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As my responsibilities have increased, I have had the opportunity to develop a broader perspective relative to the Metrology and Test Equipment functional roles and missions than normally interpreted by many organizations/companies. I have strongly supported and continued to place increased emphasis on the "cradle to the grave" concepts for the total test equipment management functions. It is more recognizable in today's economic and advanced technology environment that calibration, per se, is a limited (and becoming smaller) subset of the overall functional job relative to test equipment regardless of the size of the organization. Our NCSL Metrology activities represent a unique position within industry. I know of no other area/discipline where there is the same degree of open and free interchange of specific and meaningful ideas and material. It is common practice, and one of the strengths of NCSL, to pick up the phone and call a delegate from a member organization to ask specific questions relative to his calibration control system, procedures, customer interpretations, plans for capitalization, impact of new technology, plans for improvement, methods of monitoring/reporting test equipment delinquencies, etc.

I believe there is a logical extension of this working infrastructure within the NCSL member organizations that represents some significant opportunities for aggressive, well informed metrology and test equipment functions/management. I believe that if the top management of our member organizations were asked to identify their number one problem, a large percentage would, in some manner, home in on the need for improved productivity. ---- Productivity means different things to different people, however, I am convinced this problem of international scope represents the very basis for survival of our American Way of Life.

It is recognized that the overall issue is very complex and cannot be understood by simply comparing productivity expressed in terms of output per man-hour. However, at this point when we start to think in terms of output per man-hour, we immediately get into past and present NCSL activities related to hours/item for specific calibration and maintenance tasks. Most metrology functions have on-going programs for developing and monitoring calibration hours per item and use this data in a variety of ways from generalized man-power loading to specialized cost analysis and control. I encourage you to become knowledgeable of your company's plans/goals for productivity improvement and to adopt a strong, positive attitude.
that productivity includes you and your function ---- it's not just for the other guy. I suggest you establish internal improvement goals of your own and challenge your people to make them a reality. Show your boss that you are knowledgeable in this area and plan to specifically relate your progress in terms that can be understood by all your management. (Service functions have different needs than product line organizations.)

I further suggest that the subject of productivity be included in specific committee chartered activity for the purpose of relating individual actions and trends to the overall industry. I have asked John Minck from Hewlett-Packard to look into this area and identify specific committee activities that are appropriate.

The association with NBS management and NCSL, specifically the Board of Directors, has been very meaningful and personally rewarding in the last 2-3 years. I am impressed with the professional caliber of the individuals involved and wish each of you success in your personal endeavors as we phase into a new NCSL fiscal year.

J. Dave Mitchell
ARE YOU COMING TO THE CONFERENCE??

Notes by Anson

Plans for the 1975 NCSL Conference, are coming along nicely - Mr. Woodington, Chairman of the Conference tells me that Dr. A. V. Astin and H. Carl Biggs will attend the Conference and be recognized for their part in the formation of NCSL fifteen years ago.

Dr. Astin was the original sponsor and H. Carl Biggs was Chairman of the Ad Hoc Committee.

Others instrumental in the early activity of NCSL have been invited but it is not yet known if they can attend. For example, the following have also been invited: W. A. Wildhack, who was the first sponsors delegate; Harvey Lance, who gave the paper in 1960 that prompted the formation of a standards laboratory organization, Lloyd B. Wilson, who was the first Chairman; W. Reeves Tilley, who provided early publication support; and Charles E. White, who was the first Newsletter Editor.

Here's an addition to the Program:

WEDNESDAY, OCTOBER 1

2:00 P.M. INTERNATIONAL METROLOGY

Developer: H. L. Daneman
H. L. Daneman Associates

Speakers: Ing. Cesar Larranaga E.
Director General de Normas - Mexico
"The Significance of Metrology in Mexico"
(From the Point of View of Our National Laboratories)

Dr. Neils C. Beck
Former AID Administrator - Saigon
"The Significance of Metrology in Indochina"
(Based on Experience with the NSI, Vietnam)

Professor G. Ruffino
Director of Research - L&N Italiana
"Some Contrasts Between Institutional and Industrial Metrology in Italy"

Mr. H. L. Daneman
"Planning for Laboratories in Developing Countries"
(Based on Experience in Latin America and the Far East)

*Mr. J. A. MacDonald
Department of Defence - Australia
"The Significance of Metrology in Australia"
*Tentative
Have you Registered?

If not, fill out the following registration form, place it with your remittance (make checks payable to "1975 NCSL Conference") in an envelope and mail to:

A. J. Woodington
6034 Sierra View Way
San Diego, CA 92120

Registration fees are $75 for delegates, $80 for non-delegates, and $90 for all registrations postmarked after September 20, 1975.

This will help us expedite the registration process. (However, don't mail after September 23rd. Bring it along instead.)

NCSL CONFERENCE - 1975
OCTOBER 1-3, 1975
REGISTRATION

Name ________________________________

Affiliation ___________________________

Address ______________________________

CHECK ONE: DELEGATE NON-DELEGATE

NCSL SCHOLARSHIPS AWARDED AT CAL POLY

Three scholarships were awarded to Industrial Engineering students Tim Redmond ($250), John Durrenberger ($150), and Don Feldman ($100) at California Polytechnic State University. These students rank very high scholastically and actively participate in University affairs.

