



INTERNATIONAL COMMITTEE *on* ELECTROMAGNETIC SAFETY

Executive Committee

Chair:

Dr. John M. Osepchuk
978-287-5849

Vice-Chair:

Dr. Eleanor R. Adair
210-536-4698

Executive Secretary:

Ronald C. Petersen
908-582-6442

Treasurer:

Arthur G. Varanelli
781-860-1641

Membership:

Dr. Tom McManus
011-353-1-604-1023

International Liaison:

Dr. Michael R. Murphy
210-536-4833

IEEE Staff:

Sue Vogel
732-562-3817

Subcommittee Chairs

SC-1:

Howard I. Bassen
301-827-4950

SC-2:

Richard A. Tell
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SC-3:

Kent C. Jaffa
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SC-4:

Dr. C. K. Chou
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Dr. John A. D'Andrea
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SC-5:

John DeFrank
410-436-3353

G. Drew Koban
540-653-4296

Annual Report: 2000 – 2001

Executive Summary:

The membership of the International Committee on Electromagnetic Safety (ICES), SCC-28, has increased to 106. During the year we lost two loyal members, Drs. Charles Buffler and David Erwin whose support and contributions we will miss. We gained eight new members, 7 of which are non-US. Thus our present non-US membership is 25. With the leadership of Dr. Michael Murphy, Chairman of International Liaison and Dr. Tom McManus, Membership Chairman, ICES SCC-28 continues to become more international. After our first meeting outside the US in Munich, June 2000, many events have occurred to strengthen this international growth at a time the IEEE itself has adopted a global vision. (Membership trends indicate a 50% non US participation in IEEE by 2010). In November 2000 the meetings of SCC-28 and its subcommittees in San Antonio drew about 50 non US attendees most of whom were participants. At that time we joined with WHO (World Health Organization) in meeting to explore paths toward international harmonization of standards for the safe use of electromagnetic energy. The EXCOM of SCC-28 held its second closed meeting with the leadership of ICNIRP (International Commission on Non-Ionizing Radiation Protection). Plans continued for exchange of ideas and documents for review. A specific action was the decision to hold a joint workshop on Thermophysiology and its application to standards for EM safety.

In late 2000 a proposal for the creation of ICES was drafted. In its fullness ICES will have a new governing board with supporting members drawn from the organizations worldwide, which seek broad consensus standards, by due process of the IEEE in this field. A rationale for this action was written by the Chair of SCC-28, entitled *The ICES Imperative*. This document and a revised proposal were reviewed at meetings in New Jersey at IEEE headquarters in early 2001 followed with a meeting at Lexington, Massachusetts with Harry Epstein from the IEEE Standards Board.

SCC-28 was authorized to use the new name International Committee on Electromagnetic Safety (ICES). Action on forming a new governing Board and raising of funds was deferred. At present we are taking steps to initiate this work.

The ICES EXCOM is truly excited and gratified at the steady progress towards a truly international forum for broad consensus in the setting of safety standards in the area of electromagnetic energy, 0 to 300 GHz.

Other highlights during the year include:

- a) Recirculation and balloting of the draft Recommended Practice on safe distances between RF sources and electroexplosive devices;
- b) Approval by balloting of SC3 of a draft Standard on exposure limits for the frequency range of 0 to 3 kHz;
- c) Refinement of the draft Standard on measurement techniques by SC1 and the decision to change the lower boundary of the frequency covered from 3 kHz to 100 kHz;
- d) Further discussion by SC2 of the draft Recommended Practice on a work safety program;
- e) Extensive work was carried out by SC4 towards revision of C95.1 including the literature review and several meetings of the editorial committee and RAWG (risk assessment working group). The plans for public availability of the literature review database were reviewed and approved by SCC-28 and the Standards Board. During the year SC4 approved an interpretation of the “pinna” as an extremity, in response to a request from SCC-34.

