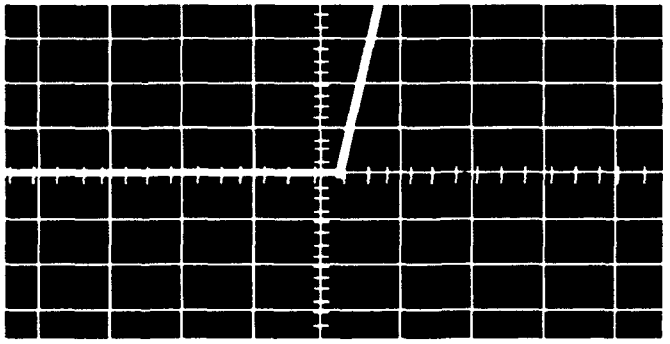

**Figure 4: Typical DC Leakage for LNA 5 Volts/Division Horizontal, 1 mA/Division Vertical**

The equipment included an IMCS model 2500 HBM ESD test tool and a Tektronix model 570 curve tracer.[5] The test procedure and failure criteria were carried out per MIL-STD-883C, Method 3015.6.

The HBM ESD failure threshold voltages measured for the LNAs are listed in Table 1. The thresholds are in the -200 to -800V range, except for pin 9 which usually survived until -3,000V. The higher resiliency of this pin is attributed to a 1,000 ohms internal bias resistor, which limited the applied ESD in-rush current.[5]

**Table 1: HBM ESD Failure Thresholds (Volts) for the LNAs**

| Pin # | Test Sample # | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | -600 | -400 | -200 | -200 | -200 | -200 | -200 |
| 2 | -400 | -200 | -200 | -200 | -200 | -200 | -400 |
| 3 | -600 | -400 | -400 | -400 | -400 | -400 | -400 |
| 4 | pre | -400 | -400 | -400 | -400 | -400 | -600 |
| 5 | not stressed (substrate connection) | | | | | | |
| 6 | -400 | -200 | -200 | -220 | -200 | -400 | -400 |
| 7 | -400 | -200 | -200 | -200 | -200 | -200 | -200 |
| 8 | pre | pre | -800 | -800 | -800 | pre | pre |
| 9 | -2500 | -3000 | -2000 | -2500 | -2000 | -3000 | -100 |

"pre" means the pin failed before it was stressed, presumably due to previous failure of another pin

A typical dc leakage curve for one of the LNA dc bias/rf gain pins after failure is shown in Figure 5. The leakage changed from a diode-like profile (per Figure 4) to a linear resistance (per Figure 5). The value of the resistance following failure was in the 0.5 to 3 kilohms range.[5]

A qualitative analysis of the physical causes of failure was performed by examining several delidded LNAs with a microscope as shown in Figure 6.

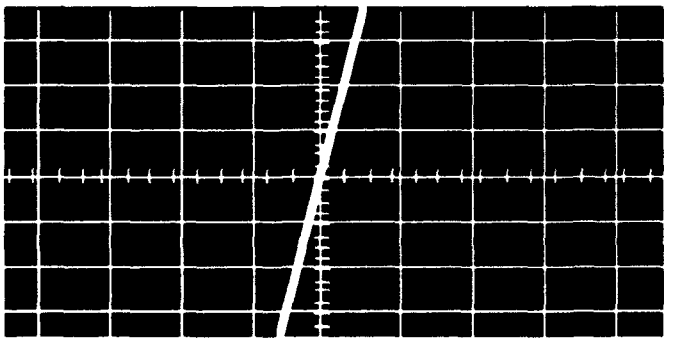

**Figure 5: Typical DC Leakage Curve for an LNA After Failure. 5 Volts/Division (Horizontal), 1 mA/Division (Vertical)**

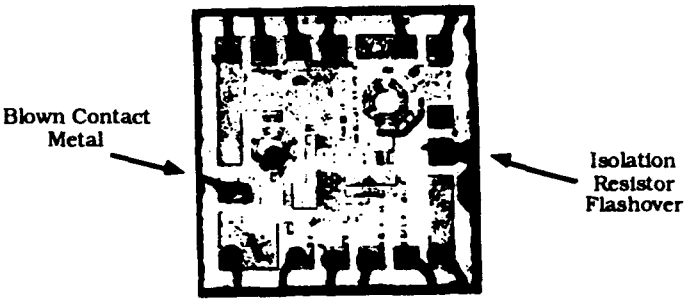


**Figure 6: Microscope Views of a Typical LNA After ESD Failure (1300 X Magnification)**

The ESD induced damage was primarily a flashover of isolation resistors that were connected between the gates of internal FETs and their bonding pads.[5] Additionally, the photographs revealed several on-chip inductors had been fused open.[5]

## Conclusion

The relatively low ESD failure thresholds measured for the LNAs indicates that ESD could be a serious threat to the reliability of future $C^3I$ radar missions that will utilize GaAs MMICs. However, it should be noted that these prototype LNAs did not contain any on-chip overvoltage suppression circuitry; future devices are expected to incorporate some means of protection.[5]

## References


(1) DoD-STD-1686, Electrostatic Discharge Control Program.

(2) F. W. Chase, EOS-10, pp. 65-70, 1988.

(3) Electrostatic Discharge Protection Test Handbook, 2nd ed., Tech Staff, KeyTek Instrument Corp., Wilmington, MA, 1986.

(4) R. G. Renninger, M. C. Jon, D. L. Lin, T. Diep and T. Welsher, EOS-11, pp. 59-71, 1989.

(5) T. M. Bilodeau and C. R. Thomas, EOS-12, pp. 131-136, 1990.

# Why an Industrial Bill of Rights?

By: Special Studies Office, University of Dayton

## Introduction

The year 1991 marked the 200th anniversary of the adoption of the Bill of Rights. While we should rejoice in the protection of our rights, we must not overlook the fact that some of the protections of the Bill of Rights have been eroded over the years, particularly the rights of employers and business owners. The celebration of the anniversary of the Bill of Rights provides an opportunity to reclaim those eroded rights.

The American view of the source of "rights" was expressed clearly in the Declaration of Independence. The signers declared that rights are not granted by governments. Instead, people are "endowed by their Creator" with rights. Having rights comes with being human, rather than from the beneficence of governors. The drafters of that document went on to say that governments are formed to protect these already existing rights of individuals, not to grant rights to individuals. By forming a government, people do not lose their rights. Instead, the very purpose of government is to protect the rights people already have.

**Editors Note: Publication of this article does not imply endorsement by the Department of Defense or RAC. Comments to RAC in letters to the Editor will be welcome; those of general interest may be printed in future RAC publications. Those wishing to express an opinion to the authors of the Industrial Bill of Rights should correspond with them directly.**

The drafters of the Constitution shared this view of rights. They did not attempt to protect the people's rights by granting them in the Constitution. Instead, they intended to protect the people's rights by limiting the powers of government to only those granted by the people, and no others. That is, rather than granting the people specific rights, the Constitution denied the government the power to violate those rights.

As part of the politics of ratifying the Constitution, a Bill of Rights was included. The Bill of Rights was intended, not as a ceiling over people's rights, but as a floor under them. It was never intended to enumerate all the rights of the people. The main body of the Constitution listed those specific powers being granted to the Federal government; the Bill of Rights spelled out some specific limitations on the powers of the Federal government. Especially noteworthy are the Ninth and Tenth Amendments. The Ninth states that the people retain other rights not specifically listed. The Tenth states that any powers not specifically granted to the Federal government are retained by the states or by the people. Concretely, these Articles mean that simply because something isn't mentioned in the Bill of Rights doesn't mean it isn't a right. On the contrary, if the Federal government wishes to do something, it is obliged to show specifically where the Constitution grants it that power.

