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IEEE

UNITED STATES ACTIVITIES

Promoting Career and Technology Policy Interests of Electrical, Electronics and Computer Engineers

United States Activities Board

Technology Policy Council

Aerospace R&D Policy
Communications &
Information Policy
Defense R&D Policy
Energy Policy
Engineering R&D Policy
Health Care Engineering Policy
Man & Radiation

Government Activities Council

Congressional Fellows
Washington Internship for
Students of Engineering
Legislative Report
National Government Activities
State Government Activities
Technology Policy Conference
U.S. Competitiveness

Member Activities Council

Awards & Recognition
Communications
Employment Assistance
IMPACT
Opinion Survey
Precollege Education
Private Practitioners Task Force
Professional Perspective
Salary Survey

Professional Activities Council

for Engineers (PACE)
National Engineers Week
PACE Regional & Divisional Activities
PACE Information Workshop
Student Professional Awareness

Career Activities Council

Anti-Discrimination
Career Maintenance & Development
Ethics
Intellectual Property
Licensure & Registration
Manpower
Pensions

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May 3, 1994

Mr. Lionel S. Johns
Associate Administrator for Technology
Office of Science and Technology Policy
Old Executive Office Bldg.
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Washington, DC 20500

*Step
Henry
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Dear Mr. Johns:

During a February meeting with David Ostfeld and Scott Grayson, you expressed an interest in IEEE-USA's discussion of the Administration's technology policy plans and progress. It was agreed that we would prepare a list of topics on which we could offer specific feedback and ideas in a briefing format. You indicated that you would then determine who within OSTP would have interests in those topics and establish a convenient date.

We have reviewed the basic Administration reports on technology policy, i.e., "Technology for America's Economic Growth: A New Direction to Build Economic Strength," dated February 22, 1993, and "Technology for Economic Growth: The President's Progress Report," dated November 1993. Based on that review, we applaud the comprehensiveness of the President's program and support nearly everything that is within both documents. We also acknowledge that much has been accomplished since January 1993.

IEEE-USA is particularly supportive of the programs/actions undertaken in the following areas:

- * Encouraging public-private alliances to tackle technology challenges;
- * Working with/through industry to develop technology roadmaps;
- * Opening up foreign markets to U.S. technology products and services;
- * Focusing defense R&D on dual use technologies and products;
- * Investing in aeronautics;
- * Improving advanced manufacturing technology; and
- * Spreading knowledge to, and improving training of, the U.S. work force.

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We commend you for being open and seeking new and creative ideas for building on what has been accomplished to date. In that spirit, we would propose the following additional subjects as potential briefing topics for your consideration. We would be pleased to present our views and recommendations on all or any of these subjects at a mutually convenient time in whatever format you deem appropriate.

✓ 1. **Technology Information/Access by Small Business:**

The Federal Government has undertaken various initiatives to improve the dissemination of technology and information resulting from Federally-sponsored R&D efforts. While these efforts have proven beneficial to large industry, small business continues to find it difficult to access and take advantage of these resources. This is unfortunate since small business, particularly in the high-tech sector, holds the key to growth of the American economy. IEEE-USA would like to share some ideas on the need and mechanisms to improve small business access and utilization of government technology resources and information.

2. **Government Outreach to Industry:**

The Administration's technology policy encourages public-private partnerships. These partnerships are critical as one means of providing private-sector input and direction to Federal technology efforts. IEEE-USA believes that other mechanisms are needed to help government better draw upon private-sector advice, as well as reforms to current law (e.g. Federal Advisory Committee Act), which are necessary to enable/facilitate private-sector input and interaction.

3. **Better Utilization of the Federal Laboratories:**

✓ While recognizing that their missions, facilities, and technical capabilities vary widely, IEEE-USA believes that collectively the Federal laboratories are national resources that make significant contributions to technology development and commercialization, but which must be better utilized if they are to survive post Cold War restructuring. IEEE-USA has ideas on means for enhancing cooperative R&D involving academia, industry, and the Federal laboratories that builds and expands upon the current emphasis on Cooperative Research and Development Agreements.

✓ 4. **Information Security:**

Rapid advances in information and encryption technologies, their utilization by the private-sector, and their importance as a commercial export market have outdated existing public policy on information security and export controls which was rooted in Cold War national security considerations. The current debate over the "Clipper Chip" represents one needed effort to come to grips with new policy to serve the broad public interest. IEEE-USA has recommendations on information security and encryption policy.

5. Medical Technology and Health Care:

Although there is great emphasis currently being placed on reform of the health care system, relatively little attention is being given to the role that medical technology can and should play in improving the delivery and quality of health care, as well as containing the overall cost. IEEE-USA is attempting to fill this gap by hosting a major conference on "The Role of Technology in the Cost of Health Care" in Washington on April 27-29th. Medical devices also represent an important industry segment that is under increasing pressure from foreign competition. IEEE-USA can present our observations on the role of technology in health care and ensuring continuing U.S. technological leadership in this area.

6. NASA's Future:

IEEE-USA believes that NASA must play a more explicit role as one of the Administration's technology policy "engines for economic growth." We endorse NASA Administrator Dan Goldin's emphasis on "smaller, cheaper, faster." We also have ideas on how NASA's resources and expertise can be more clearly applied to national needs, including paving the way for industry efforts to commercialize space in a significant fashion.

7. Improved Economics for Manufacturing:

IEEE-USA has taken the view that one of the principal competitiveness issues confronting high tech industry is a lack of patient, long-term, low-cost capital for investment in manufacturing plant and processes. Believing this to be a critical need, IEEE-USA has some concepts regarding means to encourage such capital formation and investment.

8. Science, Engineering, and Technician Retraining Assistance:

The end of the Cold War and defense down-sizing have resulted in significant lay-offs and underutilization of scientists, engineers, and technicians employed in both the public and private sector. These highly-trained "wealth-producers" can continue to make significant contributions to our economy with targeted assistance to help them make effective career transitions. IEEE-USA has ideas on how the Federal government can help displaced engineers help themselves in a cost-effective, beneficial fashion.

We have identified individuals with expertise in each of the subject areas for the purpose of presenting IEEE-USA's ideas in a briefing. Their comments would represent the considered judgment of U.S. IEEE members with expertise in the subject fields as endorsed by IEEE's United States Activities Board on behalf of IEEE's U.S. membership. IEEE-USA promotes the career and technology policy interests of the nearly 250,000 electrical, electronics, and computer engineers and allied scientists who are U.S. members of the IEEE.

IEEE-USA OSTP BRIEFING

TOPIC 1

National Investment in Manufacturing

IEEE-USA has recognized that one of the principal competitiveness issues confronting high tech industry is a lack of patient, long-term, low-cost capital for investment in manufacturing plant and processes. IEEE-USA also believes that a number of other kinds of manufacturing-related investment are also necessary to enhance U.S. competitiveness in this time of dramatic changes in manufacturing. This includes support for manufacturing technology education, and incentives for manufacturing process development.

Charles Eldon

Charles "Bud" Eldon is a past President of IEEE and past Chairman of IEEE-USA's Committee on U.S. Competitiveness. Following service as an electronics technician (USNR) during World War II, Mr. Eldon received the B.S. degree in Physics (1948) and the M.B.A. degree (1950) from Stanford University. He was associated with Hewlett-Packard from 1951-1969 as a production engineer, planner, marketing engineering, manufacturing manager, and Director of Corporate Systems/EDP. In 1969, he joined Ness Industries, Inc. as a Management Consultant and as President of its electronic components manufacturing subsidiary Ness Pacific, Inc. After 1972, he rejoined Hewlett Packard, first as a management consultant, then as Manufacturing Manager of HP's Integrated Circuits Department, and finally as Corporate Manager of Capital Equipment before his retirement.

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Robert L. Horst

Robert Horst is founder and principal of the technical consultancy Peak Productivity U.S.A., Lancaster, Pennsylvania. A registered professional engineer, career employee of Armstrong World Industries, Inc., and U.S. Navy veteran, he holds 23 U.S. and foreign patents in manufacturing methods, production apparatus, and microwave devices. He is a member of the Board of Trustees of Pennsylvania State University. He serves on the IEEE-USA's Committee on U.S. Competitiveness.

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**IEEE-USA BRIEFING
TO THE OFFICE OF SCIENCE AND
TECHNOLOGY POLICY**

**NATIONAL INVESTMENT IN
MANUFACTURING**

**CHARLES ELDON
ROBERT HORST**

OCTOBER 4, 1994

STATUS OF MFG IN USA

MOST COMPETITIVE PER WEF

Downsizing? Reengineering?

Recession in Europe, Asia?

New Govt Focus, Program?

OUTPUT 2X SINCE 1970

Like Agriculture? Job Problem?

BUT: THREAT FROM ASIA NICS!

HK, SK, Taiwan, Sing, India, China

Q: HOW TO SUSTAIN US POSITION

IEEE COMMENTS re INVESTMENT

INVOLVE MFG ENGS IN POLICY

(experts in process Improvement)

E.g., IEEE Tech Fellows

E.g., Emulate German Model

Use Association Members

Involve Industry Experts

(None in New PCAST Org)

INCREASE MFG PRODUCTIVITY

Result, Per Prof P Krugman (MIT):

Raises Living Standards

COMPETITIVENESS INCREASE

Specific Comments Follow:

#1 FINANCE RECOMMENDATIONS (GOV'T \$)

CAPITAL FOR MFG EXPANSION

Patient, Long term, Low cost

REVISE MOH DEDUCTIBILITY

Make like R&D Expense

Reflect New "Cost Driver" Acctg

BIG Improvement Incentive

ADD CONSORTIA (E.g., SEMATECH)

Concentrate on Mfg R&D in:

Equipment and Processes

Consider Teleprocessing

DEVELOP REGIONAL CENTERS

Invest in Plant & Equipment

Locate at Community Colleges?