The Executive Committee (EXCOM) met in San Antonio, Murray Hill, N.J., St. Paul, Minnesota, Kalispell, Montana and twice by teleconference. It approved the revision of the SCC-28 (ICES) operating procedures per the type 2 model SCC procedures recommended by the Standards Activities staff. It plans and arranges the main two meetings per year of the parent committee ICES SCC-28 and its subcommittees. It reviews and approves (or rejects) applications for membership. During the last year through its Chairman it has sent out decisions and explanations of interpretations when questions have been raised. We have been asked to comment on the documents of other organizations and have responded where possible. These organizations have included ICNIRP, ARPANSA (Australia) and WHO. The EXCOM, through Dr. Eleanor Adair, has been working with ICNIRP in preparing plans for a joint workshop on Thermophysiology and its relation to standards. Near the end of the year several issues were raised and will be addressed by EXCOM in the near future. One is the need for a policy on how we deal with the interface in standards between the ELF frequency range and associated stakeholder community (utilities and others) and the microwave/RF frequency range and its primary stakeholders (wireless industries, the military...) A policy is being drafted to encourage all SCs and WGs to aim at 100 kHz as the one unique and universally recognized boundary. The present Chairman has volunteered to draft a White Paper on the use of the words “safe” and “safety” in ICES documents. It is hoped this White Paper will help all IEEE personnel to understand the time-tested accepted use as terms of art and not a legal or philosophical statement or finding.

ICES has cooperated with other groups, e.g. TABD (Transatlantic Business Dialogue) and EEA (Electromagnetic Energy Association) in discussion of and opposition to the concept of the Precautionary Principle—which in Europe has been used to reject legitimate standards and to impose arbitrary and very low limits on environmental levels of EM energy.

The EEA was dissolved in 2001 in recognition of the transition from national points of view to global views. The archives and assets have been donated to ICES. It is hoped that some of the activities of EEA, such as their very successful Short Course will be continued under the auspices of ICES.

ICES continues to work closely with SCC-34, especially in its intense work toward a Recommended Practice on certification procedures for cell phones. ICES also works with SCC-34 in liaison with IEC TC-106 which is charged with development of standard procedures for assessment and measurement of EM fields regarding compliance with EM safety standards. There has been some sentiment for drafting documents on how product can be made to comply with exposure standards. We believe, per IEEE standards principles, that first proper recognition is necessary of the meanings of *exposure* standards as distinguished from *product performance* standards. Both the delegations of Canada and the US are supporting moves of TC-106 in this direction.

The leaders of ICES frequently are asked by the IEEE to respond to inquiries from the press and other people about standards and their relevance to various subjects. We attempt to do so with diligence and care and sometimes refer the questioner to other IEEE groups, like COMAR (Committee on Man and Radiation) of the EMB-Society for more detailed discussions through their TIS (Technical Information Statement) documents.

The present Chairman, in November 2000, announced his resignation as ICES Chairman, effective Sept. 1, 2001. We are happy to see this post filled by our present Vice Chairman, Dr. Eleanor R. Adair on Sept. 1. She is not only a distinguished leader in standards-setting but a leader in research on the effects of microwave exposure of humans through direct experiments.

Membership and Organization:

The organization of ICES SCC-28 has been discussed many times (cf. previous Annual Reports). The leaders of ICES and its Subcommittees are listed on the letterhead in a limited way—without mentioning Secretaries and others. We have a new Staff Liaison, Angela Ortiz who has been welcomed with our wishes for an enduring relationship. The key aspect in our membership growth is the emphasis on non-US members. We now have members from Australia, Bulgaria, Canada, China, Finland, Germany, Greece, Ireland, Italy, New Zealand, Slovenia, Sweden, Switzerland and the United Kingdom. The ICES members and many others from outside the US participate and are members of the Subcommittees. Under the leadership of Drs. McManus and Murphy we are confident that ICES will keep pace with the general trend in IEEE towards a global constituency.

The present roster of ICES SCC-28 is listed in the Appendix. In terms of stakeholders, one can see that we are well balanced. There is, however, a lack of representation from wireless industry groups. We hope to correct this in the future. We note that about 50% of this membership are IEEE members with a smaller number of SA members. This is to be expected and defended in view of the interdisciplinary nature of our members. We and the IEEE are

grateful for their voluntary contributions to ICES and it would be an unreasonable imposition to require IEEE membership. We do, however, require the leaders (e.g. Chairs) to be IEEE members.