The $500 scholarship fund was established at Cal Poly by the National Conference of Standards Laboratories in order to encourage the study of metrology and related programs.
MINUTES OF
NCSL BOARD OF DIRECTORS MEETING

June 11 & 12, 1975
National Bureau of Standards
Boulder, Colorado

Attendees:

J.D. Mitchell - President (Rockwell International)
J.M. Suraci - Executive Vice President (Lockheed Electronics Co.)
L. Auxier - Vice President (Beckman Instruments)
J. Minck - Vice President (Hewlett-Packard Company)
J.A. Valentino - Secretary (Sanders Associates, Inc.)
W. Cassady - Delegate to the Board (Rockwell International - Tulsa)
J. Lee - Delegate to the Board (Honeywell, Inc.)
C. Moss - Delegate to the Board (U.S. Air Force)
J.P. Riley - Delegate to the Board (NASA)
R. DeLapp - Regional Coordinator (Stanford Research Institute)
M. Hed - Committee Chairman
R. Kidd - Committee Chairman (Microwave Associates, Inc.)
A. Woodington - Committee Chairman (General Dynamics Corp.)
W. Anson - Newsletter Editor (National Bureau of Standards)
R. Barra - National Bureau of Standards

The NCSL Board of Directors wishes to thank Wilbur Anson and the National Bureau of Standards for hosting the meeting.

1.0 Call to Order

1.1 The NCSL Board of Directors Meeting was called to order on June 11, 1975 by NCSL President, Dave Mitchell.

2.0 Review of Minutes of February 1975 NCSL Board Meeting

2.1 The minutes of the February 20 & 21, 1975 Directors meeting were reviewed for action items. The majority of action items have been completed.

2.2 A general discussion followed on Item 22.1 of the minutes. The discussion centered on the Oklahoma Metrology Act and the 10% additional state fee for certification. Some concern was expressed over what certification and standards implied.

2.3 Mike Suraci mentioned that Andy Woodington stated that proceedings of the 1975 NCSL Conference would be available two (2) weeks after the Conference. Mike suggested amendment of the minutes accordingly.

2.4 Mike Suraci moved to accept the minutes as amended.

Motion Second - Laurel Auxier
Motion Passed
3.0 Report of the President

3.1 Dave Mitchell reported that a meeting was held with Dr. McCoubrey of NBS to discuss an NCSL appointment at NBS. Dr. McCoubrey is very interested and will support the program. Additional details will be discussed later in the Board Meeting.

3.2 Dave has sent a letter to the ANSI/MACTAB Board stating that NCSL will continue interface only from a liaison position. John Minck is seeking a Committee chairman.

3.3 A plaque was presented to John Simpson of NBS for the best paper given at 1974 JMC. Dave had previously presented John with the check and because of schedules has now presented the plaque in the presence of Dr. McCoubrey.

3.4 Wilbur Anson will be the new NCSL Newsletter editor.

3.5 Dave discussed the national round-robin and the NCSL interface with NBS. Moe Corrigan should be contacted for complete details. There appears to be some misconception on the NCSL/NBS interaction on the round-robin.

3.6 Dave has received a letter from Dr. McCoubrey of NBS stating that he strongly supports close NCSL/NBS interface and was looking forward to meeting with Dave on June 9, 1975 to discuss long range plans.

3.7 Five (5) people have been invited to sit on the Wildhack Advisory Panel. Additional people will also be invited in the near future.

3.8 Dave presented a paper on February 26, 1975 to a Conference in Sacramento. His topic was NCSL and suggested that stronger interaction could be developed.

3.9 Dave has written a letter to be used along with the NCSL Brochure. The letter is also intended to be given to non-NCSL members who participate in regional meetings. The letter identifies what NCSL is and what are its missions and goals.

4.0 Report of the Executive Vice-President

4.1 Mike Suraci reported that the NCSL Brochure is currently being printed and will be mailed shortly.

4.2 Mike has additional reports that were agenda items and would report as the items were addressed later in the meeting.
5.0 Report of the Secretary

5.1 Jim Valentino reported that five (5) new organizations have joined the NCSL since the February 1975 Board of Directors Meeting. The NCSL membership is comprised of 197 paid organizations as of June 1, 1975.

5.2 A discussion of the foreign delegates was conducted and it was suggested that each committee chairman make a formal request to the foreign delegates to participate on the committees.

5.3 Additional comments were made to request articles or laboratory biographies from the foreign delegates to be published in the Newsletter.

Action item to J. Valentino to prepare letter to foreign delegates soliciting articles or biographies. The Secretary will act as regional coordinator for the foreign delegates.

5.4 Jim Valentino will continue activity on the NCSL membership profile. A request was made to the Board as to what format and information it wished in the profile report.

6.0 Report of the Treasurer

6.1 Paul Hunter was not able to attend the meeting but submitted a written financial report.

6.2 After reviewing the 1974-1975 NCSL Budget the Board authorized the following changes to the budget.

**BUDGET ACCOUNT B - OPERATING EXPENSES**

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<thead>
<tr>
<th>Line Item</th>
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<tbody>
<tr>
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<td>$ 0.00</td>
</tr>
<tr>
<td>B2 Treasurer's Expenses</td>
<td>300.00</td>
<td>10.00</td>
</tr>
<tr>
<td>B3 Stationary</td>
<td>150.00</td>
<td>(25.18)</td>
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<tr>
<td>B4 Postage</td>
<td>75.00</td>
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<tr>
<td>B5 Petty Cash (Incl. Secty's Tape Recorder)</td>
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**BUDGET ACCOUNT C - MISCELLANEOUS**

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<tr>
<td>C1 President's Expenses</td>
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<td>C2 Wm. A. Wildhack Award</td>
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<tr>
<td>C3 JMC Best Paper (1974)</td>
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<td>C4 Regional Meeting Support</td>
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<td>1236.57</td>
</tr>
<tr>
<td>C5 Cal. Poly (Scholarship &amp; Conference)</td>
<td>700.00</td>
<td>200.00</td>
</tr>
</tbody>
</table>

6.3 Jim Valentino was asked to update the budget and ask the Treasurer for current balances.
7.0 Report of the Vice President - Administration

7.1 Dave Mitchell reported that Mort Angelo was currently recuperating from surgery.

7.2 Mort has requested that the Board and Committee Chairman send in names of people to receive awards.

8.0 Report of the Vice President - Laboratory Management & Operation

8.1 The Calibration Systems Management Committee, chaired by Walt Cassady, has had several new members added. The Committee is trying to establish regional correspondents so data can be obtained on a local personal basis. The Committee is about to begin study on the cost visibility reports and other related NCSL projects.