#2 EDUCATION (re Mfg Skills, Needs)

NEW "FRACTAL" MANUFACTURING

SUPPORT "HANDS-ON" PROGRAMS

Include Legal Protection

Endorse Engineer "Resources"

EXPAND APPRENTICE/VOC EDUC

**EXPEDITE REGIONAL TRAINING
CENTERS**

**Re FOREIGN ENGINEERS: REDUCE \$\$\$\$
(Educated at Taxpayer Expense Now)
Encourage to Stay? Reduce Number?
Modify H-1B to Protect US Engineers**

#3 OTHER INVESTMENTS

NEW TECH DELIVERY SYSTEM

Replace DOD-Led System

Must be Industry Led

Govt Provides Infrastructure

METRIC: CONVERT USA

Mfg Like Other Countries

This Is a Global Economy

SUPPORT CONSUMER ELECTRONICS

Fiscal/Monetary Policy Reform

Selection of Standards

Anti-trust Law Changes

Tax Incentives

Intellectual Property Laws

Execution (speed decisions)

IEEE-USA OSTP BRIEFING

LIST OF TOPICS AND PRESENTERS

(Draft: October 3, 1994)

TOPIC 1	National Investment in Manufacturing	Charles Eldon Robert Horst
TOPIC 2	NASA's Future	E. David Hinkley Travis Walton
TOPIC 3	Gov't Information Access by Small Business	Glenn Tenney Malcolm Smith
TOPIC 4	Information Security and Encryption	Glenn Tenney Robert Powers Jean Camp
TOPIC 5	Science, Engineering, and Technician Retraining Assistance	Paul Kostek Marvin Hammond
TOPIC 6	Improving the Return on R&D Investment in Federal Laboratories	Alexander Nauda Robert Thomas

OTHER IEEE-USA PARTICIPANTS:

David M. Ostfeld, Chairman, Government Activities Council and Briefing Moderator

J. Mark Pullen, Vice Chair, Technology Policy Council

Henry Simon, IEEE-USA Executive Fellow

U.S. Department of Commerce, Technology Administration

W. Thomas Suttle, Staff Director, Professional Activities

Chris Brantley, Manager, Government Activities Council

Stephen Carey, Administrator, Technology Policy Council

Scott Grayson, Manager, Career Activities Council

Deborah Rudolph, Manager, Technology Policy Council

3:00 -
5:00

IEEE-USA OSTP BRIEFING

TOPIC 1

National Investment in Manufacturing

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Charles Eldon

Charles "Bud" Eldon is a past President of IEEE and past chairman of IEEE-USA's Committee on U.S. Competitiveness. Following service as an electronics technician (USNR) during World War II, Mr. Eldon received the B.S. degree in Physics (1948) and the M.B.A. degree (1950) from Stanford University. He was associated with Hewlett-Packard from 1951-1969 as a production engineer, planner, marketing engineering, manufacturing manager, and Director of Corporate Systems/EDP. In 1969, he joined Ness Industries, Inc. as a Management Consultant and as President of its electronic components manufacturing subsidiary Ness Pacific, Inc. After 1972, he rejoined Hewlett Packard, first as a management consultant, then as Manufacturing Manager of HP's Integrated Circuits Department, and finally as Corporate Manager of Capital Equipment before his retirement.

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IEEE-USA OSTP BRIEFING

TOPIC 2

NASA's Future

IEEE-USA believes that NASA must play a more explicit role as one of the Administration's technology policy "engines for economic growth." We endorse NASA Administrator Dan Goldin's emphasis on "smaller, cheaper, faster." We also have ideas on how NASA's resources and expertise can be more clearly applied to national needs, including paving the way for industry efforts to commercialize space in a significant fashion.

E. David Hinkley

David Hinkley is Senior Scientist and Los Angeles/Aerospace Corporate Manager of the Science and Technology Corporation. From 1986-1992, he served as Chief Scientist on TRW's Global Chance Program, Chief Scientist for advanced space programs at Hughes Aircraft Company, and Chief Electronics Scientist with Lockheed Corporation's Aeronautics Research Laboratory. From 1976-1986, he was Manager of Atmospheric Science Section and the Microelectronics and Senior Technology Program at the Jet Propulsion Laboratory. From 1963-1976, he was a staff scientist with MIT's Lincoln Laboratory. Hinkley holds the B.S. in engineering physics from Washington University (1958), the M.B.A. in program and personnel management from Northwestern University (1959 & 1960), and an M.S. and Ph.D. in physics from Northwestern (1961 & 1963). Dr. Hinkley is a former member of the NASA Space Systems and Technology Advisory Committee and served as NASA Representative to the DoD Advisory Group on Electron Devices (1980-1986). Dr. Hinkley currently serves as chairman of IEEE-USA's Aerospace R&D Policy Committee.

W. Travis Walton

Travis Walton is the founding director of the University of Maryland's Technology Extension Service (TES), which promotes university-industry linkages through Maryland's Engineering Research Center (ERC). Mr. Walton earned the B.A. in engineering (1956) and B.S.E.E. (1957) degrees from Rice University. Before joining the University of Maryland, Mr. Walton spent ten years with NASA's Goddard Space Flight Center and NASA Headquarters leading projects in remote sensing technologies. In addition to managing TES and serving on the management team of the ERC, Mr. Walton serves on numerous advisory boards and organizations including the Board of the Regional Manufacturing Institute, the Technology Managers Advisory Board of the (NASA) National Technology Transfer Center, the American Industrial Extension Alliance (as founding member and Executive-Secretary/Treasurer), the Interagency Working Group of the Maryland Advisory Commission on Manufacturing, the National Association of Management and Technical Assistance Centers, and the Maryland Industrial Development Association. He is a member and past vice-chair of the IEEE-USA Aerospace R&D Policy Committee and an active member of IEEE's Geoscience and Remote Sensing and Aerospace & Electronic Systems Societies.

IEEE-USA OSTP BRIEFING

TOPIC 3

Government Information Access by Small Business:

The Federal Government has undertaken various initiatives to improve the dissemination of technology and information resulting from Federally-sponsored R&D efforts. While these efforts have proven beneficial to large industry, small business continues to find it difficult to access and take advantage of these resources. This is unfortunate since small business, particularly in the high-tech sector, holds the key to growth of the American economy. IEEE-USA would like to share some ideas on the need and mechanisms to improve small business access and utilization of government technology resources and information.

Malcolm Smith

Malcolm Smith graduated from Kings College, London University with special honors in Physics. He completed the Postgraduate Apprenticeship Program with the English Electric Company before joining Hewlett Packard as a sales engineer in 1967. Smith has 26 years of senior managerial and engineering experience in high technology business with H.P., with responsibilities ranging from systems engineering and manufacturing to field sales and product marketing and corporate procurement. With HP's support, Smith served as an IEEE-USA Executive Fellow on the staff of the Under Secretary of Technology in the U.S. Department of Commerce from 1991-1993. Malcolm Smith left H.P. in May 1993 to remain in Washington and establish a private consulting practice. He is a member of the IEEE-USA's Committee on U.S. Competitiveness and chairs their Executive Fellowship Task Force. He also interacts with committees of the Technology Policy Council.

Glenn Tenney

Glenn Tenney is President of Fantasia Systems, Inc. Mr. Tenney has been in the computer software and hardware profession for over thirty years. Twenty years ago he started his own software development and systems consulting company. Since then, he has started or helped start many companies and has designed, developed and consulted on a wide range of high-tech products including: many telecommunications systems both wired and wireless, laser discs, interactive multimedia systems, consumer and arcade games, set-top "500 channel TV" system, industrial robotics systems, personal computers, operating systems, and many others. Mr. Tenney's clients have included Fortune 100 companies, computer manufacturers, utility companies, many high-tech companies, and foreign companies. Mr. Tenney has spoken and written (on national television, radio, magazines, and at many conferences) on many issues including computer and network security, criminal justice and judicial users of computers, the future of intellectual property in a digital world, and access to government information on-line. Mr. Tenney is a Senior Member of the IEEE having served on the IEEE-USA's Intellectual Property Committee for many years, serves on the Information Security & Applications subcommittee of the IEEE-USA's Committee on Communications and Information Policy, and is a member of the Association of Computing Machinery.

IEEE-USA OSTP BRIEFERS

TOPIC 4

Information Security and Encryption

Rapid advances in information and encryption technologies, their utilization by the private-sector, and their importance as a commercial export market have outdated existing public policy on information security and export controls which was rooted in Cold War national security considerations. The current debate over the "Clipper Chip" represents one needed effort to come to grips with new policy to serve the broad public interest. IEEE-USA has recommendations on information security and encryption policy.

Jean Camp

(text to be added)

Robert Powers

Robert Powers is an Advisory Engineer with MCI Telecommunications, Inc., based in Richardson, Texas. He joined MCI Telecommunications in 1985, following his service as Chief Scientist to the Federal Communications Commission (1982-85). He held numerous positions at FCC including Chief and Deputy Chief of FCC's Research and Analysis Division (1980-1981), a staff member in FCC's Cable Television Bureau and Office of Science and Technology (1975-1980), and a staff member in the Office of Telecommunications (1968-1975). He began his career with the National Bureau of Standards (1961-1968) where he conducted research in plasma physics and analysis of measurement errors. He holds the B.S. in chemistry and mathematics from Southern Methodist University (1955), and the Ph.D. in physical chemistry from the University of Wisconsin (1960). Dr. Powers is currently vice chair of IEEE-USA's Technology Policy Council and a past chair and current member of the IEEE-USA Committee on Communications and Information Policy.

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IEEE-USA OSTP BRIEFING

TOPIC 5

Science, Engineering, and Technician Retraining Assistance

The end of the Cold War and defense down-sizing have resulted in significant lay-offs and underutilization of scientists, engineers, and technicians employed in both the public and private sector. These highly-trained "wealth-producers" can continue to make significant contributions to our economy with targeted assistance to help them make effective career transitions. IEEE-USA has ideas on how the Federal government can help displaced engineers help themselves in a cost-effective, beneficial fashion.

Paul Kostek

Paul Kostek is a systems engineer with Scitor Corporation, a project management and systems engineering firm. Prior to joining Scitor, Kostek held engineering positions with Sundstrand Data Control, the Boeing Corporation, and Grumman Aerospace Corporation. He holds the B.S.E.E. from the University of Massachusetts at Dartmouth and has done graduate work at the Polytechnic Institute of New York and Long Island University. Kostek is a Senior Member of the IEEE and a member of the American Institute of Aeronautics and Astronautics and the Puget Sound Career Development Association. He is in his second year as chairman of IEEE-USA's Career Maintenance and Development Committee and is a past chair of the IEEE-USA Manpower Committee (1990-1992). Kostek has held numerous volunteer positions within IEEE technical societies and at the Division level as well as servicing as chair of the IEEE Region 6 (Northwest) area.

Marvin H. Hammond

Marvin Hammond has been active in IEEE for the past 30 years and is currently chair of the IEEE-USA Defense R&D Policy Committee. He previously served on the Board of Governors of the IEEE's Aerospace and Electronic Systems Society. Dr. Hammond has been a leader in facilitating technology transfer programs within the Department of Defense. In his professional career, Dr. Hammond managed and led the timely and effective developments of numerous commercial and defense products. Currently, he is on the technical staff of the Institute for Defense Analyses and contributed in the application of models and simulations to acquisition, training, and operational systems. Previously, he was a system engineering director for General Dynamics Corporation, principal for Booz, Allen and Hamilton, and an intelligence officer while in the U.S. Air Force reserves. Dr. Hammond holds a B.S. and M.S. in electrical engineering from Kansas State University and a Ph.D. in electrical engineering from Ohio State University.

IEEE-USA OSTP BRIEFING

TOPIC 6

Improving the Return of R&D Investment in Federal Laboratories

While recognizing that their missions, facilities, and technical capabilities vary widely, IEEE-USA believes that collectively the Federal laboratories are national resources that make significant contributions to technology development and commercialization, but which must be better utilized if they are to survive post Cold War restructuring. IEEE-USA has ideas on means for enhancing cooperative R&D involving academia, industry, and the Federal laboratories that builds and expands upon the current emphasis on Cooperative Research and Development Agreements.