A major concern of the drafters of the Constitution was what they called "factions." By this they meant the possibility that a majority or a well-organized minority might use the power of government for private purposes to the detriment of their fellow citizens. They had many examples in the behavior of the individual States under the Articles of Confederation repudiating State debts and diluting bond values by issuing unbacked paper currency. Part of the intent of the Founders in writing the Constitution was to prevent this from happening; to prevent majorities or organized minorities from capturing the power of government and using it to gain an advantage over their fellow citizens. The first ten amendments contain language such as "Congress shall make no law..." and "The right of the people to ... shall not be abridged." The drafters of these articles considered certain rights to be so fundamental that they could not justly be abridged, even if a hostile majority concluded it would be "cost-effective" to suppress the rights of a minority.

Just as we do not lose our fundamental rights by establishing a government, we do not lose our fundamental rights by becoming managers, entrepreneurs, business owners, stockholders, employers, or members of the work force. Employers still retain all their rights even though it might benefit their employees if some of those rights were abridged. Likewise the rights of employees may not be abridged even though doing so might benefit their employers.

Those who wish to abridge the rights of business owners and managers sometimes attempt to obscure the issue by contrasting "faceless corporations" with the alleged victims of those corporations. This is a specious argument. Business firms are composed of people. It is these people who have rights, not the firms as such. We must be as diligent in protecting the rights of the people in businesses as we are the rights of anyone else.

James Madison warned that the Constitution was only a "parchment barrier" against those who would

infringe on the rights of others. He argued that this "parchment barrier" was insufficient. He argued that, in addition, the habits and the institutions of the people must support and sustain the rights possessed by individuals. We have seen the truth of this statement as right after right has been eroded or even denied, with little or no outcry from anyone other than those directly affected.

Over the years, organized groups of one kind or another have misused the power of government to pass laws and issue regulations which erode rights protected, either explicitly or implicitly, by the Bill of Rights. These erosions have been justified on a "cost-effectiveness" basis. They are usually supported with the argument that the erosion is minor, while the benefit to someone else is great.

Ultimately, these laws and regulations penalize people for producing wealth and reward people who have the political strength to seize a share of the wealth others have produced. The inevitable result of these laws is to reduce the efficiency, productivity, and international competitiveness of our economy.

To compete in the world market, American managers, owners, employers, entrepreneurs, and workers must reclaim those rights which have been restricted, abridged, or narrowed in scope. This must be undertaken, not as a petition for new rights to be granted by government, but as a reclaiming of inherent rights usurped by "factions" which have wrongly used the powers of government. This Industrial Bill of Rights is intended as an aid to restoring the habits and institutions needed to defend the rights of owners and employers.

## The Industrialist Papers

When the adoption of the U.S. Constitution was being debated, its supporters published a series of essays, under the pseudonym "Publius," which have since become known as The Federalist Papers. These essays were intended to provide a rationale for the provisions of the constitution. In the spirit of Publius, therefore, we here present The Industrialist Papers, which provide a rationale for our proposed Industrial Bill of Rights.

## Proposed Statement of Right. Article 1.

Government shall make no law restricting the right of a willing buyer and a willing seller, or willing employer and willing employee, to enter into any contract the object of which is not itself illegal.

**The Right to Exchange Property.** An intrinsic element of the right to own property is the right to dispose of that property, by exchange or gift. A voluntary exchange of property between two parties leaves both better off, in their own judgment. If it didn't, they wouldn't have agreed to the exchange. For a third party to claim that one of them is worse off after the exchange is to substitute the third party's judgment for that of the persons making the exchange.

Nevertheless, there are many laws and regulations which interfere with or prohibit exchanges which would be acceptable to both parties. These laws are based on the idea that the exchange actually harms one of the parties, or that it harms someone else not a party to the transaction.

Laws which require licenses or other forms of government approval before someone can offer to provide a good or service are usually justified as benefiting consumers, who are presumed to be incapable of judging the quality of what they buy. These laws have the effect, whether intended or not, of reducing competition among suppliers, and raising the price of the good or service. Both the buyers and the would-be suppliers who are "frozen out" are harmed by these laws.

All laws which interfere with an otherwise legal transaction between willing buyer and willing seller result in higher costs and reduced efficiency in the economy. However, this is not their worst shortcoming. Ultimately they violate the property rights of people who wish to engage in a voluntary exchange. Their rights are disregarded for the benefit of third parties who do not wish that particular exchange to take place.

The proposed statement of right is not intended to preclude government action to assure that buyers are informed regarding safety and long-term effects.

## Proposed Statement of Right. Article 2.

Government shall make no law which restricts an individual's use or enjoyment of his property, nor make any law or regulation which diminishes the value of that property, without compensating the owner at fair market value.

**No Takings Without Just Compensation.** The outright taking of property, whether real or personal, is prohibited by the Fifth Amendment in the Bill of Rights. Unfortunately, governments at all levels have found ways around the Fifth Amendment. This is done by regulation of one kind or another, always for some alleged good purpose.

One current example of "taking" is Federal policy regarding property deemed to be "wetlands." The Federal government, purely through regulation rather than through a law passed by Congress, has established such a broad definition of "wetland" that some 70 million acres of active farmland are included. Over 75% of the state of Alaska is officially "wetland." Under existing rules, any alteration whatsoever of existing "wetlands" requires a permit from the Corps of Engineers, and must be offset by creation of an equal acreage of "wetlands." Even moving dirt from one portion of a "wetland" to another portion of the same "wetland" is prohibited without a permit. The effect of "wetlands" regulation

is to prevent landowners from raising the economic value of their land by improving it. The regulations effectively "take" the potential increase in value.

Another current example of a "taking" is limitations on billboards located on private property adjacent to highways. In the name of eliminating "visual pollution," the potential income from billboards is "taken."

Yet another current example is rent control. The harmful effects of rent control are well documented: new construction is discouraged, landlords skimp on maintenance, and buildings are abandoned when rent no longer covers insurance and taxes. However, the real issue about rent control is that it is a "taking," in the sense of the Fifth Amendment, and it is done without just compensation.

The extent to which the Fifth Amendment has been abolished in practice can be seen from some recent words of Senator Joseph Biden: "If [action against takings] were to take place, it would be a multi-million-dollar expense for the tax-payers, if they wanted to continue to regulate the way we now regulate." Senator Biden was saying, in effect, that if the Fifth Amendment were to be obeyed, the government could not afford to continue to take citizens' property without payment. The original purpose of the "takings" clause of the Fifth Amendment was to limit the size of the government—to keep it to a size the taxpayers were willing to pay for. Abolition of the Fifth Amendment has allowed the government to expand without regard to the rights of the citizens.

These disguised violations of the Fifth Amendment are, for the most part, well intended. Wetlands protection was originally established to reduce pollution of waterways. Billboard limitations are intended to beautify highways. Rent control is described as keeping housing affordable for the poor. Nevertheless, they still represent "takings," especially if the rules are changed after someone buys a piece of land. If some good cause is to be served by such a "taking," the owner should be compensated, just as the owner is compensated when land is taken for a highway or some other public purpose.

## Proposed Statement of Right. Article 3.

Government shall make no law imposing liability on a seller or manufacturer for occurrences caused, in whole or in part, by actions over which said seller or manufacturer had no control.

**Individuals' Responsibility for their Actions.** A fundamental principle underlying the concept of a free society is that people are responsible for the consequences of their own actions. If people cannot be held responsible for their own actions, then clearly they cannot be entrusted with self-government. A legal system which in effect denies that people are responsible for their actions reduces them to the status of children, who must be governed by others.

One of the features of modern American society is an implicit denial that people are responsible for the consequences of their actions. This is reflected in both a "tort explosion" and in laws imposing liability on manufacturers and sellers for harm done by their products. The result has been such extreme rulings as the one holding a telephone company responsible for an injury suffered by a caller when a drunken driver crashed into the telephone booth. Another example is a ruling holding a tobacco company liable for the lung cancer of a heavy smoker.

Underlying this implicit denial of individual responsibility is a search for "deep pockets." If someone suffers, a search is made for someone else who is sufficiently wealthy to alleviate the suffering, and who has some plausible connection with the cause of the suffering. Wealth is dissipated in litigation instead of being used either for investment or consumption by those who produced the wealth.