Our total mailing list now is well over 350, which number includes the many volunteers in the Subcommittees. (The importance of the Subcommittees was reviewed in last year's Annual Report). Because of the increasing size and also the global nature of this mailing list, it has become impractical to continue our long-standing practice of sending to all hard copies in the Mail of our extensive documents—from minutes of meetings to white papers, etc. The parent Committee SCC-28 as well as SC-4, in the past have mailed substantial semi-annual bound (ring binders) collections of these documents. This practice fulfilled the tradition of openness, transparency and full documentation in the past activities of SCC-28 and its predecessors. In this new millennium, however, along with the IEEE, we are becoming mostly electronic in terms of document dissemination. We are in the process of determining E-mail addresses for all with the goal of 100% communication by E-mail except when required by the IEEE or other exigency to carry out mail by hard copy. We hope that all will establish an IEEE alias address which will better ensure contact in the future as member affiliations and locations change.

Besides recruitment, we have responded to many inquiries for information from outside the US. On occasion we have sent some individuals a complimentary copy of IEEE C95.1, 1999 Edition along with an invitation for their participation. Recently such communications have been made to leaders in Croatia, China and Peru.

ICES SCC-28 maintains many formal and informal liaison arrangements with other organizations. In the last year the IEEE-EMC Society requested a formal designation of a liaison. David Baron, of Holaday Industries was named official liaison to this group from ICES.

Activity:

For the past year, we compare the objectives (in italics), stated in last year's report with actual achievements during the year.

2000 – 2001:

SCC-28:

- *Continue to revise and update roster. Continue expansion of non-U.S. membership under the leadership of Drs. McManus and Murphy. Introduce new leadership within EXCOM and elsewhere with an emphasis on more participation by non-US members and younger members.*
 - As reported, above international expansion continues successfully. We now have 25 non-US members in the parent Committee ICES SCC-28 and many more among the volunteers for the Subcommittees. We hope soon to add one non-U.S. member to the EXCOM.
- *Review and confirm liaison arrangements between SCC-28 and other groups such as ICNIRP, IEC, CENELEC and national groups throughout the world. Continue closed*

Policy meetings with ICNIRP and explore possible jointly sponsored public forums on standards.

- The mentioned liaisons have all been strengthened. SCC-28 members participate in IEC TC-106, chaired by Ron Petersen. Representation from the SC3 (utility) community has been solicited on TC-106. SCC-34 maintains close relations with CENELEC. SCC-28 EXCOM held a meeting with ICNIRP leadership in November, 2000. Another is planned for late in 2001 in Luxembourg. A joint workshop plan is being developed by Dr. Eleanor Adair.
- *Work with IEEE staff on proposal to form the International Council on Electromagnetic Safety (ICES). Obtain Standards Board approval and carry out organizational tasks and begin fundraising.*
 - The proposal was developed, reviewed by IEEE staff and leaders of the IEEE Standards Board. The Board approved the new name with the substitution of “Committee” for “Council.” The Board deferred detailed review of the organizational action items and fundraising. It is planned to initiate the latter action items soon with the aid of IEEE staff.
- *Continue liaison with TABD and other industry groups, both US and non-U.S. Expand liaison with wireless industry groups.*
 - We have strong liaison with TABD (Dick Steinmetz) and they are participating with ICES in short presentations at a conference on Nov. 30, to be held by the EY/EC in Luxembourg. Although we have some liaison with non US wireless industry groups that from the US needs strengthening.
- *Ballot the revision of C95.3. Ballot “extremity” amendment to C95.1*
 - Action on both these items should take place in the near future.
- *Prepare for the balloting of the revision of C95.1*
 - This was and probably still is a premature action item.
- *Work with the IEEE-USA in the letter campaign encouraging uniform support of and participation in SCC-28 among federal agencies.*
 - Though delayed for years, the Medical Technology Policy Committee of IEEE-USA approved this action at their last meeting in August 2001. Thanks are due to Frank Ferrante, Chairman of MTPC, Deborah Rudolph, staff person assigned to MTPC, and John Moulder, Chairman of SC3 of MTPC.
- *Consider newly proposed publications about SCC-28 and its Standards in journals like **Health Physics**. Consider the creation of an electronic newsletter for the SCC-28(ICES) community.*
 - At the November 2000 and June 2001 meetings of SCC-28 this issue was discussed and a volunteer named to explore such publication. The volunteer, Dr. Martin Meltz will be reminded of this action item. Non US members have noted the absence of detailed discussion of SCC-28 activities and the C95.1 standard in professional journals and have called for a remedy to this situation.