Alexander Nauda

Alexander Nauda is Director of Research and Advanced Technology for E-Systems' ECI Division in St. Petersburg, Florida, where he is responsible for technical direction, project management, government interface/market development, internal company representation, coordination of corporate, university, and Federal laboratory interaction, and administration of the \$5.7 million Independent Research and Development program. Nauda is formerly Director of Research and Development for HRB Systems and has over 20 years of academic and industrial experience. He has consulted for Singer, NASA, Alcoa, PPG Industries and the Technology Training Corporation. A recipient of several awards for teaching excellence, Nauda had taught signal processing, communication theory, and circuit and systems engineering at Bucknell University and Penn State University. Dr. Nauda received the B.S., M.S., and Ph.D. degrees in electrical engineering from the University of Pittsburgh. He is a senior member of IEEE and a member of the IEEE Signal Processing, Engineering Management, and Professional Communication Societies. He is also a member of the American Society for Engineering Education. Dr. Nauda currently serves as vice chairman of IEEE-USA's Defense R&D Policy Committee.

Robert Thomas

Robert Thomas is a Professor of Electrical Engineering at Cornell University, where he has been on faculty since September 1973, and Director of the Power Systems Engineering Research Center, a consortium of universities involved in research on issues associated with restructuring the Nation's electric utility system. During sabbaticals from Cornell, he has served with the U.S. Department of Energy's Office of Electrical Energy Systems (1979-1980) and a Program Director for the Large-Scale Nonlinear Systems Programs in the Division of Electrical, Communications, and Systems Engineering in the National Science Foundation's Engineering Directorate (1987-1988). He has also been a consultant to NASA, the Aero-space Corporation, the Oak Ridge National Laboratories, the Solar Energy Research Institute, the U.S. Department of Energy through the Meridian Corporation on various electric utility system related issues, the Acrotech Company on circuit and control system techniques, and the General Electric Company CRD on control of motor drives. He is currently Associate Editor of the Wiley Interscience Journal on Computer Applications in Engineering Education. Dr. Thomas is a member of IEEE-USA's Energy Policy Committee.



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Professional Perspective
Salary Survey

Professional Activities Council for Engineers (PACE)

National Engineers Week
PACE Regional & Divisional Activities
PACE Information/Workshop
Student Professional Awareness

Career Activities Council

Anti-Discrimination
Career Maintenance & Development
Ethics
Intellectual Property
Licensure & Registration
Manpower
Pensions

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OCTOBER 4, 1994

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TOPIC 4	Information Security and Encryption	Robert Powers Jean Camp Glenn Tenney
TOPIC 5	Engineering Retraining Assistance Retraining Assistance	Marvin Hammond Paul Kostek
TOPIC 6	Evaluating the Federal Laboratories	Alexander Nauda Robert Thomas

OTHER IEEE-USA PARTICIPANTS:

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Henry Simon, IEEE-USA Executive Fellow
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Chris Brantley, Manager, Government Activities Council
Stephen Carey, Administrator, Technology Policy Council
Scott Grayson, Manager, Career Activities Council
Vin O'Neill, Senior Administrator, Career Policy Council
Deborah Rudolph, Manager, Technology Policy Council

IEEE-USA OSTP BRIEFING

TOPIC 6

Evaluating the Federal Laboratories

While recognizing that their missions, facilities, and technical capabilities vary widely, IEEE-USA believes that collectively the Federal laboratories are national resources that make significant contributions to technology development and commercialization, but which must be better utilized if they are to survive post Cold War restructuring. IEEE-USA has ideas on means for enhancing cooperative R&D involving academia, industry, and the Federal laboratories that builds and expands upon the current emphasis on Cooperative Research and Development Agreements.

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for the Large-Scale Nonlinear Systems Programs in the Division of Electrical, Communications, and Systems Engineering in the National Science Foundation's Engineering Directorate (1987-1988). He has also been a consultant to NASA, the Aero-space Corporation, the Oak Ridge National Laboratories, the Solar Energy Research Institute, the U.S. Department of Energy through the Meridian Corporation on various electric utility system related issues, the Acrotech Company on circuit and control system techniques, and the General Electric Company CRD on control of motor drives. He is currently Associate Editor of the Wiley Interscience Journal on Computer Applications in Engineering Education. Dr. Thomas is a Fellow of the IEEE and a member of IEEE-USA's Energy Policy Committee.

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Evaluating the Federal Laboratories

**Dr. Alexander Nauda
E-Systems
St. Petersburg, Florida**

**Prof. Robert J. Thomas
Cornell University
Ithaca, New York**

Federal Laboratories

- **Were established to develop technology for national strategic needs**
- **Contain some very talented people and unique resources**
- **Have roots in big science, classified R&D, or testing**
- **Are being evaluated for new missions**

We believe that

Technology is fundamentally necessary for both US economic strength and national security

The purpose of investing in technology is to develop a sustainable competitive advantage in the global marketplace

New missions are needed

To build a technology infrastructure

To obtain a competitive advantage in the global economy

To enable timely reconstitution of a strong defense capability when needed again

Return on Federal Lab R&D Investment may be improved by the following actions:

- **Collaborate (not compete) with industry**
- **Revise security classification bureaucracy and rules**
- **Inventory the unique expertise and facilities available**

Collaborate (not compete) with industry

- **Add to the criteria for evaluating lab performance success at industry collaboration**
- **Include industry representatives on lab review boards and advisory panels**
- **Establish commercialization (in collaboration with industry) as part of a mission to promote manufacturing and new job creation**

Encourage labs to explore new mechanisms to form strategic alliances with industry

- **Spawning new business based on collaborative work**
- **Lab personnel working as “hired-guns”**
- **Maintain and operate test facilities for industry**

Hold labs accountable for the basic research they are doing

Revise security classification bureaucracy and rules

- **Classify only what is necessary to protect national security**
- **Declassify as many technologies as possible**
- **Establish declassification (as well as technology transfer) as a mission of all DoD components, leveraging defense investment to maximize its benefit to the commercial sector**

Inventory the unique expertise and facilities of the labs

- **Preserve nationally recognized centers of excellence**
- **Focus human resources on critical civilian technologies and manufacturing processes**
- **Invest in advanced projects that improve technology infrastructure**
- **Refocus nationally recognized expertise towards new missions that will enhance competitiveness**

Continued Federal support for R&D (with an appropriate mix of laboratory, university, and industry collaboration) is needed to build the high-technology infrastructure required to support future economic growth.

IEEE-USA OSTP BRIEFING

TOPIC 5

Science, Engineering, and Technician Retraining Assistance

The end of the Cold War and defense down-sizing have resulted in significant lay-offs and underutilization of scientists, engineers, and technicians employed in both the public and private sector. These highly-trained "wealth-producers" can continue to make significant contributions to our economy with targeted assistance to help them make effective career transitions. IEEE-USA has ideas on how the Federal government can help displaced engineers help themselves in a cost-effective, beneficial fashion.

Paul Kostek

Paul Kostek is a systems engineer with Scitor Corporation, a project management and systems engineering firm. Prior to joining Scitor, Kostek held engineering positions with Sundstrand Data Control, the Boeing Corporation, and Grumman Aerospace Corporation. He holds the B.S.E.E. from the University of Massachusetts at Dartmouth and has done graduate work at the Polytechnic Institute of New York and Long Island University. Kostek is a Senior Member of the IEEE and a member of the American Institute of Aeronautics and Astronautics and the Puget Sound Career Development Association. He is in his second year as Chair of IEEE-USA's Career Maintenance and Development Committee and is a past Chair of the IEEE-USA Manpower Committee (1990-1992). Kostek has held numerous volunteer positions within IEEE technical societies and at the Division level as well as serving as Chair of the IEEE Region 6 (Northwest) area.

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Marvin H. Hammond

Marvin Hammond has been active in IEEE for the past 30 years and is currently Chair of the IEEE-USA Defense R&D Policy Committee. He previously served on the Board of Governors of the IEEE's Aerospace and Electronic Systems Society. Dr. Hammond has been a leader in facilitating technology transfer programs within the Department of Defense. In his professional career, Dr. Hammond managed and led the timely and effective developments of numerous commercial and defense products. Currently, he is on the technical staff of the Institute for Defense Analyses and is contributing in the application of models and simulations to acquisition, training, and operational systems. Previously, he was a System Engineering Director for General Dynamics Corporation, Principal for Booz, Allen and Hamilton, and an Intelligence Officer while in the U.S. Air Force reserves. Dr. Hammond holds a B.S. and M.S. in electrical engineering from Kansas State University and a Ph.D. in electrical engineering from Ohio State University.

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INSTITUTE FOR ELECTRIAL AND ELECTRONIC ENGINEERS

**Science, Engineering, and Technician
Retraining Assistance**

**Dr. Marvin Hammond
Mr. Paul Kostek**

OCTOBER 4, 1994

Discussion Item Summary

- **Wealth of Experience of Defense Workers -- Invaluable**
- **Most Retraining Programs Haven't Worked When "Independent Organizations" Decide the Retraining "Areas"**
- **Suggestions:**
 - **Change Commercial Industry's Perception of the Defense People**
 - **Industry Incentives to:**
 - Do the Selection and Retraining
 - Cooperatively Develop Products
 - **Let Industry Make the "Who and What" Decisions But with Government "Loans" and Facilitation**

Defense Workers Experience -- Invaluable

- **Know How to Get Products to Market**
 - **Government Required Different Sets of Criterion**
 - **They Know How to Deal With Wide Variety of Customers**
 - **Their Products Have Proven “Customer Satisfaction”**
- **These Workers Not “Over Paid”**
 - **OTA* Study Showed Defense Workers are Paid Comparably as Commercial Counterparts with Similar Experience and Academic Accomplishments**
 - **Many May Have Started with Higher Salaries**
- **Key Criterion for Commercial Industry -- Recent Experience**
 - **Most Have Had Job Diversification via Many Programs**
 - **Many Have Had Advanced University Courses**

* OTA Study: “After the Cold War: Living with Lower Defense Spending, 1991

“Focused” Retrained Programs Haven’t Worked

- **When “Independent Organizations” Selected “New” Technical Areas -- Poor Results**
 - **NSPE and USC Retrained Engineers in Environmental Areas -- Limited Opportunities Found**
 - **An East Coast Activity Trained 34 Individuals to be “Entrepreneurs” -- Limited Success**
 - **IEEE Sponsored Effort Retrained 20 Aerospace Engineers into Oceanic Engineers -- None Found Jobs**
- **Broad “Re-Skill” Programs Have Worked***
 - **Technology Mobilization and Reemployment Program**
 - \$28M; 34,000 participants reemployed in 21 fields
 - **Technology Utilization Project**
 - 302 of 329 reemployed in 11 industries