Business owners also seek ways to reduce their potential liability. They may delay the introduction of new technology or products. They may fail to investigate the safety of their existing products, since finding a flaw is an open invitation to a lawsuit by some user.

The end result of denying that people are responsible for their own actions, and claiming instead that someone else is responsible for anything that goes wrong, is to make us all poorer. However, this is not the only result. The most serious result is the denial that we are fit to govern ourselves.

## Proposed Statement of Right. Article 4.

Government shall make no law which restricts the right of a manager, business owner, or employee to transmit to the public, to owners, to other employees, or to other companies including competitors, any truthful or factual information which is legitimately theirs to transmit.

**Freedom of Speech and the Press.** Among the fundamental rights of Americans are those of free speech and free press. The drafters of the Bill of Rights thought these rights to be so important that they were explicitly included in the first Article of the Bill of Rights. Freedom of speech and freedom of the press are held to be so important that governments may not restrict even the publication of pornography, unless they can show it has absolutely no redeeming social value. Likewise, people are free to advocate overthrow of the government, either in speech or in writing, and may not be stopped unless they engage in some overt revolutionary act. Even burning an American flag is deemed "speech" rather than "revolutionary action." However, this same

degree of freedom has been denied to owners and managers of business firms.

Under the antitrust laws, business competitors are prohibited from discussing prices and terms of sale. This restriction is justified on the grounds that collusion among competitors leads to higher prices, and is therefore undesirable. However, this is a "cost-effectiveness" argument for restricting freedom of speech. A similar argument with regard to pornographers and revolutionaries would never be accepted by civil libertarians. There is even less justification for accepting it with regard to business owners and managers.

Under existing labor relations laws, employers are prohibited from making promises to their employees about actions they will take concerning a union certification election. This restriction on employers' freedom of speech is justified on the grounds that they have the power to make good on their offers, which puts the union at a disadvantage. This is simply another "cost effectiveness" argument and does not justify denying freedom of speech to an employer.

The most common form of publication that business firms engage in is advertising. There are numerous restrictions placed on advertising by business firms. One example is the recent ruling by the FTC which prohibited several food producers from advertising that their products contained no cholesterol, even though the claim was true. The FTC's argument was that people might be misled into thinking that the products weren't fattening. Such restrictions would be unconstitutional if imposed on the editorial pages of a newspaper. They should likewise be recognized as unconstitutional when imposed on the advertising pages. False advertising is clearly harmful. However, interfering with freedom of the press is even more harmful.

## Proposed Statement of Right. Article 5.

Government shall make no law which abridges the right of managers or owners of a business to enter or leave a specific market, or to charge for their product or service what they deem proper and necessary.

**The Right to Set Prices, and to Enter or Leave Markets.** During the Middle Ages, ideas about economics were dominated by the concept of the "just price." Following Aristotle, it was assumed that things exchanged for each other were of equal value, and that laws were necessary to establish the "just price" of items, in order to prevent either sellers or buyers from taking advantage of the other.

One of the most important principles of modern economic science is that "value" is purely subjective. People exchange things of less value to them for things of greater value to them. Each party to an exchange increases his wealth by making the exchange. No third party can tell whether an exchange is fair. Only the parties to the exchange can judge the values involved. The fact that a voluntary exchange takes place is proof not only that each party is better off as a result, but is better off than under any alternative exchange actually available to either party.

Unfortunately, the idea underlying the "just price" theory still plagues us. Thus we have laws and court decisions penalizing businesses for prices which are too low ("predatory") or too high ("monopolistic"). (If the seller is a foreign firm, prices deemed too low are called "dumping.")

In reality, there is no way a third party —Congress, judges, juries, or regulatory agencies—can determine whether a price is "too low" or "too high." Only the people actually making the exchange can judge that. The buyer might wish the price were lower. The seller might wish the price were higher. However, the fact that the transaction actually takes place shows that neither buyer nor seller could do better in the marketplace. For some outsider to later decide the price was too low or too high amounts to turning a voluntary exchange into a crime.

For either party to the transaction to demand a law which tilts the transaction in his favor is to violate the rights of the other party. Such a law forces the other party to agree to a transaction which in his judgment makes him worse off. It makes the transaction a forced one rather than a voluntary one. In the long run, it means such transactions will no longer be consummated in the marketplace but in a court of law.

## Proposed Statement of Right. Article 6.

Government shall make no law which abridges the right of managers or owners to introduce a new product or new technology to the market, except to assure that risks or hazards associated with the product or technology are made known to the buyer.

**The Right to Introduce New Products and Technologies.** The introduction of a new product or a new technology to the market usually results in a loss of business for the purveyors of the previously used technology or product. These "defenders" often attempt to protect their business by calling on the government to protect them against the "challenger." The arguments of the "defenders" are usually couched in terms of "public good," such as continued employment for particular workers, or economic activity in a particular geographical area. In reality the defenders are asking the government to violate the rights of those who would prefer to buy the new product or use the new technology, and the rights of those who offer the new product or technology for sale.

Some recent examples of government restrictions on new technology, to benefit the suppliers of older

technology, include: (1) restrictions on Cable TV, to protect over-the-air TV stations; (2) limitations on use of Bovine Growth Hormone, which increases the milk production of cows, because it would put some dairy farmers out of business; (3) restrictions on Digital Audio Tape recorders because this technology might limit the sales of pre-recorded music.

The point is simply that no one has a right to continue to do business in a particular way. No one has a right to the continued patronage of specific customers if those customers can find a better deal elsewhere.

The narrow self-interest of particular producers must not be allowed to over-ride the rights of other producers to enter a business, or the rights of buyers to transfer their patronage to a supplier who provides better service, a superior product, or some other perceived benefit. Harm to a seller cannot justify denying another seller the right to enter a market.

## Proposed Statement of Right. Article 7.

Government shall make no law which abridges the right of managers or owners to collaborate with suppliers, customers, or competitors in the development of new technologies or new products.

**The Right to Collaborate With Others.** Improvements in industrial productivity often require changes in technology. Identifying and refining production technology often requires collaboration between suppliers and users of that technology.

Advances in the technology embodied in a product are typically very expensive, whether for a consumer or other producer. The producers can reduce their individual costs by collaborating in the development of some new technology. They all gain the full benefit, but share the cost.

Unfortunately, under current American antitrust laws, collaboration between buyers and sellers of a product is illegal. In at least one classic antitrust case, a firm was convicted for its practice of testing new production machinery by allowing its customers to use that machinery in their factories. The Justice Department argued successfully that this prevented other producers of similar machinery from competing.

Likewise, collaboration between competitors who wish to share the cost of developing a new technology is prohibited. It is argued that other firms in the same industry, who do not take part in the collaboration, will then be hampered in competing. Under current law, the Justice Department can give permission to firms who wish to collaborate on RD, but without that permission, collaboration is a violation of antitrust laws.

The original intent of the antitrust laws was to prevent producers from conspiring to gouge consumers. The result of these particular interpretations, however, is to harm consumers by raising the cost of R&D and by making it more difficult for sellers of production machinery to meet the needs of the users of that machinery. If anyone at all benefits from these interpretations of the law, it is those producers who, for whatever reason, do not wish to collaborate with suppliers, customers, or competitors. They should have that right. However, they should not have the power to prevent others from voluntarily taking part in activities which benefit themselves and their customers. No one should be given a government guarantee that others will be required to buy his products.

## Proposed Statement of Right. Article 8.

Government shall make no law which abridges the right of owners or managers to establish regulations they deem necessary for the health and safety of their employees, including the right to deny workers for whom those jobs may pose a greater than normal risk, nor shall government make any law abridging the right of an employee to be informed of the risks associated with particular jobs.

**Rights Against the Government vs. Demands on Fellow Citizens.** For many years, Americans who were members of certain minority groups were subject to discriminatory laws. The disabilities imposed by law included denial of the right to vote, the right to own property, and the right to patronize particular business establishments.