8.2 Rolf Schumacher received little information feedback on the interim report of the Product Measurability Committee. The report will be modified and then issued for Board approval. Rolf will not be able to continue work on the Committee and so John Minck is seeking a new Committee Chairman. John wishes to recognize Rolf's contributions to both the Committee and Region 8.

8.3 The Measurement Assurance Committee, chaired by Moe Corrigan, has 11 members and round-robin plans have been finalized. The Committee has acquired Codi certicells and Fluke 3300 & 515 which will be calibrated by NBS first. Two (2) parallel loops will be conducted with 24 laboratories participating.

8.4 Bill Bean reports that the primary project of the Calibration Laboratory Automation Committee is to study operating experiences of laboratories now using large system automated testing.

9.0 Report of the Vice President - Measurement Requirements

9.1 Marlyn Hed, chairman of the National Measurements Requirements Committee, reported that the major committee activity has been working with the Time and Frequency Division of NBS at Boulder in relation to a new NBS frequency service. This activity has provided benefits for both NBS and many NCSL members. A final summary report of a questionnaire circulated to NCSL members will be completed 1 September 1975 for the October Conference.

Committee activity is now progressing on similar NBS interfaces with an information and questionnaire format for distribution to NCSL members.
9.2 Ron Kidd submitted written reports on the Laboratory Evaluation Committee. Ron reported that the first draft of the "Recommended Procedure for Use in the Evaluation of Standards/Calibration Laboratories" was mailed to the NCSL Membership on 16 May 1975. A 6 June 1975 reply deadline was requested for the membership's feedback.

A copy of the proposed procedure for a "National Voluntary Laboratory Accreditation Program," to be established by the Secretary of the Department of Commerce, was forwarded to the NCSL Board of Directors. Ron will attend the 24 June 1975 Department of Commerce hearing on said document with the NCSL Board of Directors approval.

Ron also submitted a report on the ASTM E-36 Committee.

9.3 Barney Anderson, chairman of the Medical Electronics Committee, submitted a written report to the Board. Barney reported that the committee's objective is to establish liaison with other professional groups dealing with safety standards for Bio-Medical Electrical devices. Hopefully, this will accomplish:

1. A unique communicative technique to assure that the work will be shared with professional groups and government agencies.

2. Eliminate redundant work and strive for consensus.

3. Assist in the generation of realistic safety standards.

4. Establish one source of expertise necessary to negotiate with government agencies.

5. Incorporate ways and means to educate those responsible for the implementation, enforcement and utilization of approved Safety Standards.

9.4 An action item was given to the Regional Coordinator to send all changes of member delegates to the Secretariat.

10.0 Report of the Vice President - Communications & Marketing

10.1 Mike Suraci reported for Lew Wears that the 1975 Directory is complete and being mailed. The various sections of the NCSL Information Manual are being retyped in order to have all pages the same format and style. Lew expects the Manual to be complete in late July. Any information to be included in the Manual should be sent to Lew immediately.
10.2 The NCSL Newsletter has a new editor, Wilbur Anson from NBS, Boulder Laboratories. Dave Mitchell received a letter from Dr. McCoubrey affirming the Bureau's support of Wilbur as editor.

Additionally, a letter was received from Jim Leaney, Kentron Hawaii, Ltd., complementing Mike Suraci on the excellent publications of the Newsletter.

11.0 1975 NCSL Conference

11.1 Andy Woodington, chairman of the NCSL Conference, distributed a preliminary program for Board review. Several minor changes were made.

A discussion followed on the proceedings of the Conference. Andy displayed a cassette tape program that would be professionally produced and stored in book binder form.

11.2 Laurel Auxier moved to appropriate $2300 for Conference tapes.

The motion received no second.

11.3 Andy will calculate cost of adding the tape program to the Conference fee and report back to the Board on recommendations.

11.4 Andy has also invited several of the NCSL establishers: Briggs, Lance, Wildhack, Astin, White, Wilson.

12.0 Report of the Sponsor

12.1 Ralph Barra reported for Joe Cameron that the environment is currently right that NCSL should strongly strengthen its ties with NBS. Additionally, interface could be achieved with all the Divisions of NBS and not only the IBS Divisions.

13.0 Intergovernmental Committee

13.1 The charter for the intergovernmental committee has not been established yet. Ralph is still investigating the best approach for achievement of NCSL goals. Many federal, state and local committees are being established to accomplish a technical assessment and technological interchange. Industry/government relationships are beginning to develop.

13.2 Ralph also reported that the NBS Annual Report has been completed and included is a description of some 25 Bureau programs that have an impact on society. Ralph suggested that we make this available to the NCSL membership.
14.0 Wildhack Advisor Panel

14.1 Dave Mitchell has sent invitation letters to participate on the Wildhack Advisory Panel to the following.

Dr. Andrew F. Dunn - National Research Council of Canada.
Mr. Doug Strain - Electro Scientific Industries, Inc.
Mr. Jerry Hayes - Navy Metrology Engineering Center.
Professor Peter Stein - Arizona State University.