OTA Study

Suggestion: Help Commercial Industry Refocus

- **Unemployed Defense Workers Do NOT Have “Defense” Science, Engineering or Technical Degrees**
- **Focus on Technical Skills -- Not What Industries “They” Were In**
- **Engineering is “Problem Solving Using Technical Expertise”**
- **Idea: Government Sponsorship of Symposiums to Help Refocus**
 - **Objective: Increase Awareness of Available Skills to Satisfy Industry Needs**
 - **Industry and Workers Participate -- Government Moderator**
 - Company Leaders
 - Science, Engineering, and Technical Societies
 - Unions, e.g., CESO
 - Cross Section of Un-employed Workers

Suggestion: Industrial Credits

- **Employers Know Their Needs -- Let Them Select and Train New Employees but Give them Credits IF They Select Laid-Off Defense Employees**
 - **Tax Credits**
 - **Low Interest Loans**
- **Ease Anti-Trust Laws to Permit Greater Cooperative Product Development (Not Just Research) Among Companies**
 - **Joint Development Among Sub-units of Defense Companies with Commercial Companies**
 - **Dual-Use Development Would “Re-Skill” Defense Personnel and use Costly Facility Assets**

Suggestion: Defense Workers' GI Bill

- **Most Workers are “Smart” and JUST Need Re-Focusing/Re-Skilled NOT Reeducation**
- **Not Another Master's Degree -- An Over Kill in Time, Cost, and Need**
- **Offer Short 2-4 Month Courses By Universities**
 - **Industry Selects**
Topics, e.g.,
Commercial Product and Process Developments
Commercial Standards vs. MILSPEC
Students, e.g.,
Based on Resumes and Recommendations from
Defense Companies
 - **Industry Instructors Teach and Evaluate Students for Jobs**
 - **Government Pays Part, e.g., Tuition, and Structured as Loan**
 - **Students Pay Part, e.g., Transportation, Room, and Board**

IEEE-USA OSTP BRIEFERS

TOPIC 4

Information Security and Encryption

Rapid advances in information and encryption technologies, their utilization by the private-sector, and their importance as a commercial export market have outdated existing public policy on information security and export controls which was rooted in Cold War national security considerations. The current debate over the "Clipper Chip" represents one needed effort to come to grips with new policy to serve the broad public interest. IEEE-USA has recommendations on information security and encryption policy.

L. Jean Camp

Jean Camp is a researcher and doctoral candidate in telecommunications and information policy at Carnegie Mellon University. She has an M.S.E.E. from the University of North Carolina and a M.S. in engineering and public policy from Carnegie Mellon University. She has published research on all levels of computer systems: VLSI, networking, and applications. Currently she is specializing in cryptographic techniques for implementing electronic commerce. She is the Chair of the Security and Applications Subcommittee of IEEE-USA's Committee on Communications and Information Policy.

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Robert Powers

Robert Powers is an Advisory Engineer with MCI Telecommunications, Inc., based in Richardson, Texas. He joined MCI Telecommunications in 1985, following his service as Chief Scientist to the Federal Communications Commission (1982-85). He held numerous positions at FCC including Chief and Deputy Chief of FCC's Research and Analysis Division (1980-1981), a staff member in FCC's Cable Television Bureau and Office of Science and Technology (1975-1980), and a staff member in the Office of Telecommunications (1968-1975). He began his career with the National Bureau of Standards (1961-1968) where he conducted research in plasma physics and analysis of measurement errors. He hold the B.S. in chemistry and mathematics from Southern Methodist University (1955), and the Ph.D. in physical chemistry from the University of Wisconsin (1960). Dr. Powers is currently Vice Chair of IEEE-USA's Technology Policy Council and a past Chair and current member of the IEEE-USA Committee on Communications and Information Policy.

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Glenn Tenney

Glenn Tenney is President of Fantasia Systems, Inc. Mr. Tenney has been in the computer software and hardware profession for over thirty years. Twenty years ago he started his own software development and systems consulting company. Since then, he has started or helped start many companies and has designed, developed and consulted on a wide range of high-tech products including: many telecommunications systems both wired and wireless, laser discs, interactive multimedia systems, consumer and arcade games, set-top "500 channel TV" system, industrial robotics systems, personal computers, operating systems, and many others. Mr. Tenney's clients have included Fortune 100 companies, computer manufacturers, utility companies, many high-tech companies, and foreign companies. Mr. Tenney has spoken and written (on national television, radio, magazines, and at many conferences) on many issues including computer and network security, criminal justice and judicial users of computers, the future of intellectual property in a digital world, and access to government information on-line. Mr. Tenney is a Senior Member of the IEEE having served on the IEEE-USA's Intellectual Property Committee for many years, serves on the Information Security & Applications subcommittee of the IEEE-USA's Committee on Communications and Information Policy, and is a member of the Association of Computing Machinery.

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Information Security and Encryption

OSTP Briefing

by

IEEE - USA

4 October 1994

Security and Privacy

Security

- **Origin -- who sent the message**
- **Content -- the message is complete and unmodified**
- **Secrecy -- preventing others from knowing...**

Privacy

- **“The right of determining to what extent one’s thoughts, sentiments, and emotions shall be communicated by others.” (Warren, 1890)**

Security does not equate to privacy

Privacy requires security

The Current Situation

GII -- the NII is global

Legislation can't keep up with fast-moving technology

Security and encryption know-how is no longer just for government agencies

The vast majority of on-line communication is in the open

Computers and messages on the Internet are under attack -- usually by individuals

Things To Consider

U.S. competitiveness is harmed by inadequate security and privacy

Security is often breached using low-tech means -- “social engineering” is most common

Who has jurisdiction for violations on a global network?

There is little experience in dealing with the info-terrorist of the future

Things To Do

Remove export restrictions on encryption software and hardware

While establishing security policies, also establish privacy policies for the private sector as well as the government

Encourage the creation and deployment of encryption standards and tools for global use

- **Unclassified**
- **Allowable in hardware or software**
- **Avoid those having a “single point” of failure**

Educate and inform people and businesses of the problem and solutions

IEEE-USA OSTP BRIEFING

TOPIC 2

NASA's Future

IEEE-USA believes that NASA must play a more explicit role as one of the Administration's technology policy "engines for economic growth." We endorse NASA Administrator Dan Goldin's emphasis on "smaller, cheaper, faster." We also have ideas on how NASA's resources and expertise can be more clearly applied to national needs, including paving the way for industry efforts to commercialize space in a significant fashion.

E. David Hinkley

David Hinkley is Senior Scientist and Los Angeles/Aerospace Corporate Manager of the Science and Technology Corporation. From 1986-1992, he served as Chief Scientist on TRW's Global Chance Program, Chief Scientist for advanced space programs at Hughes Aircraft Company, and Chief Electronics Scientist with Lockheed Corporation's Aeronautics Research Laboratory. From 1976-1986, he was Manager of Atmospheric Science Section and the Microelectronics and Senior Technology Program at the Jet Propulsion Laboratory. From 1963-1976, he was a staff scientist with MIT's Lincoln Laboratory. Hinkley holds the B.S. in engineering physics from Washington University (1958), the M.B.A. in program and personnel management from Northwestern University (1959 & 1960), and an M.S. and Ph.D. in physics from Northwestern (1961 & 1963). Dr. Hinkley is a former member of the NASA Space Systems and Technology Advisory Committee and served as NASA Representative to the DoD Advisory Group on Electron Devices (1980-1986). Dr. Hinkley currently serves as Chairman of IEEE-USA's Aerospace R&D Policy Committee.

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W. Travis Walton

Travis Walton is the founding director of the University of Maryland's Technology Extension Service (TES), which promotes university-industry linkages through Maryland's Engineering Research Center (ERC). Mr. Walton earned the B.A. in engineering (1956) and B.S.E.E. (1957) degrees from Rice University. Before joining the University of Maryland, Mr. Walton spent ten years with NASA's Goddard Space Flight Center and NASA Headquarters leading projects in remote sensing technologies. In addition to managing TES and serving on the management team of the ERC, Mr. Walton serves on numerous advisory boards and organizations including the Board of the Regional Manufacturing Institute, the Technology Managers Advisory Board of the (NASA) National Technology Transfer Center, the American Industrial Extension Alliance (as founding member and Executive-Secretary/Treasurer), the Interagency Working Group of the

Maryland Advisory Commission on Manufacturing, the National Association of Management and Technical Assistance Centers, and the Maryland Industrial Development Association. He is a member and past Vice-Chair of the IEEE-USA Aerospace R&D Policy Committee and an active member of IEEE's Geoscience and Remote Sensing and Aerospace & Electronic Systems Societies.

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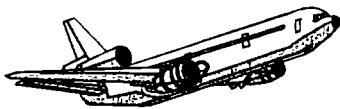
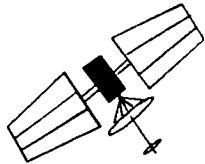
NASA's Future

**Presentation to the
Office of Science and Technology Policy
by**

**Dr. E. David Hinkley (Chairman) and Travis Walton
IEEE-USA Aerospace Policy Committee**

October 4, 1994

NASA's Main Programmatic Thrusts



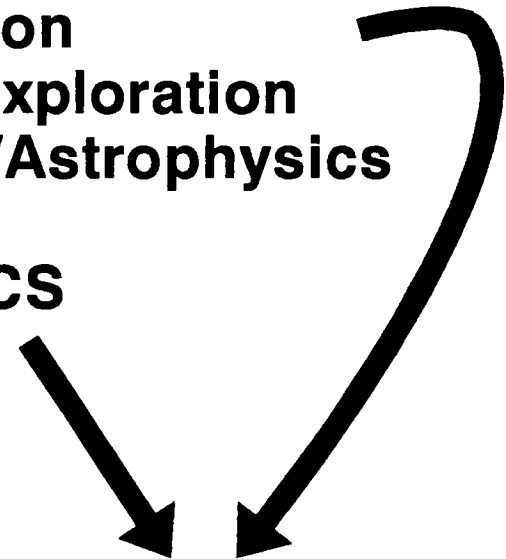
■ SPACE

- Mission to Planet Earth
- Space Station
- Planetary Exploration
- Astronomy/Astrophysics

■ AERONAUTICS

- Hypersonic
- Supersonic
- Subsonic

■ TECHNOLOGY TRANSFER AND COMMERCIALIZATION



NASA's Current Objectives

- 1. Advance scientific knowledge about space, aeronautics, and the global environment**
- 2. Develop the science, engineering, and information network infrastructure to perform the necessary measurements and analysis, and make the data readily available both within NASA and outside**
- 3. Transfer science and engineering expertise to monitoring and enforcement agencies such as NOAA, EPA, and FAA**
- 4. Enable and help accelerate the commercialization of new technology developed by the core NASA programs**

Issue #1: NASA Vision and Roadmap

NASA must regain the confidence of the American people by developing and advertising a strong, relevant vision statement along with a believable roadmap to indicate how its goals will be reached within budget, what the intermediate milestones will be, and when they will occur.