These discriminatory laws were a violation of the civil rights of the victims. Fortunately, these violations of civil rights were ended by several laws passed in the 1960s. Unfortunately, the concept of "civil rights" was distorted in the process. It was argued that it did no good to repeal a discriminatory law if people continued to discriminate. The concept of "civil rights" was extended to include "rights," not against the government, but against one's fellow citizens. As a member of the Supreme Court has put it, "Before, a right meant the freedom to do something; now a right has come to mean the legal claim to receive and demand something."

This extension misrepresents the concept of civil rights. A "civil right" is a protection against the power of the government. It is not a claim on one's fellow citizens in their private roles. However, once a claim against one's fellow citizens is seen as a "right," the government is called in to enforce that right. In the name of "civil rights," the Bill of Rights has been stood on its head. Instead of serving as a protection against government power, it has become an excuse for government interference in people's private affairs.

One example is the recent Supreme Court ruling that employers may not bar women from certain jobs simply because of hazards to children those women might yet bear. In effect, the Court ruled that women had a "civil right" to particular jobs, regardless of the wishes of their employers. The issue in this case is not "women's rights" vs. "fetal rights," but rather rights as protections against government vs. "rights" as claims on one's fellow citizens. No one has a "right" to a particular job. Under the right of free association, employers have the right to hire whomever they please, for whatever reason they please. Similarly, workers have the right to apply for any job they please, and to quit for any reason they please. The employment contract spells out the legitimate claims of both employer and employee. As long as the employer doesn't violate that contract, a worker's recourse against an "unfair" employer is to take a job with a "fair" employer. This issue is a good place to begin restoring the concept that "civil rights" are protections against government, not claims on the resources of other people.

## Proposed Statement of Right. Article 9.

Government shall make no law which prescribes the means by which owners or managers must achieve compliance with governmentally established environmental regulations. The right of an owner or manager to achieve compliance by the most economical means shall not be abridged.

**The Right to Operate Efficiently.** One of the rights which was neglected throughout the early part of this century was the right not to have others trespass on one's property through air or water pollution. Originally, under English common law, people living beside a river had legally defensible rights against polluters. In effect they had property rights in an unpolluted river.

Early in the 18th century, however, British courts reversed this traditional common law. These rulings permitted newly developing industries to dump waste into rivers. The courts held that the "needs of industry" to dispose of wastes superseded the rights of property owners along the river.

This bad precedent was inherited by the United States when we declared our independence. Until quite recently, it was considered acceptable to dump wastes into rivers or the air. This simply transferred the problem to people downstream or downwind. The person who ended up paying the cost of cleanup gained no benefit from the activity which produced the waste. Here was a clear-cut case of government failing to protect individual rights, by allowing some people to transfer their costs to others.

We now recognize that simply dumping waste into a river, or dispersing it in the air, doesn't get rid of it. We now recognize that pollution must be stopped at the source. Unfortunately, this recognition has been accompanied by a command and control approach to eliminating pollution. Government officials not only prescribe emissions limits, but prescribe the means by which pollution must be controlled. A recent example is a law requiring electric power plants in the Midwest to install scrubbers which removed a specific percentage of the sulfur from the exhaust. In reality, a cheaper way to reduce sulfur emissions would have been for the power plants to burn low-sulfur Western coal. The scrubber requirement was imposed to protect the jobs of Eastern coal miners, who produce high-sulfur coal. One unfortunate result was that the power plant exhaust, even after scrubbing, contained more sulfur than would the unscrubbed exhaust from low-sulfur coal.

The command and control approach is a violation of the property rights of business owners. Government has an obligation to protect the rights of citizens by setting standards for maximum allowable levels of emissions. The pollution emitters, however, equally have the right to meet those standards by means best suited to their particular circumstances.

### What about responsibilities?

It may be asked, don't people in business have responsibilities that accompany their rights? Of course! Just as people retain all their rights as citizens when they enter business, they retain all their responsibilities. This includes responsibilities to employees, customers, stock-holders, neighbors, and the environment.

### What can I do?

Abraham Lincoln said, "With public sentiment nothing can fail, without it nothing can succeed." Samizdat is an example of this in practice. The Russians knew they needed radical change and used a self-publishing technique (Samizdat) to accomplish it. We ask you to distribute this document via Samizdat. Send a copy to an interested party.



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## Army Has Cold Region Data

The Cold Regions Research and Engineering Laboratory (CRREL) is an agency of the U.S. Army Corps of engineers concerned with operations in frigid climates. The following is excerpted from a laboratory information brochure for the benefit of RAC quarterly readers who may find CRREL's data useful.

The CRREL technical library has come to be recognized as the world's foremost collection of cold regions scientific and technical literature. It holds over 16,000 monographs, 175,000 reports, 150,000 micrographic items and a small map collection, and subscribes to nearly 600 journals. The library has a general science and engineering collection augmented by a specialized cold regions collection; 60% of the latter is in the Russian language.

Extensive literature retrieval services are provided. Computerized searches can be performed on over 300 data bases. The library's own data base, COLD, covers the world's cold regions literature. The Defense Technical Information Center data base (DROLS) provides access to classified and unclassified defense-related literature. Capabilities such as an on-line catalog, automated serial check-in, and CD-ROM data bases are available. The library is part of the Corps of Engineers LS-2000 computerized library network.

The library provides loan and reference services to the international scientific and academic community. More than 2000 requests for information materials are filled each year. Future plans call for a new Technical Information Analysis Center that will allow CRREL to greatly expand its automated information services and gain space for its ever-expanding collection of cold regions knowledge.

The *Bibliography on Cold Regions Science and Technology* is prepared at the Library of Congress under the sponsorship of CRREL. Established in 1951, it contains over 135,000 citations of world literature on snow, ice, and frozen ground. New items are published monthly in *Current Literature*, which is annually cumulated and published with an author/subject index. The bibliography contains approximately 50,000 Russian items as well as the results of all CRREL research. It is available internationally for on-line searching via the Orbit Search Service, 8000 Westpark Drive, McLean, Virginia 22102. The CRREL library maintains a microfiche collection which corresponds to every item in the bibliography. The printed version is available from the National Technical Information Service, Springfield, Virginia 22161. For further information contact: US Army Corps of Engineers, Cold Regions Research & Engineering Laboratory, 72 Lyme Road, Hanover, New Hampshire 03755.

## RAC's "IMPACT" Program Seeks Data on Plastic and Photonic Devices

The RAC, which is the DoD's centralized repository of reliability, maintainability and quality data and information has begun an initative to expand its reliability databases specifically for plastic encapsulated microcircuits and photonic devices. IMPACT (Information Management of Advanced Component Technology) will be an extension of RAC's failure rate and failure mode/mechanism databases. Qualitative and quantitative reliability data on these types of devices is being solicited from component manufacturers, government/industry research labs and military, automotive, medical, industrial and commercial system/equipment users. Data submitted can be either component or system level including reliability testing and field/warranty results. RAC will protect any proprietary restrictions required by data sources. Information may be used to provide recommendations to change military documentation such as MIL-HDBK-217, MIL-STD-454 Req. 64, MIL-I-38535 and to develop RAC report(s) expanding upon the recent RAC publication "Plastic Microcircuit Packages: A Technology Review" (CRTA-PEM), to provide latest plastic device usage criteria. For additional details, write or call Jack Farrell at RAC, 201 Mill Street, Rome, NY 13440-6916. Phone (315) 339-7056, Fax: (315) 337-9932.

## Update on Rome Laboratory's CADBIT Tool

Reprinted from the January 1993 issue of the "Reliability Maintainability Technology Transition Fact Sheet" published by Rome Laboratory, USAF.

Computer-Aided Design for Built-In-Test (CADBIT) selects, inserts, and evaluates BIT circuits at the Printed Circuit Board (PCB) level. It draws from an internal knowledge base of 13 commonly used BIT techniques. Input data regarding the characteristics of the design determine which techniques are chosen. The designer is then asked to weigh the importance of area, power, weight, delays, and test time. These factors are used to rank the chosen BIT techniques and offer the designer guidance in choosing the best technique for the design. CADBIT has detailed descriptions of the BIT techniques and their operation available on demand through an extensive network of HELP screens. The user is free to override CADBIT selections and include or exclude individual techniques as desired.