- No action was taken on an electronic newsletter. This goal will be integrated into the plan for ICES in which ICES financial supporters will receive special news updates.

SC1:

- *Help shepherd the revised C95.3 through SCC-28 and the IEEE Standards Board.*
 - This is about to occur.
- *Address questions on frequencies below 3 kHz. Consider a project for a new recommended practice.*
 - SC1 has agreed to amend its current draft Recommended Practice to have a low-frequency boundary of 100 kHz in anticipation of an overall ICES policy. SC1 will be encouraged to extend the coverage in C95 documents on measurement to zero frequency
 - Chairman Howard Bassen, of FDA, holds separate working meetings of SC1.

SC2:

- *Complete the Work Practices document and ballot at the SC level.*
 - A draft exists and has been extensively discussed. The aid of Ed Hare, of ARRL, in maintaining an E-mail reflector for SC2 has been invaluable. Chairman Tell has arranged an early meeting in Sept.2001 to forge a consensus document ready for balloting.
- *Consider how to document OSHA exemption in C95 documents.*
 - Chairman Tell has agreed to write OSHA to obtain an updated confirmation of the exemption permitting industry to use the modern C95.2 warning signs instead of the obsolete signs still in OSHA regulations.

SC3:

- *Conduct SC discussion and review of strawman (Reilly) standard principles.*
- *Address literature review task.*
- *Begin editorial committee for drafting a standard and begin preparations for balloting at SC level.*
 - SC3 has moved faster than expected and not only drafted a standard but also balloted it and approved it. SC3 is readying the draft for submission to ICES SCC-28 for balloting. It has decided that no literature review, per se, is required for the standard that addresses hazard due to known effects—i.e. electrostimulation. A separate statement will be prepared to explain why allegation of a cancer-link and associated literature are not addressed in this standard.
- *Prepare budget for future activity.*

— This will be done as the fundraising project takes place.

SC4:

- *Complete balloting on amendment to C95.1 (extremity issue.)*
 - This was done—approved and the recommendation is now before SCC-28.
- *Continue literature reviews and designate endpoints.*
 - The literature review is behind schedule but several hundred papers out of over 1000 papers have had engineering reviews. The reviews are computerized and the complete database will be available to the public at an appropriate time.
- *Receive reports from the RAWG and the editorial committee.*
- *Begin drafting final version of C95.1 and prepare for balloting.*
 - These activities are well under way but the pace of progress is much slower than anticipated. The delay is not due to lack of activity—several meetings of working groups occur during the year. The issues in this complicated standard are substantial and the delay is unavoidable. Since the anticipated target date for issuance of the revision is probably two years away, we have submitted an appropriate PAR extension request for this project.
- *Review plans for second Short Course.*
 - This was written with a Course specifically designed to explain the C95.1 Standard for users. This was not done. The dissolution of EEA and its donation of its assets to ICES presents us with an opportunity to review such plans in general with the guidance of the ICES parent committee.
- *Prepare budget for future activity*
 - As with SC3, this item is premature and awaits the fundraising project.

SC5:

- *Review plans for future activity. Draft statement on urban myth of field ignition hazard at gas pumps with wireless phones.*
 - These matters have not yet been addressed. SC5 has been fully engaged in unanticipated matters of correcting errors in the draft Recommended Practice and managing recirculation and coordination tasks. The stated tasks remain for the future.

2001 – 2002 Goals:

ICES SCC-28:

- Continue international expansion led by Drs. McManus (and ICES EXCOM) and Murphy. Introduce new leadership with emphasis on non US and younger members. Revise and update rosters.