Dave will possibly also send invitation letters to the National Academy of Engineering, National Science Foundation or the National Academy of Sciences. An attempt was made to cover a broad range of measurement expertise and includes NBS management, NAS/NBS Advisory Panel members, NRC, DoD, and the non-measurement society.

15.0 Report of the Regional Coordinators

15.1 Lew Wears submitted a written report on Regions 1 and 2 to the Board. Region 1 had its last meeting on March 26, 1975 with about 18 organizations represented. Region 2 will conduct a meeting on June 12, 1975. Both regions are having difficulty in acquiring active participation.

15.2 Walt Cassady reported on the activities of Region 6. The Region conducted its last meeting on May 16, 1975 with only 4 member delegates and 3 visitors attending. Some members indicated that either press of business or travel funds would prevent them from attending.

15.3 Clyde Moss reported that Region 5 held its last meeting on March 7, 1975 with 5 members and 5 non-members in attendance. Lack of travel funds is also given as a reason why delegates cannot participate.

Saul Alford has a package for a MAP that he will make available to members of Region 5.

15.4 John Lee and Bob DeLapp reported on the activities of Region 7. Both feel that the region has much potential and could be cultured into an active region.

15.5 Activities of Region 4 were reported by John Riley. The last meeting was not well attended but did bring in some members who had not attended a meeting previously. John feels that the region is somewhat polarized with a concentration in central Florida and in Georgia. Again travel funds appear to be a problem.
15.6 Dave Mitchell and Laurel Auxier reported on Region 8 activities. The last meeting held on June 11, 1975, while the Board meeting was being conducted, had over 200 participating.

16.0 Professional Registration of Engineers

16.1 Dave Mitchell reported on the California Registration of Professional Engineers. State registration is now available in the following disciplines: Traffic, Safety, Quality, Corrosion, Manufacturing, Fire Protection, Control System, Nuclear and Agricultural Engineering.

17.0 NCSL Scholarship Program

17.1 Dave Mitchell has sent a letter to Professor Paul Scheffer, of California Poly Tech, indicating that the $500.00 NCSL Scholarship could be used for students enrolled in the school's Industrial Engineering Curriculum if qualified individuals could not be found in the Measurement Science Program. Dave requested feedback on the fund distribution, recipient(s) and publicity.

18.0 NCSL Nominations

18.1 Don Greb submitted a written report on the NCSL nominations. Don reported that response from the Board and Regional Coordinators was poor. However, a total of 5 people were named for Executive Vice President, 4 for Treasurer, and 25 for the eight Vice Presidents/Delegate Member positions.

All selected candidates have been notified and were requested to respond by June 10, 1975. Any candidate who does not respond will have his name removed from the slate.

19.0 NBS/NCSL Fellowship Program

19.1 Dave Mitchell has continued the investigation of a full time NCSL representative at NBS. Dave has discussed the matter with Dr. McCoubrey, who feels very strongly in favor and will support it financially. Currently, it is felt that NBS, NCSL and the delegate's organization would equally share the cost.

19.2 A committee must be established and a prospectus must be prepared. The Board conducted a lengthy discussion on the feasibility, management and other aspects of the program.
19.3 Motion made by John Lee to allocate a maximum of $10,000.00 for the NCSL Fellowship Program.

    Motion Second - John Minck
    Motion Passed

19.4 Dave Mitchell will take action to meet with several other Board members to formulate a prospectus and continue dialogue with NBS to develop a concrete program.

20.0 The Journal of Applied Measurements (JAM)

20.1 Laurel Auxier reported on the current status of JAM. The following is an abstract of the report:

1. Publishing the Journal, as originally conducted, has been suspended, primarily due to financial limitations.

2. The PMA Board of Directors have been working to arrange an alternate method of publishing the JAM.

20.2 Laurel recommended that NCSL continue close liaison and continue encouragement and help.

3. The efforts have resulted in only one possible publisher. Spec Tech Publishing (STP) which is in the process of generating a formal written proposal. Highlights of the proposal will include the following negotiable points.

a. STP would own the magazine.
b. Initially, the magazine would be distributed under "controlled audit distribution," not subscription.
c. STP would be responsible for all ad sales, printing, etc.
d. Initially circulation would be 7,500 (probably rising to 15,000 the second year).
e. Magazine to be published Quarterly the first five issues and then go to BiMonthly January 1977.
f. STP would require $750/issue subsidy for first five issues dropping to $325/issue for the next four issues.
g. Size of an issue would be 32-48 pages.

4. Other general information.

a. Projected cost of publishing 7,500 copies in color including handling, mailing, etc. is $9,465 per issue.
b. STP currently publishes four other magazines. They are: PRODUCTS RECYCLING, SOLID STATE POWER CONVERSION, POWER FINISHING, and FINISHING HIGHLIGHTS.
c. Circulation to be computer controlled.
d. STP has nation wide sales representation.
e. Magazine structure to be repositioned for proper balance, i.e., practical how-to-do-it type articles.
f. Existing editorial and publication review structure is expected to be utilized.

21.0 **Liaison Delegates' Report**

21.1 Laurel Auxier reported on several PMA activities such as changes made to streamline the Association's operating procedures and costs. Programs have been initiated to promote an increase in section activities and new memberships. PMA is expanding its efforts of support and participation of technical conferences.

21.2 Dave Mitchell received a letter from Bob Couture, PMA President. The letter highlights some of the recent PMA activities and thanked NCSL for its continuing support.