When the choice of a certain technique has been made, CADBIT will transfer all necessary parts for the creation of the BIT circuit to the Mentor Graphics Design Architect tool which holds the schematic for

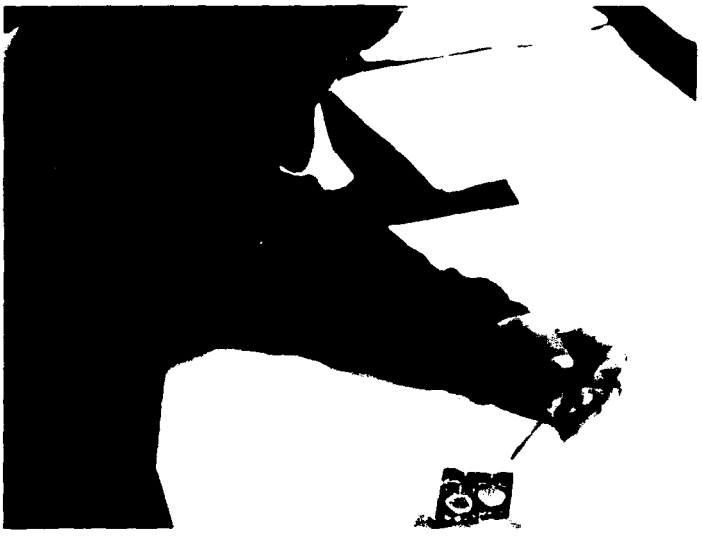
the PCB being developed. If the user wishes to see or use the default design for the BIT technique, it is also available on demand. HELP screens, design and insertion instructions, BIT Technique Insertion Diagrams (BTIDs), flowcharts, advantage and disadvantage screens, and bibliography lists are all available for each technique.

The CADBIT software can be expanded to include additional BITs as they are developed or to update existing BITs as the technology changes. All HELP screens and instructions are flat files which may be edited at any time. This built-in flexibility enables the user to customize the CADBIT software according to their needs. It also ensures that CADBIT will remain current and will continue to aid the designer in the development of effective and reliable future systems.

Technical reports or demonstrations of the CADBIT tool are available to both DoD and commercial contractors. Requests should be addressed to: Rome Laboratory, Edward DePalma, RL/ERSD, 525 Brooks Road, Griffiss AFB, NY 13441-4505. (RL/ERSD, Edward L. DePalma, (315) 330-2702).

## RAC Album

Jeanne Crowell formats the last issue of the RAC Newsletter at her computer workstation. RAC's 20,000 subscribers will receive the new RAC Journal instead starting this summer.



RAC's Bill Swavely dissects an electronic module no longer available for a critical Air Force application. Reverse Engineering by RAC will lead to the design for its replacement.

## Just for Fun

The heaviest element known to science was recently discovered by physicists. The element, tentatively named Administratium, has no protons or electrons and thus has an atomic number of 0. However, it does have 1 neutron, 125 assistant neutrons, 75 vice neutrons and 111 assistant vice neutrons. This gives it an atomic mass of 312. These 312 particles are held together in a nucleus by a force that involves the continuous exchange of meson-like particles called morons.

Since it has no electrons, Administratium is inert. However, it can be detected chemically as it impedes every reaction it comes in contact with. According to the discoverers, a minute amount of Administratium caused one reaction to take over four days to complete, when it would normally occur in less than one second.

Administratium has a normal half-life of approximately three years at which time it does not actually decay but instead, undergoes a reorganization in which assistant neutrons, vice neutrons, and assistant vice neutrons exchange places. Some studies have shown that the atomic number actually increases after each reorganization.

Research at other laboratories indicates that Administratium occurs naturally in the atmosphere. It tends to concentrate at certain points such as government agencies, large corporations and universities, and can usually be found in the newest, best appointed and best maintained buildings.

Scientists point out that Administratium is known to be toxic at any level of concentration and can easily destroy any productive reactions where it is allowed to accumulate. Attempts are being made to determine how Administratium can be controlled to prevent irreversible damage but results to date are not promising.

Author Unknown

# THE EDITOR'S CORNER

### For Fun and Profit, Try Polite Rebellion

Total Quality Management (TQM) starts with the commitment of top management. Too often, it ends with the indifference of middle management. Managers in America are highly skilled in creating an image of compliance with the CEO's directives, completely independent of reality. And too often, a manager will make a sincere commitment to TQM without making a connection between his goal and his own actions. Where the manager speaks TQM and acts "business as usual," his subordinates will do likewise until the next buzzword comes along. And nothing changes.

It doesn't have to be this way. While the CEO and his gurus work from the top, the enlightened worker can put on some pressure from the bottom. The manager in the middle may get squeezed into shape to the benefit of all.

TQM will work only when all levels of employee, from the CEO to the lowest paid, become intolerant of defects. This is a two-way street. If a boss should be intolerant of defects produced by a worker, the worker should also be intolerant of defects caused by the boss. And since the boss controls the process, he is responsible for most of the defects produced by it. Juran estimates that about 85% of all defects are management's fault. Deming's estimate is about 94%. On the other hand, the worker doing the job has the best feel for what needs fixing. So it's about time that the bosses got some direction from the troops.

Enlightened companies do all they can to harness the brainpower of the workers. Other companies, probably most, will get this free resourse only when the worker decides to make his voice heard through some form of rebellion.

Now, how do you do this without getting fired?

Rebellion doesn't have to be confrontive, unfriendly or insubordinate. All it takes is a refusal to consider the way we do things as immutable. This can be done very politely. For example:

"Hey boss, I know you want to show the chief how you are applying TQM in the department. Well, we have this process here with a lot of non-value added steps. I have some ideas of things we can change that will make us company heros."

A company-wide TQM policy provides a great opportunity for successful rebellion. But, maybe you have a boss who declares he isn't buying TQM. All is not lost. Here's another approach:

"Boss, I know you don't think much of TQM, but I also know you are too smart to think that there isn't any room for improvement in our operations. We could save some time in the fabrication plant by....."

Anytime you can make your boss a hero or save him some money, you can get his attention. Polite rebellion won't get you fired. It might even make you one of your boss's heros.

One Air Force officer defined TQM as a chance to ask "why?" Let's start asking. And let's not stop until we get some answers. Rebellion against the mindless repetition of past practices should be profitable, and seeing one of your ideas put into practice should be fun.

Anth ppola
Editor

# You Think You Have Troubles?

Reprinted from the Manufacturing Competitiveness Frontiers, who excerpted it from the Wall Street Journal

BEIJING - Eighteen factory managers were executed for poor product quality at Chien Bien Refrigerator Factory on the outskirts of the Chinese capital. The managers - 12 men and six women - were taken to a rice paddy outside the factory and unceremoniously shot to death as 500 plant workers looked on.

Minister of Economic reform spokesman, Xi Ten Haun, said the action was required for committing unpardonable crimes against the people of China. He blamed the managers for ignoring quality and forcing shoddy work, saying the factory's output of refrigerators had a reputation for failure.

For years, factory workers complained that many component parts did not meet specification and the end product did not function as required. Complaining workers quoted the plant manager as saying, "Ship it." Refrigerators are among the most sought-after consumer items in China. Customers, who waited up to five years for their appliances, were outraged.

"It is understandable our citizens would express shock and outrage when managers are careless in their attitudes towards the welfare of others." Haun says. "Our soldiers are justified in wishing to bring proper justice to those errant managers."

The executed included the plant manager, the quality manager, the engineering managers, and their top staff.

# From the RAC

**Reliability Analysis Center**
**Products and Activities**

RAC is pleased to announce the release of four new reference books and the update of two popular RAC publications. They are:

### Parts Selection, Application and Control

By: W. Denson, J. Farrell, and N. Fuqua

The first in a planned series dealing with parts, this publication provides an overview of topics concerning the selection, application and control of electrical and electronic parts in general. It identifies specific selection and procurement tools to enable designers, reliability engineers and project managers to obtain the most cost-effective parts suited for their applications. Both DoD and commercial applications are considered. Order number PSAC. Price is $50 (US orders), $60 (Non-US orders).