Issue #2: Reduce Cost to Space

- **Commercial investment in space requires major reductions in the cost of placing payloads in orbit, performing work in orbit, and bringing the payloads back to Earth.**
- **IEEE-USA is interested in low-cost access to space as the *means to an end*.**
- **IEEE-USA understands that NASA and OSTP have recognized this need and support the development of a new generation of launch vehicles.**
- **Other costs associated with space exploration and commerce should also be addressed.**

Issue #3: Involvement of Industry

NASA should strengthen its partnership with U. S. industry in all program areas in order to:

- Benefit from lower-cost, commercial products (e.g., COTS hardware) and techniques;**
- Facilitate industrial commercialization in space by leasing platforms to U. S. industry;**
- Expedite technology transfer by developing a better understanding of the needs and requirements of the private sector and marketplace.**

Issue #4: Earth Observing System and EOSDIS

- **NASA is the U. S. lead agency for developing space-based sensors to study and archive the Earth's atmosphere, oceans, and land surfaces.**
- **Consequently, the Earth Observing System (EOS) and the EOS Data & Information System (EOSDIS) should receive very high funding priority, recognizing that the ultimate users and beneficiaries of EOS data will be outside NASA.**
- **Adequate funds should be maintained for data analysis related to ongoing missions and for follow-ons to successful space experiments such as the recent Lidar In-Space Technology Experiment (LITE) -- consider a joint NASA-Industry Laser Atmospheric Wind Sounder (LAWS).**

Issue #5: Risk vs. Reward

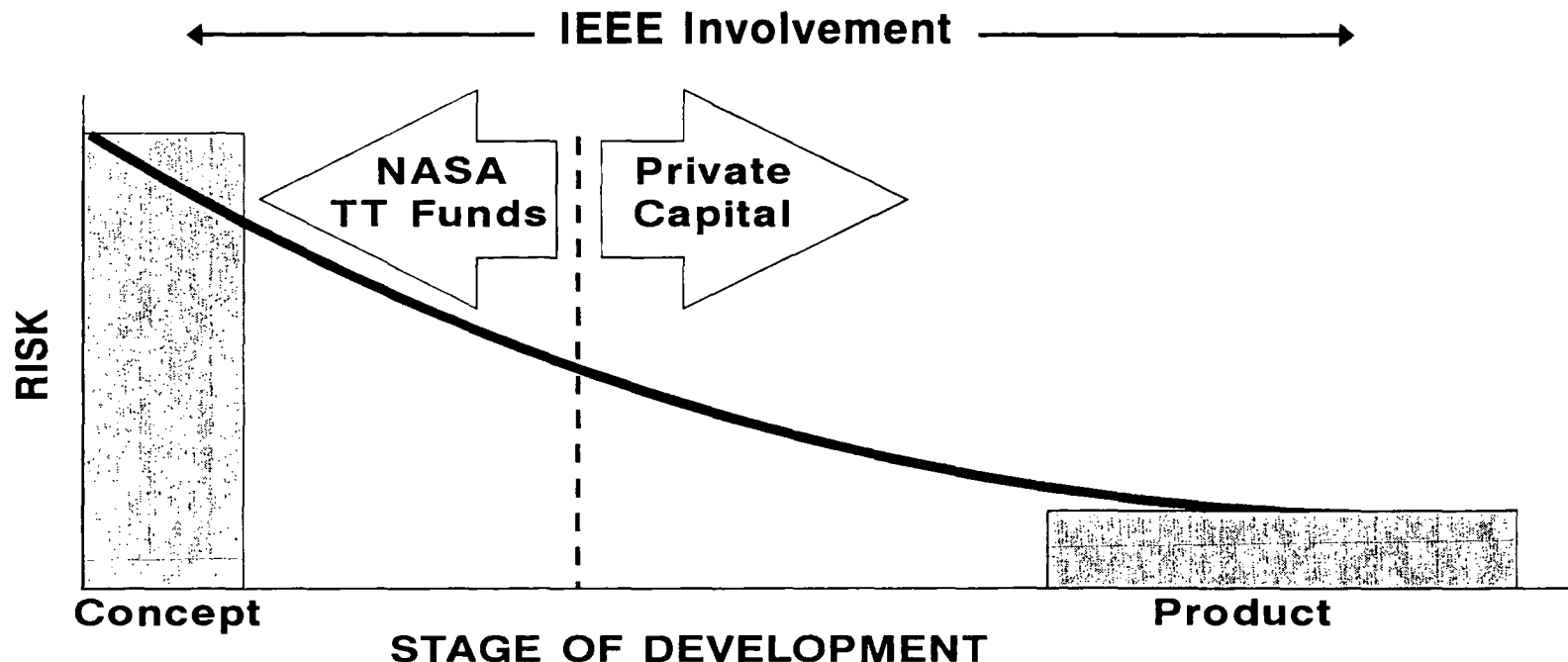
NASA programs which have direct market benefit should be evaluated in terms of risk and cost vs. expected reward to the U. S., as indicated below for the aeronautics program:

<u>Regime</u>	<u>Overall Risk</u>	<u>Reward Time</u>	<u>NASA Investment</u>
<i>Hypersonic</i>	<i>High</i>	<i>20 years</i>	<i>Low</i>
<i>Supersonic</i>	<i>Medium</i>	<i>10 years</i>	<i>High</i>
<i>Subsonic</i>	<i>Low</i>	<i>Immediate</i>	<i>Medium</i>

Conclusion: NASA appears to be apportioning its Aeronautics program appropriately.

Issue #6: Technology Transfer and Commercialization

NASA should fund the high-risk, early stages of technology development, enabling technology transfer where venture capital, investment bank funds, or other private funds can commercialize the product(s). *Technology Transfer is a contact sport.*



RECOMMENDATIONS

IEEE-USA recommends that NASA:

- ... regain the confidence and interest of the American people by actively promoting a relevant, achievable vision statement.
- ... stop the erosion of funding for the uniquely-crucial Earth Observing System (EOS) program and EOSDIS.
- ... work closely with U.S. business to reduce the cost of access to space, to promote space commerce, and to keep our aeronautics industry the best in the world.
- ... continue to improve and expand its technology transfer efforts so that U.S. industry will be able to benefit from "first rights" to advanced R&D from the U.S. space program.

IEEE-USA OSTP BRIEFING

TOPIC 3

Government Information Access by Small Business:

The Federal Government has undertaken various initiatives to improve the dissemination of technology and information resulting from Federally-sponsored R&D efforts. While these efforts have proven beneficial to large industry, small business continues to find it difficult to access and take advantage of these resources. This is unfortunate since small business, particularly in the high-tech sector, holds the key to growth of the American economy. IEEE-USA would like to share some ideas on the need and mechanisms to improve small business access and utilization of government technology resources and information.

Malcolm Smith

Malcolm Smith graduated from Kings College, London University with special honors in Physics. He completed the Postgraduate Apprenticeship Program with the English Electric Company before joining Hewlett Packard as a sales engineer in 1967. Smith has 26 years of senior managerial and engineering experience in high technology business with H.P., with responsibilities ranging from systems engineering and manufacturing to field sales and product marketing and corporate procurement. With HP's support, Smith served as an IEEE-USA Executive Fellow on the staff of the Under Secretary of Technology in the U.S. Department of Commerce from 1991-1993. Malcolm Smith left H.P. in May 1993 to remain in Washington and establish a private consulting practice. He is a member of the IEEE-USA's Committee on U.S. Competitiveness and chairs their Executive Fellowship Task Force. He also interacts with committees of the Technology Policy Council.

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television, radio, magazines, and at many conferences) on many issues including computer and network security, criminal justice and judicial users of computers, the future of intellectual property in a digital world, and access to government information on-line. Mr. Tenney is a Senior Member of the IEEE having served on the IEEE-USA's Intellectual Property Committee for many years, serves on the Information Security & Applications subcommittee of the IEEE-USA's Committee on Communications and Information Policy, and is a member of the Association of Computing Machinery.

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Government Information Access by Small Business

OSTP Briefing

by

IEEE - USA

4 October 1994

Small Businesses Are Changing

Businesses are reducing full-time staffing

- **Fewer employed engineers**
- **More self-employed consultants**

Smaller businesses tend to be service businesses

Many small businesses have fewer than 20 employees

More businesses use high-tech ways to obtain and share information

Small Business View of Government Data

It is difficult to locate the data

**Data is not always usable even when you
have it**

Much government data is still too expensive

**Many small businesses don't know how to
apply the information once they have it**

Make the Data Affordable and Available

Use and enhance GILS and access to GILS

Make the data accessible across a wide range of computers in a consistent manner

Subsidize more local points of access to government data

- Both on-line and “walk-in” points accessible to the public

Continue making more and more government information available on-line

- Free whenever possible, lowest marginal cost otherwise
- On the GII (e.g. the internet) whenever possible
- Encourage inter-agency use of on-line information

Assist Businesses in Applying the Information

**Identify more information that should be made
available**

**Identify and support local programs in which
industry, academia and government work
together to help small businesses**

- **Network these programs nationally**
- **Encourage agencies to cooperate with these programs**

**Produce and distribute inexpensive videotapes of
government briefings and seminars**

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Arrest Made In Calling Card Fraud

By Sandra Sugawara
Washington Post Staff Writer

Federal authorities said yesterday they have uncovered one of the largest telephone calling card fraud operations ever. An employee at MCI Communications Corp. stole more than 50,000 calling card numbers that were used to make about \$50 million in long-distance calls, they alleged.

Ivy James Lay was alleged to have used specially designed software that could recognize and record calling card numbers and personal identification numbers as they were sent over MCI's long-distance tele-

See PHONES, C12, Col. 1

MC Worker Charged With Card Fraud

PHONES, From C1

phone network, according to Secret Service special agent James E. Bauer.

The stolen numbers were from calling cards issued by MCI, AT&T Corp., Sprint Corp. and other small long-distance and local telephone companies. Numbers also were stolen from conventional credit cards that can be used to charge calls.

Bauer said federal authorities believe that the numbers were then sold to a network of computer users in the United States and Europe.

MCI said that Lay, known in computer hacking circles as the "Knight Shadow," was a technician who worked at a telephone switching facility in Cary, N.C. He was arrested last week, officials said, and charged with access device fraud. He could face up to 10 years in prison if convicted.

Tom Cochran, a federal public defender in Greensboro, N.C., who is representing Lay, said his client is declining to comment. Cochran said that Lay is out on bail.

MCI spokeswoman Leslie Aun said Lay was fired after the arrest, which was reported yesterday by the Los Angeles Times.

The alleged theft of the numbers mirrors techniques that are sometimes used on the Internet computer network. Special software that is secretly put on computers that are part of the network collect computer passwords as they flow on the network.

When customers make long-distance calls using calling cards, they generally punch in their calling card number and personal identification number before speaking.

Bauer said that Lay is alleged to have installed software in call-routing equipment at a facility where he worked, that could record calling card numbers. Lay then allegedly sold the numbers to individuals in Southern California, who in turn are alleged to have sold the numbers to people throughout the United States, including Seattle, Philadelphia, Minneapolis and Chicago, Bauer said.