22.0 **Oklahoma Metrology Act**

22.1 Walt Cassady briefly discussed laboratory certification. The assets and liabilities and the pitfalls of a state certification program.

23.0 **Common Regional Meeting Programs**

23.1 Andy Woodington has been asked to establish a program or topics that could be discussed, as a common base, at each of the regional meetings. Andy feels that the common topics or subjects should be those which the NCSL Board wishes to take a position on. He will structure a straw-man type agenda and hopes to acquire feedback to the Board.

23.2 Andy will proceed to communicate with the regional coordinators that two of the topics at their next regional meetings should include: 1) Laboratory Accreditation and 2) Life Cycle Calibration Costs.

23.3 Mike Suraci and Dave Mitchell suggested that the educational benefits of NCSL membership could be discussed. Such items as the conferences, Dimensions, Metrology Guides, Epic, etc., are available for free to NCSL members, in addition to committee reports and recommended practices.
24.0 General

24.1 Dave Mitchell has been concerned with the lack of participation of member delegates. Dave has drafted letters to be sent to the member delegates and one to an executive officer seeking support in the delegate's participation.

After general discussion, the Board felt that the letters would possibly be a good means of stimulating activity.

24.2 Dave Mitchell discussed the UNIDO Program for measurement specialists and has been working with Peter Pattridge of the State Dept. Dave has been giving the information to PMA for publication in the Journal. The positions will be published in the Newsletter.

24.3 Dave Mitchell has received a letter from Loebe Julie addressing the concern over the small inventor led electronic instrument companies. A copy was given to each Board member for information.

24.4 Dave reported that he has suggested to AIA that Project remain open in the event that a revision to MIL-C-45662 is again proposed.

24.5 Laurel Auxier commented on Dave's proposed letters. Laurel feels that many times when a delegate cannot actively participate then the delegate assumes no one within his organization can participate for him. Dave requested Laurel to mark-up the letters and forward them back to Dave.

24.6 A brief discussion was held on increasing the membership dues. Mike Suraci will investigate and report back at the next Board Meeting.

24.7 A discussion was held on the ineffectiveness of the Education and Training Committee. Dave Mitchell will take corrective action.

24.8 Mike Suraci motioned to appropriate $200.00 for the upcoming Cal Poly Tech Conference. The item had been previously budgeted under C6 in the old budget and C5 in the current revised budget.

Motion Second - Laurel Auxier  
Motion Passed

25.0 Adjournment

25.1 NCSL President, Dave Mitchell, adjourned the meeting.
NCSL Board of Directors Meeting at NBS, Boulder, Colorado, June 11-12, 1975.
The first Regional Meeting of the new Region 4 (Florida, Georgia, Alabama, and South Carolina), was held at U.S. Army Metrology and Calibration Center, Redstone Arsenal, on 8 May 1975.

**Attendees**

<table>
<thead>
<tr>
<th>Attendee</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>John P. Riley</td>
<td>NASA/Kennedy Space Center</td>
</tr>
<tr>
<td>James K. Specht</td>
<td>Anniston Army Depot</td>
</tr>
<tr>
<td>V.T. Wesley</td>
<td>Lockheed - Georgia Co.</td>
</tr>
<tr>
<td>G.T. Carpenter</td>
<td>NASA/Marshall Space Flight Center</td>
</tr>
<tr>
<td>J.C. McKinney, Jr.</td>
<td>U.S. Army Metrology &amp; Calibration Center</td>
</tr>
</tbody>
</table>

The attendees were welcomed by Jarmon McKinney who presided at the meeting. It was noted that Wilbur Anson is taking over the Editor job of the NCSL Newsletter. John P. Riley led a discussion on laboratory accreditation mentioning the new State of Oklahoma Metrology Act.

A film was shown depicting the Army Calibration Program and traceability from the Field Army to NBS.

A presentation was made by Mr. G.L. Brooks, Physicist, U.S. Army Standards Laboratory, on the Volt Pilot Program with NBS and due to its success the subsequent implementation of a similar measurement assurance program with all the next lower level laboratories in the Army.

The attendees watched the Primary Level Calibration of an Attenuation Standard on an H.P. 9500 Automated Microwave Calibration System, and also the calibration of a Micropotentiometer on an Automated Micropot Calibration System.

Mr. James M. Breece, USAMCC, gave a presentation on recent developments in Department of Defense Calibration regulations, the proposed standard calibration label for the armed service, MIL C 45662, Handbook-52A and also discussed the Department of Defense Calibration Coordination Group Study of laboratory environmental requirements for measurement.

The group also toured the U.S. Army Standards Laboratory.
The Region 7 Spring meeting was held at Hewlett-Packard Company on May 28, 1975. Nineteen member delegates and guests attended.

Report From the Board

John Minck reported on board activity and organization. Committee activity was noted from the newsletter reports and some future projects were outlined. It was noted that our region now includes the Washington-Oregon area although no members from there were able to attend. On future meetings we would make a stronger effort to get northern members (and possibly Canada) people to attend.

Discussion

The upcoming September conference topics served as our agenda. Considerable discussion centered on the legal and government influence on our work. Al Kohler reported on a recent visit to Washington to present cost impacts of proposed "guard band" spec changes of 8200. As a result, 8200.4 may be rewritten so that increase in calibration cost is avoided.

Al Kohler reported that he attended Senate hearings on a new super-agency which will combine EPA, CPSA, and OSHA and will clearly impact our technical life. All people agreed that our NCSL members need an "early warning" mechanism for rulings which affect our companies.