### Worst Case Circuit Analysis Application Guidelines

By: B. Johanson, D. Russell, W. Swavely

The latest in RAC's Concurrent Engineering Series, this publication presents an overview of Worst Case Circuit Analysis, a method for determining circuit performance under extreme (worst case) conditions. Both internal and external factors will cause variations in part parameters which will, in turn, cause variability in the circuit. General guidelines for performing worst case analysis are presented. Order CRTA-WCCA. $75 (US), $85 (Non-US).

### TQM Toolkit

By: A. Coppola

This publication provides an encyclopedic listing of Total Quality Management (TQM) tools divided into groups covering the "Seven Basic Tools," other simple tools, the "Seven Management and Planning Tools," the Statistical Design of Experiments, team tools and action plans. Each tool is described in sufficient detail for practical application by the reader. The tools can be used collectively to support an integrated TQM approach, or individually to solve a variety of everyday problems. Order TQM-TOOLKIT. $75 (US), $85 (Non-US).

### Failure Mode, Effects and Criticality Analysis (FMECA)

By: R. Borgovini, S. Pemberton, M. Rossi

This publication discusses Failure Mode, Effect and Criticality Analysis (FMECA), a reliability evaluation/ design technique which examines the impact on performance of potential failure modes of components within a system or equipment. The approaches required for conformance to MIL-STD-1629 are described in detail. Order CRTA-FMECA. $75 (US), $85 (Non-US).

### RAC Reliability Sourcebook

By: N. Fuqua

In response to many inquires received by RAC concerned with locating various types of reliability data, this publication provides a single, consolidated reference to sources of reliability data and information, including books, periodicals, organizations, on-line databases, etc., covering both military and commercial sources. Order RSDC-1. $25 (US), $35 (Non-US).

### Reliability and Maintainability Software Tools

By: N. Fuqua

The second in a series of RAC publications (updating RMST-91) discussing Reliability, Maintainability and related software packages, this work offers a listing of commercially available automated tools accompanied by relevant data such as operating platform, cost, contacts, access/ limitations and claimed capabilities. This information was obtained from both military and commercial sources. Order RMST-93. $50 (US, $60 (Non-US).

**To Place an Order Call (800) 526-4802**

**DIRECT ALL INQUIRIES AND ORDERS TO:**
**Reliability Analysis Center**
**P. O. Box 4700**
**Rome, NY, USA 13442-4700**

**(315) 337-0900 ..... Main telephone**
**(315) 337-9932 ..... Facsimile**
**(315) 337-9933 ..... Technical inquiries**
**(800) 526-4802 ..... Publication orders**
**(800) 526-4803 ..... Training course information**
**(800) 526-4804 ..... Total Quality Management**

**Make checks payable to IITRI/RAC. Non-U.S. orders must include a check drawn on a U. S. bank. Quantity discounts are available. Military agencies may use DD Form 1155: indicate the maximum authorized dollar amount and cutoff date on the order and identify vendor as IIT Research Institute/Reliability Analysis Center. Contact Gina Nash at (800) 526-4802 or the above address for a complete Product Catalog or a free copy of the RAC Users Guide.**

# Industry Brief

**Industry Announcements and Calendar of Events**

## NEWS NOTES

### European Quality Award winners Announced

In the Summer 1992 issue of this publication, we announced the creation of a European Quality Award for the most successful exponent of Total Quality Management in Western Europe, and European Quality Prizes for companies that demonstrate excellence in their management of quality for continuous improvement. We have since learned that The 1992 European Quality Award was won by Rank Xerox Limited, and that Quality Prizes were earned by BOC Special Gases, Milliken European Division, and Industries del Ubierna SA, UBISA.

### Systems Safety Analysis Handbook Contacts Identified

In the last issue of this publication, RAC announced the availability of the Systems Safety Analysis Handbook from the Systems Safety Society, PO Box 9524, Albuquerque NM 87119-9524, but did not list a contact for further information. We received a number of calls requesting this information, which we referred to SSS national headquarters in Sterling VA at (703) 450-0310. We have since received notification that the SSS New Mexico Chapter president is Dick Stephans, Ogden Environment and Energy Services Company, at (505) 881-9228. Fax: (505) 881-9357. The Handbook is dated July 1993, contains 300 pages and costs $40, prepaid.

### Concurrent Engineering Network offers Free Service

CERCnet is a free, on-line subscription service providing access to concurrent engineering (CE) related abstracts, events, want ads and conferencing. For internet access use: babcock.cerc.wvu.wvnet.edu (internet address 129.71.14.1) and login as: cercnet. For modem access dial (800)-331-3808 or (304) 293-6833. Use settings: 1200/2400 baud, 8, N, 1. Login as: cercnet. The system is menu-driven and each login is limited to 45 minutes. For more information or to register as a user contact Concurrent Engineering Research Center, West Virginia University, Morgantown, WV 26506, Attn: CERCnet. Tel: (304) 293-7226.

E-Mail: sysop@cerc.wvu.wvney.edu.

### New Consultant Firm Formed

Samuel J. Keene, Ph.D., and Dale M. Butler, P.E., recently founded a consulting firm offering reliability and quality services including customized workshops in Software Reliability and Quality, Concurrent Engineering, Software Logistics and Costing, and Quality Functional Deployment. Contact Quality Innovations, 3081 Fifteenth St., Boulder, CO 80304. Tel: (303) 447-3697. Fax: (303) 440-3879.

### New Books Announced

Maintenance Minimization for Competitive Advantage, by Hans Reiche. List price $55. Individuals may order for $35 from Gorden and Breach Science Publishers, PO Box 786, Cooper Station, New York, NY 10276. Phone (800) 545-8398.

Estimating Device Reliability: Assessment of Credibility, by Franklin R. Nash. ISBN 0-7923-9304-X, $68. Kluwer Academic Publishers, PO Box 358 Accord Station, Hingham, MA 02018-9990.

### ISO 9000 Video Seminar Offered

Two video tapes (each about 45 minutes long), a workbook and a set of the ISO 9000 series of quality standards are offered in a package covering the importance, content and registration procedures of the international standards. Cost is $595. Offered by International Quality Systems, 2533 N. Carson St. Carson City, NV 89706. Tel: (800) 343-2315. Fax: (702) 883-4874.

### New Books Written for Europe

IFS Ltd. has announced publication of two new books:

- Eurochallenge: The TQM Approach to Capturing Global Markets, by G. Merli. The Japanese model and the European Quality Award are used as the basis for a strategic approach and starting point for total quality.

- Kaizen for Europe, by R. Hannam. This looks at the problems manufacturers in Europe face in adapting Japanese quality techniques and explains how they can be made to work in Europe.

For further information contact: IFS Ltd., Freepost, Wolsely Business Park, Kempston, Bedford MK42 7YA, UK. Tel: (0234) 853605. International: +44 234 853605 Fax: (0234) 854499.

## MTIAC Lists TQM Books Published in 1992

The following listing of new TQM texts was extracted from the February 1993 issue of the Current Awareness Bulletin of the Manufacturing Technology Information Analysis Center (MTIAC):

- Engineering, Quality, & Experimental Design, D. M. Grove and T.P. Davis, Longman Scientific and Technical.
- TQM in New Product Manufacturing, H.G. Menon, McGraw-Hill.
- Kaizen Teian 2: Guiding Continuous Improvement Through Employee Suggestions, Japan Human Relations Association, Productivity Press.
- Quality Maintenance: Zero Defects Through Equipment Management, Seiji Tsuchiya, Productivity Press.
- TQM: Getting Started and Achieving Results with Total Quality Management, William Winchell, Society of Manufacturing Engineers.