Those individuals then allegedly sold the numbers again, principally to computer users in Europe. They are said to have used the card numbers for lengthy calls to computer bulletin boards in the United States.

Bauer said Lay is the only person arrested so far, but that several search warrants were served last week across the country. Federal investigators believe that up to 12 other

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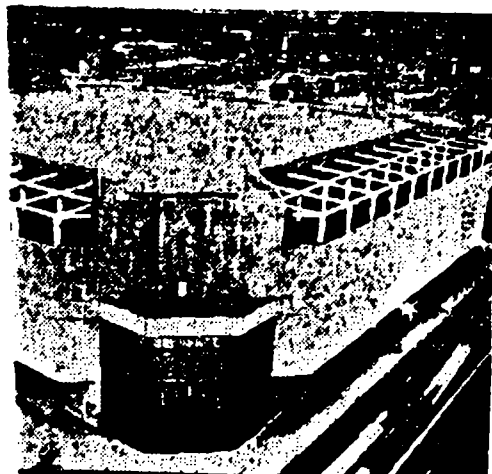
Bauer said the Secret Service investigation began last May when officials of MCI, Sprint and AT&T met with Secret Service officials, under whose jurisdiction interstate computer crimes fall. The industry officials said that after observing an unusually high level of fraud, the three companies had launched internal investigations, which indicated that the problem was in the Charlotte area, said Bauer.

Aun said this fraud differed from others encountered by the telephone industry in size and technique. She said most fraud is much smaller and involves people looking over customers' shoulders at airports as they punch in their credit card numbers or listening as they read them to operators.

The telephone companies said that customers will not be billed for fraudulent calls that they did not make.

Wash Post
4 Oct 94

to Wall Street





UNITED STATES ACTIVITIES

Promoting Career and Technology Policy Interests of Electrical, Electronics and Computer Engineers

Tech Div
- Wed discussion
cc: Kitty
Mike
Henry
Rich
Ed

FOR DISCUSSION @
NOON STAFF MTG 5/11

United States Activities Board

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May 3, 1994

Mr. Lionel S. Johns

Associate Administrator for Technology
Office of Science and Technology Policy
Old Executive Office Bldg.
17th Street & Pennsylvania Ave., N.W.
Washington, DC 20500

Dear Mr. Johns:

During a February meeting with David Ostfeld and Scott Grayson, you expressed an interest in IEEE-USA's discussion of the Administration's technology policy plans and progress. It was agreed that we would prepare a list of topics on which we could offer specific feedback and ideas in a briefing format. You indicated that you would then determine who within OSTP would have interests in those topics and establish a convenient date.

We have reviewed the basic Administration reports on technology policy, i.e., "Technology for America's Economic Growth: A New Direction to Build Economic Strength," dated February 22, 1993, and "Technology for Economic Growth: The President's Progress Report," dated November 1993. Based on that review, we applaud the comprehensiveness of the President's program and support nearly everything that is within both documents. We also acknowledge that much has been accomplished since January 1993.

IEEE-USA is particularly supportive of the programs/actions undertaken in the following areas:

- * Encouraging public-private alliances to tackle technology challenges;
- * Working with/through industry to develop technology roadmaps;
- * Opening up foreign markets to U.S. technology products and services;
- * Focusing defense R&D on dual use technologies and products;
- * Investing in aeronautics;
- * Improving advanced manufacturing technology; and
- * Spreading knowledge to, and improving training of, the U.S. work force.

We commend you for being open and seeking new and creative ideas for building on what has been accomplished to date. In that spirit, we would propose the following additional subjects as potential briefing topics for your consideration. We would be pleased to present our views and recommendations on all or any of these subjects at a mutually convenient time in whatever format you deem appropriate.

1. **Technology Information/Access by Small Business:**

The Federal Government has undertaken various initiatives to improve the dissemination of technology and information resulting from Federally-sponsored R&D efforts. While these efforts have proven beneficial to large industry, small business continues to find it difficult to access and take advantage of these resources. This is unfortunate since small business, particularly in the high-tech sector, holds the key to growth of the American economy. IEEE-USA would like to share some ideas on the need and mechanisms to improve small business access and utilization of government technology resources and information.

2. **Government Outreach to Industry:**

The Administration's technology policy encourages public-private partnerships. These partnerships are critical as one means of providing private-sector input and direction to Federal technology efforts. IEEE-USA believes that other mechanisms are needed to help government better draw upon private-sector advice, as well as reforms to current law (e.g. Federal Advisory Committee Act), which are necessary to enable/facilitate private-sector input and interaction.

KG
3. **Better Utilization of the Federal Laboratories:**

While recognizing that their missions, facilities, and technical capabilities vary widely, IEEE-USA believes that collectively the Federal laboratories are national resources that make significant contributions to technology development and commercialization, but which must be better utilized if they are to survive post Cold War restructuring. IEEE-USA has ideas on means for enhancing cooperative R&D involving academia, industry, and the Federal laboratories that builds and expands upon the current emphasis on Cooperative Research and Development Agreements.

mw
4. **Information Security:**

Rapid advances in information and encryption technologies, their utilization by the private-sector, and their importance as a commercial export market have outdated existing public policy on information security and export controls which was rooted in Cold War national security considerations. The current debate over the "Clipper Chip" represents one needed effort to come to grips with new policy to serve the broad public interest. IEEE-USA has recommendations on information security and encryption policy.

5. **Medical Technology and Health Care:**

Although there is great emphasis currently being placed on reform of the health care system, relatively little attention is being given to the role that medical technology can and should play in improving the delivery and quality of health care, as well as containing the overall cost. IEEE-USA is attempting to fill this gap by hosting a major conference on "The Role of Technology in the Cost of Health Care" in Washington on April 27-29th. Medical devices also represent an important industry segment that is under increasing pressure from foreign competition. IEEE-USA can present our observations on the role of technology in health care and ensuring continuing U.S. technological leadership in this area.

6. **NASA's Future:**

IEEE-USA believes that NASA must play a more explicit role as one of the Administration's technology policy "engines for economic growth." We endorse NASA Administrator Dan Goldin's emphasis on "smaller, cheaper, faster." We also have ideas on how NASA's resources and expertise can be more clearly applied to national needs, including paving the way for industry efforts to commercialize space in a significant fashion.

7. **Improved Economics for Manufacturing:**

IEEE-USA has taken the view that one of the principal competitiveness issues confronting high tech industry is a lack of patient, long-term, low-cost capital for investment in manufacturing plant and processes. Believing this to be a critical need, IEEE-USA has some concepts regarding means to encourage such capital formation and investment.

8. **Science, Engineering, and Technician Retraining Assistance:**

The end of the Cold War and defense down-sizing have resulted in significant lay-offs and underutilization of scientists, engineers, and technicians employed in both the public and private sector. These highly-trained "wealth-producers" can continue to make significant contributions to our economy with targeted assistance to help them make effective career transitions. IEEE-USA has ideas on how the Federal government can help displaced engineers help themselves in a cost-effective, beneficial fashion.

We have identified individuals with expertise in each of the subject areas for the purpose of presenting IEEE-USA's ideas in a briefing. Their comments would represent the considered judgment of U.S. IEEE members with expertise in the subject fields as endorsed by IEEE's United States Activities Board on behalf of IEEE's U.S. membership. IEEE-USA promotes the career and technology policy interests of the nearly 250,000 electrical, electronics, and computer engineers and allied scientists who are U.S. members of the IEEE.

We look forward to your response as well as an indication of which issues our input would be of most use to you and your staff. Please contact Chris Brantley in our Washington office at (202) 785-0017 if you have any questions or need assistance.

Sincerely,

A handwritten signature in black ink, appearing to read 'C. K. Alexander, Jr.', with a stylized flourish at the end.

Charles K. Alexander, Jr., Ph.D., P.E.
Vice President, Professional Activities
and
Chairman, United States Activities Board

Talking Points for IEEE Speech

1. Administration technology policy focuses explicitly on partnerships with industry to promote economic growth and the creation of good jobs.
2. President Clinton has announced intention to move from dominance of military in Federal R&D to roughly fifty-fifty for military on the one hand and civilian on the other.
3. *Talk Budget*
We are emphasizing competitively selected, cost-shared partnerships with industry in dual use and civilian technologies. TRP -- Clinton Administration initiative, got an overwhelmingly enthusiastic response, we're increasing funds for it. ATP -- we've already increased it from \$68 million to \$200 million, have asked for \$450 million next year. Both TRP and ATP require a commercialization plan from industry partners. We're also strongly supporting dual use CRADAs in DOE, DOD and NASA labs.
4. Technology deployment -- manufacturing extension -- is also important for competitive success of American industry. We're helping small and medium size manufacturers perform better, thus helping both themselves and the large firms for which they are suppliers.
5. Other policies important to industry include education and training, export policy (e.g., lifting bans on computer exports), 3-year extension of R&D tax credit, favorable capital gains treatment for small business etc (see Progress Report for BRIE conference, Nov. 93)
6. NSTC role, committees especially relevant to commercial success, especially CIT with its Clean Car initiative, National Electronics Manufacturing Initiative, Building and Construction Initiative, and continuing support for Manufacturing Infrastructure.

Apologies for rough notes. I'm in a tearing hurry. Good luck at IEEE.

Kitty

*NSTC Parallel to NSEC
9 Committees —
Strategic Guidance*



IEEE

UNITED STATES ACTIVITIES

Promoting Career and Technology Policy Interests of Electrical, Electronics and Computer Engineers

United States Activities Board

March 17, 1994

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Manpower
Pensions

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(202) 785-0835

Lionel S. Johns

Associate Director for Technology and Space

Executive Office of the President

Office of Science and Technology Policy

Washington, D.C. 20500

Dear Mr. Johns:

Once again it was a pleasure meeting with you. We wanted to thank you for accepting to speak on May 20th at IEEE-USA's symposium on technology transfer and intellectual property.

We would like you to speak for 15-20 minutes offering the White House perspective on how government can assist private industry in commercializing technology and what you see for the future.

Other confirmed speakers are: Bruce Lehman, Assistant Secretary of Commerce and Commissioner of the U.S. Patent and Trademark Office, Joseph Allen, Director of the Federal Technology Transfer Center, Beverly Berger, Federal Laboratory Consortium and Joseph Papavitch, Deputy Assistant U.S. Trade Representative for Intellectual Property.

We plan to have 50-60 invited guests. Among them will be representatives from IBM, Apple, Sun, Computer & Communications Industry Association (CCIA), National Association of Manufacturers (NAM), and the Software Publishers Association (SPA).

Johns Letter
Page 2

The symposium will be held at the Madison Hotel, located at 15th & M Streets, N.W., Washington, D.C. on May 20, 1994 at 9:00 a.m. - 12 p.m. If you would like additional information please contact Scott Grayson at IEEE-USA: (202) 785-0017.

We are pleased that you will join us at this symposium.