It was suggested that Ralph Barra's committee on government relations use a full page in each newsletter to inform the membership of pertinent happenings in this area.

For example, Bill Rolly of Ampex reported that CPSA recently indicated that a digital multimeter would not be considered a consumer product. A DVM manufacturing company had submitted information on a potential defect. The CPSC said it would not be considered a "consumer product" since it is a special purpose device designed for use in commercial or industrial applications. This information is of considerable importance.

Comments were made on the lab accreditation recommended practice and will be sent directly to Ron Kidd. John Minck discussed his approach for the workshop on Life Cycle Cal Costs for October. The idea is to explore the interface between manufacturer and user to see if progress can be made on over-specifying, critical parameters, etc.
Discussion on impact of MIL-STD-1556 to our members. Most need more information but are very concerned by the Region 8 minutes which imply that substantial new administrative effort (1/2 to 1 extra person) might be involved. The region asked John Minck to bring up their concern at the June Board Meeting.

Al Koehler asked that NCSL spearhead a change to the terminology "traceable to NBS" since NBS itself will not provide reports with proper documentation.

Discussion of the new TV station timing system revealed that care must be exercised in assuring that the station is on a national network when using for timing purposes.
MINUTES - REGION 8

Rolf B.F. Schumacher of Autonetics
Regional Coordinator

The ninth regional NCSL meeting held by Region Eight was organized jointly with the Precision Measurement Association (PMA) and subsequently cosponsored by the Orange Empire Section of the American Society for Quality Control (ASQC). The meeting was held on June 11, 1975, at the Hilton Inn in Fullerton, California. It was attended by approximately 180 persons. Twenty NCSL member organizations were represented by 98 persons; of those attending, 45 persons were affiliated with the PMA and 91 persons with the ASQC. Numerous attendees representing NCSL member organizations were also affiliated with the PMA or the ASQC.

The meeting was held in two parts. The afternoon part was devoted to business primarily of interest to NCSL and PMA members only; the evening part was devoted to guide attendees through the application process for registration as Professional Quality Engineers under the "Grandfather" clause of an amended licensing law recently enacted by the State of California.

Rolf Schumacher opened the meeting and introduced Robert J. Couture, Autonetics, National President of the PMA, and Albert L. Lauerman.

What will be the impact of metrication on standards and calibration laboratories? - Al Lauerman, Autonetics, chaired the session under this title and introduced the panelists, William Peverill, ITT Cannon Electric, Dr. Albert J. Mattay, TRW Systems Group, and Rolf Schumacher. Al Mattay discussed the approach to be taken in an organization preparing for the changeover. Not much of a problem was foreseen by simply redefining length standards, originally expressed in inches, in metric units; conversion from ounces to grams is also a matter of arithmetic only. Fastener standardization, screw threads will have a significant impact by requiring many new thread measuring wires, gages, etc. The biggest impact, however, may be on the stock room, because of new metric standard parts sizes and dimensions.

Where will the next generation of standards and calibration laboratory technicians and engineers come from? - Bob Couture chaired this session and introduced the panelists, Richard Starn, California Bureau of Measurement Standards, Dale Rockwell, U.S. Metrology Engineering Center, Steve Kozich, Quality Audit Co., Arthur Plourde, Metron Corp., Algie Lance, TRW Systems Group, and Dean Brungart, Teledyne. Cal Poly at San Luis Obispo will drop the program in measurement science because of lack of interest. Lack of glamour image? The experiences and difficulties encountered by educational institutions to set up curricula in measurement science were reported. The U.S. Navy is setting up courses in total quality control with partial emphasis on
Metrology. The cooperation of Cal Poly San Luis Obispo officials in setting up courses in measurement science was praised. However, it was suggested, because of dropping enrollment in such courses, that similar curricula be established in urban areas where the necessary support from industry can be obtained. Requirements for metrologists will grow because of increased consumer and workers protection regulations. Universities and colleges also need industry support to provide guidance in practical requirements.

Engineers fresh out of college are frequently poorly prepared for careers in metrology; on-the-job training difficulties are encountered because of lack of motivation and appreciation for the necessity of making precise measurements and experienced gaps between recently graduated engineers and experienced technicians knowledgeable in making precision measurements. Industry may have undersold Metrology by stressing the glamours of other engineering disciplines. But first, top industry management must be sold by metrology management on the economic virtues and necessities of metrology. Industry is faced with a challenge to provide the resources (time and money) to train and attract metrology technicians and engineers. The PMA is forming a committee to develop curricula for two- and four-year colleges in measurement sciences.

Rolf Schumacher opened the second part of the meeting, welcomed the new attendees, primarily ASQC members and practitioners of quality control disciplines other than metrology, and introduced Fred Singdale, Process Systems Inc. Fred Singdale introduced Dana M. Cound, Corporate Director, Quality Assurance, Rockwell International, member of the Ad Hoc Committee for Licensing Professional Engineers, ASQC Vice President, Education and Development, and past Chairman, Orange Empire Section, ASQC.

Registering as Professional Quality Engineer - Dana Cound discussed the requirements of becoming a licensed Professional Quality Engineer under the "grandfather" clause. Applicants must show significant accomplishment in at least two of the four areas of quality control, (1) tests and measurements, (2) statistical analysis, (3) product analysis, and (4) reliability. Applicants need not be residents of California.

(For other interested NCSL delegates and colleagues: Application forms and directions on completing them may be obtained from Department of Consumer Affairs, State of California - Agriculture and Services Agency, 1006 Fourth Street, Sacramento, CA 95814, Tel. (916) 445-5544.) Applications may be made until October 1, 1977.