## New Courses Offered by AMA

The American Management Association is offering three new self-study courses:

- How to Qualify for ISO 9000, #95003GY1, $130.
- Going Global: getting Started in International Trade, #94054GY1,$130.
- How to Gain the Competitive Edge with JIT (Just-in-time), #94092GY1,$99.95.

Two CEUs will be awarded for successful completion of any one of these courses. Contact American Management Association Extension Institute, PO Box 1026, Saranac Lake, NY 12983-9986. Tel: (800) 538-4761, Fax: (518) 891-3653.

## Authors Wanted

The Shock and Vibration Information Analysis Center (SAVIAC) is considering updating Monographs published from 1967 to 1986, and is looking for authors interested in doing the updates. The monographs are:

SMV-1, Random Noise and Vibration in Space Vehicles, 1967.

SMV-2, Theory and Practice of Cushion Design, 1968.

SMV-3, Programming and Analysis for Digital Time Series Data, 1968.

SMV-4, Dynamics of Rotating Shafts, 1969.

SMV-5, Principles and Techniques of Shock Data Analysis, 1969.

SMV-6, Optimum Shock and Vibration Isolation, 1971.

SMV-7, Influence of Damping in Vibration Isolation, 1971.

SMV-8, Selection and Performance of Vibration Tests, 1971.

SMV-9, Equivalence Techniques for Vibration Testing, 1972.

SMV-11, Calibration of Shock and Vibration Measuring Transducers, 1979.

SMV-12, Balancing of Rigid and Flexible Rotors, 1986.

Potential authors or persons wishing to purchase copies of any of the above may contact SAVIAC, Booz-Allen & Hamilton, Inc., 2711 Jefferson Davis Highway, Suite 600, Arlington, VA 22201-4158. Call (703) 769-7570.

## Academic Institutions Offered Free Proceedings

The IEEE Reliability Society has a surplus of 1992 International Reliability Physics Symposium Proceedings and 1993 Annual Reliability and Maintainability Symposium Proceedings, and offers to provide multiple copies to academic institutions for educational purposes while supplies last. The Society also has a residue of about 100 copies of the 1992 Annual Reliability and Maintainability Symposium (RAMS) Proceedings and about 40 copies of the 1991 RAMS, from which they will also donate copies for educational purposes while supplies last. Contact A. Coppola, 18 Melrose Ave., Utica, NY 13502.

## FMEA Software Updated

Powertronics Systems, Inc. (PSI) has announced the availability of FMEA-2.0, for failure modes, effects and criticality analysis of electronic, electro-mechanical, electric and mechanical systems, in accordance with MIL-STD-1629A, MIL-STD-?165, and AMC-P750-2. Built into the software are failure mode libraries from MIL-HDBK-338, FMD-91, NPRD-3 and NPRD-2. It requires a PC with MS-DOS 3.3 or higher, 512 KB free RAM, 1 MB hard disk space and a floppy disk. Graphics capability is not required. Licence fee is $1700 ($4800 for a site licence) including one year of updates and unlimited technical support. Contact: Nancy Deaton, Powertronic Systems, Inc., 13700 Chef Menteur Hwy., New Orleans, LA 70129. Call (504) 254-0383.

## New Journal Plans 1994 Debut

An International Journal of Reliability, Quality and Safety Engineering is scheduled to begin publication with four quarterly issues in 1994. Potential authors

may contact the Editor-in-Chief, Hoang Pham, Idaho National Engineering Laboratory, PO Box 1625, MS 2406, Idaho Falls ID 83415. Tel: (208) 526-9274. Fax: (208) 526-2930. E-Mail: hgp@inel.gov. Basic subscriptions are $220 per year from World Scientific Publishing Co., Suite 1B, 1060 Main St., River Edge, NJ 07661, USA or their offices in London, Singapore and India. U.S. toll free number is (800) 227-7562.

## Software Quality and Testing report offered

(Abstracted from the Data and Analysis Center for Software Newsletter.) Copies of "Software Quality and Testing: What DoD Can Learn from Commercial Practices" may be requested from LTC Mark R. Kindl, Army Research Laboratory, Software Technology Branch, ASQB-GCI, Georgia Institute of Technology, 115 O'Keefe Building, Atlanta, GA 30332-3110.

## Statistics Software Updated

John Wiley & Sons, Inc. has announced the availability of X-STAT 2.0, a program for statistical experiment design, data analysis and non-linear optimization. New features include a Microsoft Windows interface, improved graphics and the ability to handle more data. Price is $595. A free demo kit is available. Contact John Wiley & Sons, Wiley-Interscience, 605 Third Avenue, New York, NY 10158-0012. Call (800) 879-4539.

## EMPF Offers Soldering and Wire Wrap Training, MIL-STD-2000 Certification

The Electronic Manufacturing Productivity Facility (EMPF) offers courses on basic soldering technology to provide training in soldering and assembly skills. The courses are customized in duration to fit the needs of small and medium manufacturing organizations. EMPF also offers a three day course in wire wrap training in accordance with MIL-STD-1130B. Dates and fees available on request.

EMPF also conducts a ten day course on MIL-STD-2000 Soldering Technology Certification. Students satisfactorily completing the course will be awarded formal certification as a contractor Category C or H or a government Category B or H in accordance with MIL-STD-2000. The fee is $1850. Classes are scheduled for August 2-13 and September 13-24. Those already certified who require recertification can attend a three day course on MIL-STD-2000 Soldering Technology Recertification and receive recertification on successful completion. The fee is $555 and classes are scheduled for August 10-12, August 24-26, September 14-16 and September 28-30.

For further information or enrollment, contact the EMPF Electronics Manufacturing Learning Center, 714 North Senate Avenue, Indianapolis, IN 46202-3112. Tel: (317) 226-5640. Fax: (317) 226-5615.

### ICRMS' 94 Announced

The Second International Conference on Reliability, Maintainability and Safety has been scheduled for 7-10 June, 1994 in Beijing, China. The deadline for Abstracts is 30 June, 1993, with notification of authors scheduled for 31 August 1993. Exhibit space is available. Further information is available from Xu, Fu-Rong, ICRMS' 94 Secretariat, PO Box 9200-76, Beijing, China. Tel: (861) 8381147. Fax: (861) 8382257.

### Testing Handbook Extended

Volume II of the Reliability and Life Testing Handbook explores the reduction of latent defects and manufacturing problems by implementing environment stress screening (ESS). Volume II supplements Volume I, a comprehensive treatment of testing, published in 1992. Both volumes were authored by Dr. Dimitri Kececioglu. Volume II Data: 600 pages, IBSN 0-13-772369-5, Prentice Hall, 1993.

# Calls for Papers

The 1993 International Integrated Reliability Workshop (Formerly the Wafer Level Reliability Workshop) to be held October 24-27, 1993 in Lake Tahoe CA, seeks papers on Building-in Reliability, Wafer Level Reliability, and "Known Good Die." Submit a one or two page proposal by July 30, 1993 to: David L. Erhart, Motorola, 1300 N. Alma School Road, CH240, Chandler, AZ 85224. Tel: (602) 814-4256. Fax: (602) 814-4167.

E-mail: DAVID_ERHART@EMAIL.SPS.MOT.COM

The 1994 Interntional Reliability Physics Symposium (IRPS) is soliciting papers for the symposium to be held April 11-14, 1994 at the Fairmont Hotel in San Jose, CA. Topics include Building-in Reliability for Si, GaAs, and Optoelectronic Devices, Testing Methodologies for Reliability and Analyzing for Reliability. Requested are 15 copies of both a 50 word abstract and a two-page summary by 1 October 1993. For more details contact: Paul J. Boudreaux, Technical Program Chairman, 1994 IRPS, Laboratory for Physical Sciences, 8050 Greenmead Drive, College Park, MD 20740. Tel: (301) 935-6547. Fax: (301) 935-6723.

E-mail:boudreau@eng.umd.edu

# Calendar of Events

**SSS NATIONAL CONFERENCE**
**JULY 28-AUGUST 2, 1993**
**CINCINNATI, OH**
Contact: Systems Safety Society, 5 Export Drive, Suite A, Sterling VA 20164-4421. Tel: (703) 450-031.