Sincerely,

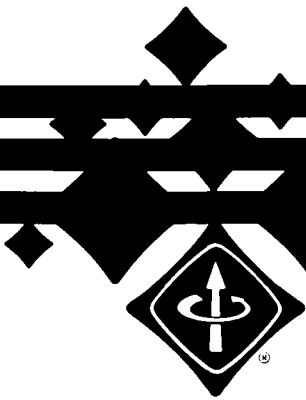

David M. Ostfeld

Chairman, Government Activities Council &
Vice Chairman, Intellectual Property Committee



SCOTT D. GRAYSON
Manager, Career Activities

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
1828 L STREET, N.W., SUITE 1202, WASHINGTON, DC 20036-5104 U.S.A.
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ENTITY POSITION STATEMENT

REVERSE ENGINEERING

The Institute of Electrical and Electronics Engineers, Inc.

1828 L STREET, NW SUITE 1202, WASHINGTON, DC 20036-5104
(202) 785-0017

This statement was developed by the Intellectual Property Committee of the United States Activities Board of The Institute of Electrical and Electronic Engineers, Inc. (IEEE), and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. The IEEE United States Activities Board promotes the career and technology policy interests of the 240,000 electrical, electronics, and computer engineers who are U.S. members of the IEEE.

We encourage the protection of intellectual property rights associated with each computer software product sold in domestic and international markets, including copyrights, trademark rights, trade-secret rights, and patent rights. We believe that the development of high value software products in the United States should be encouraged by promoting (1) the incorporation of high intellectual work content into these computer software products and (2) the establishment and maintenance of worldwide protection for the intellectual property rights associated with this intellectual content.

We also believe that the high intellectual content of a computer product and competition are enhanced when computer products developed by one vendor are capable of operating with computer products developed by another vendor. This compatibility promotes the development of interoperable products by independent and competing vendors and, therefore, promotes enhanced value to the vendee at a competitive price.

The authors of the Constitution realized that scientific and cultural advantages would be fostered by providing legal protection for limited periods of time to the originators of intellectual property. Congress passed the Copyright Act to provide authors, including computer programmers, exclusive rights to the expression contained in their work. On the other hand, Congress did not, under Copyright Act, protect the ideas contained in that expression. Rather, Congress desired that the ideas contained in works, including computer programs, should be available for use by and to reach others. Accordingly, we consider that it is appropriate to perceive and learn those ideas by lawful means of reverse engineering.

We further believe that lawful reverse engineering of computer programs is fundamental to the development of programs and software-related technology. The term "reverse engineering" means the discovery by engineering techniques of the underlying ideas and principles that govern how a machine, computer

IEEE United States Activities Board

Approving Entity

November 1993

Date

program or other technological device works. Engineers use this information for many purposes, including making other products interoperate with the target product that is the subject of the reverse engineering. Engineers also use this information for the purpose of designing competing products that are not substantially similar in expression, as well as to discover patentable subject matter and ideas not otherwise disclosed in the literature provided with the product by the originator. We further believe that lawful reading, analysis, or disassembly of machine language is a reverse engineering technique by which an engineer can reconstruct the ideas of a computer program.

Accordingly, an engineer having the right to use a copy of a computer program should be entitled, without the authorization of the author, to observe, study or test the functioning of the program, in order to determine the ideas that underlie the program, if it is accomplished while performing any of the acts of reading, displaying, running, transmitting, receiving, or storing the program or other lawful acts involving the program that the engineer is entitled to do.

We support the fair use rulings in the recent Appellate Court decisions in the Ninth and Federal circuit, in Sega Enterprises vs. Accolade, 977F.2d 1510 (9th Cir. 1992) and Nintendo vs. Atari, 975F.2d 832(Fed Cir. 1992) pertaining to disassembly of computer code.



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INTELLECTUAL PROPERTY PROTECTION

The Institute of Electrical and Electronics Engineers, Inc.

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The Constitution of the United States calls for Congress "to promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries". Since this was written, there have been many changes in our Patent and Copyright laws; nevertheless, the innovator of new intellectual property faces today a system which is expensive, unwieldy, and often ineffective. We support the following action:

1. Seek ways of effectively protecting new technologies by amendment of the patent and copyright laws; where this is not appropriate, seek ways of evolving new forms of legal protection. Immediate goals would include formulating methods of providing better protection for easily copied products such as computer software and semiconductor chips and other intellectual property rights.
2. Reduce the cost and complexity of obtaining and enforcing patents so that independent engineers and small business concerns will have greater incentive to conduct research and development leading to inventions. Specific objectives would support investigating the means to and would endorse legislation that would:
 - * enable decreases in Patent and Trademark Office fees for "small entities".
 - * enable the Patent and Trademark Office to be more responsive and provide greater assistance to inventors who are prosecuting their own applications and to extend such assistance to all inventors, their agents and their attorneys.
 - * enable the courts to minimize litigation costs.

IEEE United States Activities Board

Approving Entity

February 1990

Date

3. Work for enactment of legislation that would stimulate creative and inventive activity in the U.S. by providing additional incentives to independent and employed originators. For example, a bill setting Federal standards for permissible pre-invention assignment agreements would permit employers to take title only to those inventions directly resulting from the work the engineer does for the company and thus would encourage employed engineers to make inventions outside the scope of their employment in addition to those made on the job. (See USAB Entity Position Statement on Pre-Invention Assignment Agreements for this example).



ENTITY POSITION STATEMENT

WORLD INTELLECTUAL PROPERTY RIGHTS

The Institute of Electrical and Electronics Engineers, Inc.

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Although the Constitution of the United States provides for Congress "to promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries," it does not provide for equitable international intellectual property protection.

In today's global market, it is more important than ever for U.S. inventors to remain competitive with foreign nations. One way to enhance U.S. competitiveness is to establish a standardized and harmonious patent system. Because patent subject matter is different for various countries, U.S. inventors have difficulty obtaining patents in other countries. In most countries patent applicants must have their patent applications translated from their native languages to foreign languages, and filed and prosecuted separately in each country. Inventors must provide multiple translations, pay multiple filing and handling fees, understand differences in the types of claims that can be filed in each country, and contend with the lack of international intellectual property rights enforcement.

In order to protect products and be competitive, we must strive toward achieving a harmonious intellectual property system. Therefore, we support the development of a world patent system that would:

- * Institute a worldwide standard of patent examination so that allowance of a patent application to issue a patent would be uniform. In this manner, U.S. inventors will not be faced with multiple criteria for patentability, such as software patent ability, but can be assured of a uniform system for testing whether a patent will issue.

IEEE United States Activities Board

February 1992

Approving Entity

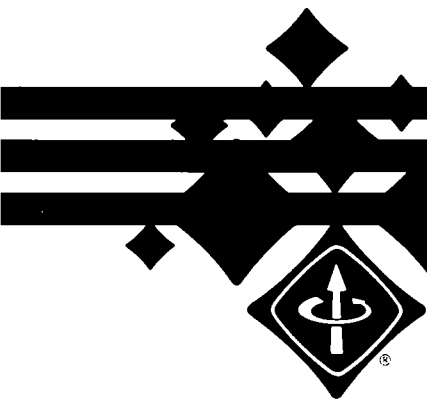
Date

- * Allow international patents to be issued through single filing in the home country, so that only one prosecution of an application and one filing fee would be necessary. In this manner, if engineers file their applications in the United States convince the Patent Office through prosecution of applications before the Patent Office in the United States that they have valid patents that should be issued, those same patents would be considered valid in foreign countries without additional translations or additional prosecutions outside of the home country.¹¹
- * Reduce costs to U.S. inventors in obtaining foreign intellectual property protection by avoiding multiple filings and prosecution of applications and developing trans-labor costs.
- * Allow U.S. inventors to obtain foreign intellectual property protection more rapidly by prosecution through the U.S. Patent and Trademark office.
- * Make accessible to emerging nations the services of the U.S. Patent and Trademark office to expedite patent protection for U.S. citizens in such countries.

In addition, we support the following U.S. government international intellectual property negotiations:

- * World Intellectual Property organization (WIPO) negotiations.
- * Trade-Related Intellectual Property Section of the General Agreement on Tariffs and Trade (GATT).
- * Proposed Intellectual Property Section of the North American Free Trade Agreement.

Further, we support uniformity with respect to copyright protection for computer software. It is vital to the future of U.S. competitiveness that U.S. inventors' intellectual property rights are protected internationally.



ENTITY POSITION STATEMENT

COMPUTER INDUSTRY PATENTS

The Institute of Electrical and Electronics Engineers, Inc.

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(202) 785-0017

This statement was developed by the Intellectual Property Committee of the United States Activities Board of The Institute of Electrical and Electronics Engineers, Inc. (IEEE), and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. The IEEE United States Activities Board promotes the career and technology policy interests of the 240,000 electrical, electronics, and computer engineers who are U.S. members of the IEEE.

We encourage the protection of all intellectual property rights associated with computer-based products sold in domestic and international markets, including copyrights, trademark rights, trade-secret rights, and patent rights. Therefore, we believe that the development in the United States of high value software products that control programmable machines to achieve useful, novel and unobvious products and processes should be encouraged by promoting (1) the incorporation of high intellectual content into these computer software products and (2) the establishment and maintenance of worldwide protection for the intellectual property rights associated with this intellectual content.

Patents have been an important factor in motivating business leaders and investors to finance the research and development necessary to create new products and new technologies. The U.S. patent laws provide that a person is entitled to a patent on an invention that is useful, novel and unobvious over art known at the time of the invention.

We specifically recommend the patenting of computer program-related inventions that meet the strict statutory criteria imposed for patents. Engineering work product in the computer arts that meets the statutory criteria should be eligible for patenting, without discrimination, just as inventions in any other technology.

However, we also believe that improperly granted patents in any technical area hinder industry and the advancement of technology. It is important to ensure high quality examination by U.S. Patent & Trademark Office Examiners in computer technology. We also specifically recommend:

- (1) That the U.S. Patent & Trademark Office take all necessary steps to improve the collection of prior art used by the Patent Examiners in making patentability decisions in computer program-related inventions; and
- (2) That the U.S. Patent & Trademark Office take all necessary steps to raise and maintain the level of accessibility and search methodology in computer program-related examining to help ensure that only quality patents are issued.



UNITED STATES ACTIVITIES

Promoting Career and Technology Policy Interests of Electrical, Electronics and Computer Engineers

March 22, 1994

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FAX
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Dr. Anita K. Jones
Director, Defense Research and Engineering
U.S. Department of Defense
The Pentagon, 3E1014
Washington, DC 20301

Dear Dr. Jones:

I am writing to you in your capacity as Chair of the National Science and Technology Council's Committee on Information and Communication R&D to express the Institute of Electrical and Electronics Engineers - United States Activities (IEEE-USA) support for your on-going efforts to develop and coordinate sound Federal science and technology policy in this critical area. As the world's largest technical professional society, IEEE is pleased to offer whatever assistance we can provide to help you and the committee in that regard.