Dean Brungart, Teledyne, again graciously served as official photographer.
### NCSL ATTENDANCE

<table>
<thead>
<tr>
<th>Name of NCSL Member Organization</th>
<th>Location</th>
<th>Number of Attendees from Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerojet Mfg. Co.</td>
<td>Azusa, CA</td>
<td>1</td>
</tr>
<tr>
<td>Aeronautronic, Philco-Ford</td>
<td>Newport Beach, CA</td>
<td>6</td>
</tr>
<tr>
<td>American Geophysical</td>
<td>Gardena, CA</td>
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<tr>
<td>Autonetics, Rockwell International</td>
<td>Anaheim, CA</td>
<td>39</td>
</tr>
<tr>
<td>Beckman Instruments</td>
<td>Fullerton, CA</td>
<td>5</td>
</tr>
<tr>
<td>Celesto Industries</td>
<td>Costa Mesa, CA</td>
<td>1</td>
</tr>
<tr>
<td>Collins Radio, Rockwell International</td>
<td>Cedar Rapids, IO</td>
<td>1</td>
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<tr>
<td>General Dynamics, Convair Div.</td>
<td>San Diego, CA</td>
<td>1</td>
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<tr>
<td>General Dynamics, Pomona Div.</td>
<td>Pomona, CA</td>
<td>2</td>
</tr>
<tr>
<td>Hughes Aircraft</td>
<td>Culver City</td>
<td>5</td>
</tr>
<tr>
<td>Jet Propulsion Lab</td>
<td>Pasadena, CA</td>
<td>1</td>
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<tr>
<td>Lockheed California Company</td>
<td>Burbank, CA</td>
<td>2</td>
</tr>
<tr>
<td>McDonnell-Douglas, Astronautics</td>
<td>Huntington Beach</td>
<td>10</td>
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<tr>
<td>McDonnell-Douglas</td>
<td>Long Beach</td>
<td>8</td>
</tr>
<tr>
<td>National Astro Laboratories</td>
<td>Burbank, CA</td>
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<tr>
<td>Space Division, Rockwell Interna</td>
<td>Downey, CA</td>
<td>3</td>
</tr>
<tr>
<td>Teledyne</td>
<td>Northridge, CA</td>
<td>2</td>
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<tr>
<td>U.S. Navy Metrology Engrg. Center</td>
<td>Pomona, CA</td>
<td>7</td>
</tr>
<tr>
<td>Wasatch Div. Thiokol</td>
<td>Brigham City, UT</td>
<td>1</td>
</tr>
<tr>
<td>Process Systems, Inc.</td>
<td>Santa Ana, CA</td>
<td>1</td>
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</table>

Discussing the Impact of Metrification on a Standards or Calibration Laboratory. Panelists, from left to right: Bill Peverill, Al Mattay, Al Lauerman, Rolf Schumacher.
Introducing the panel to examine the question: Where will the next Generation of Standards and Calibration Laboratory Technicians and Engineers come from? From left to right: Dean Brungart, Algie Lance, Steve Kozich, Bob Couture, Arthur Plourde, Dale Stockwell.

Rolf Schumacher getting the workshop started to guide the attendees through the application for registration as Professional Quality Engineers.

Presentation of Certificates of Appreciation to Dana Cound (center) by Bob Couture, PMA President (left) and Rolf Schumacher, NCSL Region 8 Coordinator.
The U.S. manned space program has evolved from a rather small one-man spacecraft effort with a globe-girdling objective, to multiple manned lunar landings and return. No other country has been able to match that feat. The feat itself is not as important as what has happened to the people of this country because of it. We reached out into the cosmos, grabbed hold of a heavenly body, shook out some scientific data, and in the process advanced technology in the U.S. to a considerable degree.

The technological gain, although having immense impact, is not as important as the realization that the limits man has placed upon himself are less than those imposed on him by the universe. We've stretched and, in some measure, grown to fit that stretch.

National interest and backing was like no other previous program. The space program proved that almost any undertaking could be accomplished by application of the will of the people and a systems approach. It is our challenge now, as U.S., and world citizens, to bring these tools to bear upon the multitude of critical endeavors facing us today. Man has had a taste of the stars, now he will have no less.

The last planned spacecraft mission until the end of the decade has been completed. Apollo-Soyuz Test Project (ASTP) mission was completed on July 24th when the Apollo spacecraft splashed down in the Pacific Ocean near Hawaii. Astronauts Vance Brand, Thomas Stafford, and Donald "Deke" Slayton conducted a very successful mission that involved a historic linkup with two Soviet cosmonauts, Alexei Leonov and Valeri Kubasov, in their Soyuz spaceship. ASTP was the first space program which was conducted as a joint US-USSR endeavor. The first international manned docking mechanism was developed and utilized in space. The first space transfer of international astronauts into the opposite country's spacecraft was conducted. Scientific experiments were conducted jointly utilizing the two spacecrafts.

The end of a manned space era is at hand. Project Mercury one-man spacecrafts were utilized in the early 1960's. Gemini two-man spacecraft flew in the early to middle 1960's. Spanning a decade, the Apollo three-man spacecraft has been used throughout the Apollo, Skylab, and the recent ASTP missions.

Space Shuttle launches are to commence about 1980. These are to be airplane-like spacecraft capable of long orbit stays, large systems delivery, and re-entry via flying into special airports. In some configurations it could transport a dozen people to earth orbit, or take into orbit, and later retrieve, a cylindrical package measuring 15' diameter by 60' long. Shuttle is currently the U.S.'s only manned spacecraft program.
The Tulsa Division of Rockwell International Corporation is Oklahoma's first State Certified Metrology Laboratory receiving license number one. The license was issued by the State Board of Agriculture following their investigations to assure that the Tulsa Division complied with the provisions of the Oklahoma Metrology Act and the Rules and Regulations proclaimed by the State Board of Agriculture.