**SURFACE MOUNT MANUFACTURING COURSE**
**AUGUST 2-6, 1993**
Providing technical base for Surface Mount Technology (SMT), diagnostic procedures and process troubleshooting

and

**REWORK SMT COURSE**
**AUGUST 9-13, 1993**
Providing training, in SMT rework procedures
$695 each course.
Contact: Electronics Manufacturing Productivity Facility (EMPF), Electronics Manufacturing Learning Center, 714 North Senate Avenue, Indianapolis, IN 46202-3112. Tel: (317) 226-5640. Fax: (317) 226-5615.

**WORKSHOP ON HIERARCHICAL TEST GENERATION**
**AUGUST 8-11, 1993**
**BLACKSBURG, VA**
Contact: James R. Armstrong, Electrical Engineering, Virginia Tech., Blacksburg, VA 24061. Tel: (703) 231-4723. Fax: (703) 231-3362. E-mail: jra@vtvm1.cc.vt.edu

**SOLE INTERNATIONAL SYMPOSIUM**
**AUGUST 23-25, 1993**
Contact: Society of Logistics Engineers at (310) 459-8446.

**ADVANCED MICROELECTRONIC QUALIFICATION/ RELIABILITY WORKSHOP**
**AUGUST 24-26, 1993**
**DENVER, CO**
Contact: Dorothy Kelly, General Technical Services (GTS), 3100 Route 138, Wall Township, NJ 07719. Tel: (908) 544-3231. Fax: (908) 389-9992.

**AUTOTESTCON '93**
**SEPTEMBER 20-23, 1993**
**SAN ANTONIO, TX**
Contact: Walter D. Downing, Southwest Research Institute, PO Drawer 28510, San Antonio, TX 78228-0510

**15TH ANNUAL EOS/ESD SYMPOSIUM**
**SEPTEMBER 27-30, 1993**
**BUENA VISTA PALACE HOTEL, ORLANDO, FL**
Electrical Overstress/Electrostatic Discharge (EOS/ESD) Symposium. Contact: EOS/ESD Symposium, 200 Liberty Plaza, Rome, NY 13440. Tel: (315) 339-6937. Fax: (315) 339-6793.

**12TH SYMPOSIUM ON RELIABLE DISTRIBUTED SYSTEMS**
**OCTOBER 6-8, 1993**
**PRINCETON, NJ**
Contact: Prof. David Taylor, Dept. of Computer

Science, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1. Tel: (519) 888-4432.
E-mail: dtaylor@grand.uwaterloo.ca

**OCTOBER 11-12, THE BASICS OF BENCHMARKING**
**OCTOBER 13, ORGANIZING AND MANAGING BENCHMARKING**
**OCTOBER 14-15, TOOLS AND TECHNIQUES**
Contact: American Productivity and Quality Center, 123 North Post Oak Lane, Suite 300, Houston, TX 77024-7797. Tel: (713) 681-4020. Fax: (713) 681-8578.

**IASTED CONFERENCE ON RELIABILITY, QUALITY CONTROL AND RISK ASSESSMENT**
**OCTOBER 13-15, 1993**
**CAMBRIDGE, MA**
Sponsored by The International Association of Science and Technology for Development (IASTED)
Contact: Dr. Hoang Pham, Idaho National Engineering Lab., PO Box 1625, MS 2408, Idaho Falls, ID 83415. Tel: (208) 526-9274. Fax: (208) 526-2930. E-mail:hgp@inel.gov

**TRANSPORT AIRCRAFT SURVIVABILITY**
**OCTOBER 19-21, 1993**
**STOUFFER CONCOURSE HOTEL, ST. LOUIS, MO**
Contact: American Defence Preparedness Association, Two Colonial Place, 2101 Wilson Blvd., Suite 400, Arlington, VA 22201-3061. Tel: (703) 522-1820, ask for Tracy Stuckrath or Donna Alexander.

**64TH SHOCK AND VIBRATION SYMPOSIUM**
**OCTOBER 25-28, 1993**
**FORT WALTON BEACH AND EGLIN AFB, FL**
Contact: SAVIAC/Booz-Allen, 2711 Jefferson Davis Highway #600, Arlington, VA 22202-4158.

**FOURTH INTERNATIONAL SYMPOSIUM ON THE PHYSICS AND FAILURE ANALYSIS OF INTEGRATED CIRCUITS**
**NOVEMBER 1-4, 1993**
**SINGAPORE**
Contact: Swee Yong Khim, 200 Jalan Sultan, #11-03, Textile Centre, Singapore 0719. Tel: (65) 291-9690. Fax: (65) 292-8596.

**ISSRE'93**
**NOVEMBER 3-6, 1993**
**DENVER, CO**
The Fourth International Symposium on Software Reliability Engineering.
Contact: Michael R. Lyu, Bellcore, 445 South Street, Morristown, NJ 07962-1910. Tel: (201) 829-3999. Fax: (201) 829-5981. E-mail:lyu@bellcore.com

# RAC Training Courses
# October 19-22, 1993 at Boston, MA

**Course Dates:**
October 19-22, 1993

**Registration Deadline:**
October 8, 1993

**Course Fee**
$995

**Location and On-Site Accommodations:**
Colonial Hilton & Resort
Rts. 128 & 95
Audubon Road
Wakefield, MA 01880
(617) 245-9300

For further information on registration contact Ms. Nan Pfrimmer at the Reliability Analysis Center, (800) 526-4803 or (315) 339-7036.

**Design Reliability Training Course**
This intensive overview covers theoretical and practical aspects of reliability through concurrent engineering. Reliability analysis, test and evaluation, parts selection, circuit analysis, and applicable standards and information sources are addressed.

**Mechanical Reliability Training Course**
Practical applications of mechanical engineering to system and component reliability are covered in this popular session. Basic theories of mechanical reliability and the essential tools of mechanical reliability analysis are covered and reinforced through problem solving and discussion.

**Software Cost and Schedule Estimation**
Estimating the cost and schedule for a software development or maintenance project is one of the most difficult tasks in software engineering today. In many organizations, a lack of a structured process often leads to very inaccurate estimates which hinder project management and control and adversely affect the reliability and quality of the system. This course will be of interest to systems engineers, software engineers, systems analysts, quality assurance analysts, and project managers. The Constructive Cost Model (COCOMO) estimating technique is utilized to introduce typical cost model terms and parameters.

**System Software Reliability**
Featuring hands-on software reliability measurement, analyses and design, this course is intended for those responsible for measuring, analyzing, designing, automating, implementing, or ensuring software reliability for commercial or government programs.

**☞ Half-Day Seminars**
RAC offers a choice of half-day seminars given on Friday morning following the regular three-day courses. Each presents an introduction to a fundamental assurance technology topic.

Introduction to :
Advanced Design Reliability
System Software Reliability

## RAC On-Site Courses and Consulting

RAC has provided training courses and consulting services to government and industry in virtually every aspect of reliability and quality. On-site training is often more cost-effective for organizations, particularly since on-site "closed" courses can be tailored to specific customer products and processes. RAC specialists are also experienced at providing focused consulting support separate from or combined with a custom training program. Technology areas include:

- Design for Reliability
- Reliability Modeling
- Fault Tree Analysis
- Failure Analysis
- Statistical Process Control
- Software Engineering
- Software Reliability
- Failure Data Systems
- Reliability Testing
- Testability Analysis
- Reliability Analysis
- Reliability Management/Planning
- Statistically-Based Management
- Microelectronics Standardization
- Worst Case Circuit Analysis
- Mechanical Reliability
- Failure Mode, Effects & Criticality Analysis
- Total Quality Management
- Environmental Stress Screening
- Parts Selection and Control
- Reliability-Centered Maintenance
- Probabilistic Mechanical Design
- Qualified Manufacturer's List
- Maintainability Testing

Call (800) 526-4803 for training course information or (315) 337-9933 with technical or consulting inquiries.