We understand that advisory working groups are in the process of being established to provide a mechanism for private sector advice and input to each of the newly formed committees of the National Science and Technology Policy Council. IEEE is pleased to recommend Drs. Larry A. Coldren, Irwin Dorros, Rui J. P. deFigueiredo, George Providakes, Andrew P. Sage, and Will Stackhouse to you as highly qualified IEEE members willing to serve in such an advisory capacity to the Information and Communication R&D committee. Attached is biographical and contact information on each individual.

Thank you for your consideration. Please contact Tom Suttle, director of IEEE-USA's Washington office, at 202-785-0017 if we can be of any further assistance.

Sincerely,

Charles K. Alexander, Jr., Ph.D, P.E.
Vice President, Professional Activities

Encls.

cc: S. Johns

IEEE-USA, 1828 L Street, N.W. Suite 1202, Washington, DC 20036-5104

The Institute of Electrical and Electronics Engineers, Inc.

Forward to A.P-D

Larry A. Coldren, Ph.D.

Professor of Electrical
and Computer Engineering
University of California
at Santa Barbara
Santa Barbara, CA 93106

Dr. Larry Coldren received the B.S. in electrical engineering and the B.A. in physics from Bucknell University (1968), and the M.S. (1969) and Ph.D. (1972) in electrical engineering from Stanford University. He spent 13 years in the research area at Bell Laboratories, working initially on various ultrasonic devices and then on III-V semiconductor integrated optics. In both instances, the development of new fabrication techniques were central to his research. In 1984, he was appointed professor of Electrical and Computer Engineering at the University of California at Santa Barbara. In 1989, Dr. Coldren became Associate Director of the NSF-supported UCSB Science and Technology Center (QUEST). In 1990, he became Director of the multi-campus APA Optoelectronics Technology Center. Dr. Coldren holds 25 patents and has published over 250 papers in the areas of ultrasonic signal processing, III-V microfabrication techniques, tunable diode lasers, waveguide modulators and switches, surface-emitting lasers and modulators, quantum-wire device design, and in situ fabrication.

A Fellow of the Institute of Electrical and Electronics Engineers, Dr. Coldren served as IEEE's Vice President for Technical Activities (1991-1992). He is also a Fellow of the Optical Society of America and a member of Tau Beta Pi, Sigma Pi Sigma, Pi Mu Epsilon, and Phi Beta Kappa honorary societies.

Recommended for service with the advisory working group on Information and Communication R&D.

Rui J. P. deFigueiredo, Ph.D.

Department of Electrical and
Computer Engineering
University of California-Irvine
Irvine, CA 92717
Office: (714) 856-7043
Fax: (714) 725-3408
Internet: rui@uci.edu

Dr. deFigueiredo holds the B.S. and M.S. from the Massachusetts Institute of Technology (1950) and a Ph.D. from Harvard University (1959). Since 1990, Dr. deFigueiredo has served as Professor of Electrical and Computer Engineering and Mathematics at University of California at Irvine. He is the Founder and head of the Laboratory for Machine Intelligence and Neural and Soft Computing, which is engaged in joint R&D activities with the McDonnell Douglas Aerospace Company in Huntington Beach, California. Prior to joining the University of California, he was Professor of Electrical and Computer Engineering and of Mathematical Sciences at Rice University (1965-1990). Dr. deFigueiredo is Founding Chair of the NASA/JSC Universities Space Automation and Robotics Consortium, a research consortium consisting of NASA's Johnson Space Flight Center, Rice University, University of Texas at Austin, Texas A&M University, and University of Texas-Arlington. In addition to founding the Laboratory for Machine Intelligence at University of California-Irvine, he has also been involved in the creation and development of the Laboratory for Nuclear Physics and Engineering in Portugal (1960), the Image Processing Laboratory at Rice University (1978), and the Cooperative Intelligent Mobile Robot Laboratory at Rice (1988). Dr. deFigueiredo's contributions to research include work on applied mathematics and engineering applications reported in 3 books, 10 book chapters, and 86 journal articles, and 134 conference papers. His work has made a major impact on underwater seismic acoustic signal processing, on space robotics for use with the space station program, and neural network analysis.

Dr. deFigueiredo is a Fellow of the Institute of Electrical and Electronics Engineers and IEEE's Circuits and Systems Society. He is also a member of the Society of Photo-optical Instrumentation Engineers (SPIE) and the Society of Industrial and Applied Mathematics. A member of Eta Kappa Nu and Sigma Xi, he has received numerous honors and awards.

Recommended for service with the advisory working groups on Fundamental science and engineering research, International Science, Engineering, and Technical R&D, Information and Communication R&D, and/or Education and Training R&D.

Irwin Dorros, Ph.D.

3 Cobblestone Lane
Morris Township, NJ 07960
(Phone) (201) 285-1266
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Dr. Irwin Dorros retired in 1993 as Executive Vice President, Technical Services for Bell Communications Research (Bellcore). Dr. Dorros was responsible for the entire work program of Bellcore, a \$1 billion research and development organization of 5,000 scientists, engineers, and software specialists. Responsibilities included research, systems engineering, software design, quality assurance, technical standards planning, network planning, and other technical services. Having begun his career with the Bell Telephone Laboratories in 1956, Dr. Dorros also served as Assistant Vice President for Network Planning with AT&T (1978-1982) and Executive Director, Network Planning, Bell Telephone Laboratories (1973-1978). Dr. Dorros has served on numerous corporate and advisory boards, including the FCC Advisory Committee on Advanced Television Services (1987 to present), the Board of Directors of the Microelectronics and Computer Technology Corporation (1984-1993), the Board of Advisors for the Carnegie-Mellon University's Department of Electrical and Computer Engineering (1991-1993) and the National Research Council's Committee on Electronic Postal Service (1979-1981). He holds 5 patents and has published over 50 papers in technical and trade journals. Dr. Dorros received the B.S. and M.S. in electrical engineering from the Massachusetts Institute of Technology (1956) and the Doctorate of Engineering Science in electrical engineering from Columbia University (1962).

A Fellow of the Institute of Electrical and Electronics Engineers, Dr. Dorros is also a member of the National Academy of Engineering, Eta Kappa Nu, Tau Beta Pi, and Sigma Xi honorary societies.

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Dr. Providakes holds the B.S. in electrical engineering from the Massachusetts Institute of Technology (1971) and the Ph.D. in electrical engineering from Cornell University (1985). Following military service as a communications and engineering officer (1971-1976), Dr. Providakes began his professional career with the MITRE Corporation in 1982. He is currently Associate Technical Director for Communications where he serves as Chief System Engineer and Program Advisor for ESC/TG Air Space Management and Communications Directorate. Previously he served as Department Head for UHF and SHF Satellite Communications (1990-1992), and as Associate Department Head for Advanced Technology and Systems for Satellite Terminals (1987-1990). As a member of the technical staff in the MITRE satellite terminal division, he served as Group Leader (1985-1987), supporting the MILSTAR "core" terminal acquisition system for RF subsystems and optical/RF systems in MILSATCOM terminals. While at Cornell University, Dr. Providakes worked on research to develop diagnostics and perform measurements on slow space charge waves on an intense relativistic electron beam (IREB) (1979-1982) and research to develop an mm-wave free electron laser using rippled magnetic fields and IREB (1976-1979). He has authored numerous technical articles and papers.

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Dr. Andrew Sage received the B.S.E.E. degree from the Citadel, the S.M.E.E. degree from Massachusetts Institute of Technology and the Ph.D. from Purdue, the latter in 1980. He received a Doctor of Engineering *Honoris Causa* degree from the University of Waterloo in 1987. Dr. Sage has been a faculty member at the University of Arizona, the University of Florida, and Southern Methodist University. He has had industrial and consulting experiences with several firms. At SMU he was the Head of the Electrical Engineering Department and Director of the Information and Control Sciences Center. From 1974 through 1984 he was the Lawrence R. Quarles Professor of Engineering Science and Systems Engineering at the University of Virginia. During portions of this time, he was Acting Chairman of the Chemical Engineering Department, Associate Dean for Graduate Studies, and Chairman of the Department of Systems Engineering. In July 1984, he accepted a position as First American Bank Professor of Information Technology and Engineering at George Mason University and Acting Associate Vice President for Academic Affairs. In July 1985, he was appointed as the first Dean of the GMU School of Information Technology and Engineering. He is a member of the Board of Trustees of the CNA Corporation. His initial research concerned optimization, estimation, system modeling and identification, and communications and control systems design. His current interests include systems, engineering efforts associated with decision support, command and control, information system design and evaluation, and software systems engineering and management.

Dr. Sage is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and the American Association for the Advancement of Science (AAAS). He was President of IEEE's Systems, Man and Cybernetics Society for the period 1984-1985 and chaired SMC's annual conference in 1974 and 1987. He is also editor of the IEEE Transactions on Systems Man and Cybernetics, AUTOMATICA, Information and Decision Technologies, and the John Wiley textbook series on Systems Engineering. Dr. Sage is the recipient of numerous awards.

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Dr. Will Stackhouse is a technical expert and advisor on issues related to technology commercialization, microelectronics, supercomputing, advanced digital systems, and advanced materials. Dr. Stackhouse holds the B.S. in engineering science from the United States Air Force Academy (1964), the M.S. in engineering mechanics from the University of Michigan (1972), and a Ph.D. in engineering design and bioengineering from Oxford University (1977). After 31 years service, he retired from the U.S. Air Force in 1991 with the rank of Colonel, where he had served as Assistant for High Leverage Technology, trouble-shooting Air Force high technology programs. In that position, he was called upon to support NASA, the Departments of Commerce, State, and Defense on a variety of matters relating to procurement, acquisition policy, electronic or computing components and systems, national standards, intellectual property, security and counter intelligence, and export policy. He chaired four government/industry meetings, the Government Microelectronic Directors Meeting, the Government/Industry Computing Meeting, the Government Threat Meeting, and the "Critical Software" meetings and served on Defense Science Board Task Forces concerning commercial components and high resolution systems. After retirement, he continued to perform an equivalent job as the Assistant for High Leverage Technology at NASA's Jet Propulsion Laboratory. He is Dr. Stackhouse has received numerous professional honors and awards including special recognition by the President's Commission for the Handicapped for his research and services related to the handicapped (1979) and a "Laurel" presented by Aviation Week and Space Technology for his efforts in "advancing critical U.S. based technologies." As an Air Force officer, Colonel Stackhouse held both Command Pilot wings and the Master Space badge.

Dr. Stackhouse is a member of the Institute of Electrical and Electronics Engineers. He currently chairs IEEE-USA's Technology Policy Council and that Council's Committee on Communications and Information Policy. He has played a leading role in organizing a series of IEEE conferences and information exchanges related to high resolution systems and the national information infrastructure. He is also been involved with the Center for Strategic and International Studies, the Society of Motion Picture and Television Engineers, and the Hudson Institutes's Task Force on Competitiveness.

Recommended for service with the advisory working groups on Information and Communication R&D and/or National Security R&D.