- EXCOM to prepare a policy on 100 kHz as basic boundary between “ELF” and “microwave/RF” standards.
- ICES Past Chairman to prepare a White Paper on usage of words “safe’ and “safety” in ICES documents.
- Strengthen liaisons with ICNIRP, IEC, etc. Carry out closed leadership meeting with ICNIRP in late 2001 in Luxembourg.
- Plan joint Thermophysiology workshop.
- Attend EU/EC conference on EMF and arrange for presentation by ICES Chairman at that conference.
- Arrange for meetings for ICES and Subcommittees in Luxembourg following EU/EC conference: Dec. 1 – 3, 2001
- Arrange for second winter meeting of ICES and Subcommittees in San Antonio, January 2002.
- Work with IEEE staff to initiate fundraising and other organizational tasks for ICES, with Board approval.
- Continue liaison with TABD and expand liaison to wireless industry groups.
- Ballot the revision of C95.3
- Ballot the “extremity” amendment to C95.1 (Sense of the ICES community.)
- Pursue the project on publicizing ICES and C95.1 standards in the literature (Dr. M. Meltz).
- Reassess plans for an electronic newsletter in recognition of ICES objectives.
- Correct administrative errors in transmission of C95.1-1999 Edition to ANSI for adoption.

SC1:

- Help shepherd revised C95.3 through ICES SCC-28 and the IEEE Standards Board.
- Consider new project for documents addressing measurements below 100 kHz.

SC2:

- Complete and ballot Work Practices document.
- Establish formal record of OSHA exemption on signs.

SC3:

- Shepherd new standard through SCC-28 and the Standards Board.
- Work with ICES EXCOM on future budgets.

SC4:

- Continue literature reviews and designate cutoff date.
- Begin drafting standard; prepare for balloting
- Work with ICES EXCOM on future budgets.

SC5:

- Review plans for future activity including statement on fuel ignition hazard myth.

IEEE Staff:

We have been fortunate to have the support of the staff of IEEE Standards Activities beginning with Judy Gorman, Terry DeCourcelle, Sue Vogel and Denise Scozzafava. We now welcome Angela Ortiz who has replaced Denise as Staff Liaison to ICES SCC-28. The staff has been helpful not only in the routine operations of SCC-28 but also in helping us with planning the new ICES and its concomitant global expansion.

Other Activity:

Members of ICES SCC-28 are continually involved in a wide spectrum of activities that relate to standards setting including research, drafting of regulations and education. Members participate in the governmental activities in many nations, as well. This includes the FCC in the US and the EU/EC in Europe. We participate in the broad activities of the WHO and its EMF Project and the European EBFA organization with various meetings around the world. In the near future some are scheduled for Finland, Korea, Turkey and elsewhere. We interact with professional societies especially the IEEE Societies (the EMB-S in particular), the Health Physics Society and the Bioelectromagnetics Society (BEMS). We try to arrange our semiannual meetings in coordination with the BEMS meetings. and in the fall with other groups like EMB-S.

Meeting Schedule:

Meetings of ICES SCC-28 with Subcommittees.

- November 17 – 19, 2000, San Antonio, Texas.
- June 8 – 10, 2001, St. Paul, Minnesota
- Dec. 1 – 3, Luxembourg.
- January 2002, San Antonio, Texas.
- June 2002, Quebec City (BEMS)
- November 2002; with EMB-S meeting in Houston, Texas.

This report was prepared and submitted by:

John M. Osepchuk, Ph. D.
Chairman, ICES SCC-28
August 29, 2001

Appendix

Membership of ICES SCC-28; August 30, 2001

Name	Affiliation	Classification
Eleanor R. Adair, Ph. D	Air Force Research, Texas	User (U)
Melvyn R. Altman	FDA/CDRH; Wash., D. C.	General (G)
Vitas Anderson	Telstra Research; Australia	Producer (P)
J. Robert Ashley, Ph. D.	EM Inventions, Florida	(G)
Edward Aslan	Narda Microwave; New York	(G)
Q. Balzano, Ph. D.	Motorola (ret.), Ft.Lauderdale	(P)
Howard Bassen	FDA/CDRH; Wash. D. C.	(G)
John Bavin	Consumers Energy; Michigan	(P)
John A. Bergeron, Ph. D.	Bergeron Associates; New York	(G)
Ulf Berquist, Dr. Med. Sci.	Univ. Linköping; Sweden	(G)
David Black, M. D.	Environmedix IT; New Zealand	(G)
Rolf Bodemann	Siemens AG, Germany	(P)
Aviva Brecher, Ph. D.	Dept. of Transp.; Cambridge, MA	(G)
Jerrold T. Bushberg, Ph. D.	U. California, Davis	(G)
Philip Chadwick, Ph. D.	Microwave Consultants; U.K.	(G)
A. Scott Chesnick	Nat. Inst. Health; Bethesda, MD	(G)
Huai Chiang, M. D.	Zhejiang Medical Univ.; China	(G)
Stephen Chiusano	Lawrence Livermore Lab.; Calif.	(G)
C. K. Chou, Ph. D.	Motorola; Ft. Lauderdale, FL	(P)
Robert F. Cleveland, Ph. D.	FCC OET; Wash., D. C.	(G)
Roger Coghill	Coghill Res. Labs.; U. K.	(G)
Jules Cohen, P. R.	Indep. Consultant; Wash., D. C.	(G)
Robert A. Curtis	OSHA; Salt Lake City	(G)
John A. d'Andrea, Ph. D.	Navy Health Research; Texas	(U)
James M. Daly	BICC Cables Corp.; New York	(P)
John J. DeFrank	Army CHPPM; Maryland	(U)
John O. DeLorge, Ph. D.	Navy Res. (Ret); Florida	(G)
David Dini	Underwriters Lab; New York	(G)

Louis Dornetto, Ph. D.	Navy SPAWAR; South Carolina	(U)
Linda S. Erdreich, Ph. D.	Exponent; New York	(G)
Stewart Fastman	Insurance Consultant; New York	(G)
William E. Feero	Elec. Res. & Mgt., Inc; Pennsylvania	(G)
Kenneth R. Foster, Ph. D.	Univ. Pennsylvania; Philadelphia	(G)
Peter Gajsek, Ph. D.	Slovenia	(G)
Om P. Gandhi, Ph. D.	Univ. Utah; Salt Lake City	(G)
Robert C. Gardner	Min. of Defense; U. K.	(U)
David L. George	Unisys Corp.; Pennsylvania	(P)
Georges Goldberg	IEC; Geneva, Switzerland	(G)
Gregory M. Gorsuch	Navy Bur. of Medicine; Wash., D. C.	(U)
Martino Grandolfo, Ph. D.	Instituto Superia di Sanita; Italy	(G)
Arthur W. Guy, Ph. D.	Bioelectromagnetics Consultant; WA	(G)
Dennis E. Hadlock, Ph. D.	Geo-Centers, Inc.; Maryland	(G)
Donald L. Haes, Jr. CHP	MIR; Cambridge	(G)
K. N. Kalkiotis, Ph. D.	Greek Atomic Energy Commission	(U)
Ed Hare	ARRL; Connecticut	(U)
James B. Hatfield	Hatfield & Dawson; Seattle, WA	(G)
Donald M. Heirman	Don HEIRMAN Consultants; NJ	(G)
Paul Heroux, Ph. D.	McGill Univ., Montreal	(G)
Louis N. Heynick	Indep. Consultant; California	(G)
Michel Israel, Ph. D.	Nat. Ctr. Of Hygiene; Bulgaria	(G)
Veronica Ivans, Ph. D ^a .	Medtronic Inc., Minneapolis	(P)
Kent C. Jaffa	Pacificorp; Salt Lake City	(P)
Sheila Johnston	U. K.	(G)
Kenneth H. Joyner	Motorola; Australia	(P)
Ralph Justus	Elec. Indust. Assoc.; Wash. D. C.	(U)
Sheila Kandel	Tel Aviv Med. School; Israel	(U)
B. J. Klauenberg, Ph. D.	USAf/Research; Texas	(U)
G. A. Koban	Nav. Surf. Warfare Ctr.; Virginia	(U)
Joseph L. Koepfinger	Duquesne Light Co; Pittsburgh	(P)
Anthony LaMastra	Amer. Iron & Steel Inst.; Penn.	(U)
Sakari Lang	Nokia Research Ctr., Finland	(P)

John A. Leonowich, Ph. D.,	Pacific NW Nat. Lab., Washington	(G)
James C. Lin, Ph. D.	Univ. of Illinois; Chicago	(G)
C. J. Maletskos ^b	NCRP; Gloucester, MA	(G)
Stewart Maurer, Ph. D.	RF&RLF Consultant; New York	(G)
Robert W. McCourt	PSE&G; Newark, NJ	(P)
Tom McManus, Ph. S.	Dept. Pub. Enterprise; Ireland	(G)
Martin L. Meltz, Ph. D.	Univ. Texas Hlth. Sci. Ctr	(G)
John C. Monahan, Ph. D.	FDA/CDRH; Wash. D. C.	(G)
Noel D. Montgomery	Navy Jt. Nonlethal Weapons, Virginia	(U)
Michael R. Moore	Oak Ridge Nat. Lab., Tennessee	(G)
Amitaba Mukhopadhyay	Con Edison, New York	(P)
Michael R. Murphy, Ph. D.,	USAF/Research, Texas	(G)
John L. Orr, Ph. D.	Toxicology Consultant, Texas	(G)
John M. Osepchuk, Ph. D.	Full Spectrum Csltg; Concord, MA	(G)
Russell D. Owen, Ph. D.	FDA/CDRH; Wash., D. C.	(G)
Andrei Pakhomov	McKesson Bioservices, Texas	(G)
William F. Paul	IBEW; Wash., D. C.	(U)
Bertil R. Persson, Ph. D.	Lund Univ., Sweden	(G)
Ronald C. Petersen	Indep. Consultant; New Jersey	(G)
J. Patrick Reilly	Metatec Associates, Maryland	(G)
Michael R. Repacholi, Ph. D. ^c	World Health Org., Geneva	(G)
Brad J. Roberts	Army CHPPM; Maryland	(U)
Ervin D. Root	Alliant Energy; Iowa	(P)
Terence Rybak	Gen. Mtrs. Prov. Ground, Michigan	(U)
Veli Santomaa	Nokia Research Center, Finland	(P)
William G. Scanlon, Ph. D.	Univ. of Ulster, Northern Ireland	(G)
Herman P. Schwan, Ph. D.	Univ. of Pennsylvania (Ret.)	(G)
Asher R. Sheppard, Ph. D.	Asher Sheppard Consulting; Calif.	(G)
Jon H. Sirugo	So. Calif. Edison	(P)
Jan A. Stolwijk, Ph. D.	Yale School of Medicine	(G)
F. Kristian Storm, M. D.	Univ. of Wisc. Clin. Sci. Ctr.	(G)
Carl H. Sutton, M. D.	VA Med. Ctr., Wisconsin	(G)
Mays L. Swicord, Ph. D.	Motorola, Inc.; Ft. Lauderdale	(P)

Rosa M. Tang, M. D.	Univ. of Texas	(G)
John Tattersall, Ph. D.	DERA; U. K.	(G)
Richard A. Tell	Richard Tell Associates; Las Vegas	(G)
Thomas S. Tenforde, Ph. D.	Battelle Pacific NW Labs, Washington	(G)
Art Thansandote	Health Canada; Ottawa	(G)
Tammy Utteridge, Ph. D.	Institute of Med.&Veterin.; Australia	(G)
Arthur A. Varanelli	Raytheon Company	(P)
Robert T. Watkins	Mass. Dept. of Public Health	(G)
Christian B. Wenger, Ph. D.	Army res. Inst., Massachusetts	(G)
Louis A. Williams, Jr.	Louis A. Williams Consult., Ohio	(G)
Donald W. Zipse	Zipse Elec. Engr., Inc., Pennsylvania	(G)
Marvin C. Ziskin, M. D.	Temple Univ. Sch of Medicine; Phil.	(G)

(a) AAMI Liaison (b) NCRP Liaison (c) WHO Liaison