"The establishment of state certified laboratories will further protect the consumer and taxpayer," stated K. C. Adamek, Quality Assurance director for the Tulsa Division. He explained that any equipment being used to run tests, surveys and samples first needs to be accurate itself. These tests can range from checking that gauges controlling the temperature of curing food items are accurate to the checking of stress equipment used to make sure the type of asphalt for instance placed on a road is strong enough.

"The equipment in our laboratory which will test the accuracy of other equipment is yearly checked and certified by the National Bureau of Standards as complying with national standards of accuracy," Adamek stated.

California is the only other state which has certified laboratories to control the accuracy of test equipment. Since there are only two of these laboratories in California, the Tulsa Division becomes the third in the nation to receive certification under state statute.

The license allows the Tulsa Division to commercially perform measurement services and certification on equipment dealing with gas flow, dimensions, mass and force, optics, temperature, pressure and vacuum, electrical, time and frequency.

"The Tulsa Division is proud to meet the standards of the Oklahoma Board of Agriculture and to have the opportunity to assure the accuracy of tests and measures for the Oklahoma consumer," Adamek concluded.
NEW NCSL MEMBERS

Naval Ammunition Depot  
Code 7053  
Crane, Indiana 47522  
Delegate - Maurice L. Dake

SIMCO Electronics  
382 Martin Avenue  
Santa Clara, California 95050  
Delegate - William T. Harrison

INCAL Service Corp.  
73 Southfield Avenue  
Stamford, Connecticut 06902  
Delegate - James Dunleavey

Rockwell International Corp.  
6633 Canoga Avenue  
Canoga Park, California 91311  
Delegate - Joseph A. Revilla

DR. SIMPSON RECEIVES BEST PAPER AWARD

Dave Mitchell, NCSL President presents the NCSL BEST PAPER Award to Dr. John Simpson of NBS while Dr. McCoubrey, Director of the NBS Institute For Basic Standards, joins in the ceremony. Dr. Simpson's paper, "Modernizing Gage Block Calibrations: A Case Study in Measurement Assurance", was presented at the 1974 Joint Measurement Conference (JMC). Dr. Simpson is Deputy Chief of the Optical Physics Division.
First Call for Papers

The program committee invites papers discussing recent advances in the technique of precise measurement of all electromagnetic quantities, at frequencies from d.c. through the visible. Acceptable topics include measurements of fields and signal characteristics such as power, current, voltage, field strength, and frequency; transfer characteristics of devices and networks such as impedance and attenuation; and the electromagnetic properties of materials.

The emphasis on precision is tempered by the degrees to which various quantities can be defined and controlled, but should generally reflect the best attainable. The Conference will cover traditional topics such as the realization and maintenance of SI units as well as progress in applying newer technologies such as digital instrumentation, cryogenic devices, and lasers. Noise, interference, and electromagnetic radiation hazards will also be appropriate topics.

The special theme of this Conference will be the close and complex interdependence of all electromagnetic measurements with more than a minimal degree of sophistication.

Submit papers to the Chairman of the Technical Program Committee:

Dr. Robert A. Kamper
Electromagnetics Division
National Bureau of Standards
Boulder, Colorado 80302

Authors should send two copies of a 500 to 1000 word summary with up to five illustrations before January 15, 1976. Upon acceptance, authors will receive detailed instructions for preparation of camera-ready copy of final summaries to be reproduced in the Conference Digest.

Papers from the 1976 CPEM will be reviewed for publication in a special issue of IEEE Transactions on Instrumentation and Measurement.

General questions concerning the Conference should be addressed to:

George Goulette, Director
Bureau of Conferences and Institutes
University of Colorado
Boulder, Colorado 80302
Crucial to the success of microwave information systems are antennas which receive microwaves or transmit them in patterns of fields that vary in strength with direction and distance from the antenna. The successful design and operation of microwave systems depend on accurate and detailed measurements of antenna patterns and performance.

Major advances in antenna measurements are reported from the National Bureau of Standards laboratories in Boulder, Colorado. There David Kerns, Paul Wacker, Ramon Baird, Allen Newell, and Ronald Bowman of the NBS Electromagnetics Division have been working for several years on systems for evaluating antenna performance. Using new techniques and measurements made close to the antenna (the "near-field"), these NBS scientists are now able to accurately calculate antenna fields at any distance from the antenna. The result of these studies are cheaper, more accurate systems for carrying the burgeoning information necessary for today's society.

The theory that led to this near-field scanning technique was developed by Dr. Kerns. Dr. Wacker worked out an extrapolation technique that accurately determines the concentration (gain) of a microwave beam from an antenna in any given direction.

The new techniques for microwave antenna measurements--carried out on a nearby scenic Colorado mesa, in the Boulder laboratory and at various field locations--have contributed to the successful operation of microwave antennas for Apollo and Sky-lab missions, satellite communications systems, and aircraft and shipboard radar. The techniques have reduced costly system failures and the bulkiness and cost of many transmitters and receivers. They have also helped reduce unnecessary energy consumption for microwave telecommunications.

Expansion of the NBS work has led to at least partial replacement of the conventional far-field method for antenna measurement. The traditional method requires microwave measurements from distant towers, satellites or airplanes. Aside from the expense, these measurements give only a fragmentary picture of the whole microwave field. And far-field measurements of electrically large microwave antennas (greater than 50 to 100 wavelengths in diameter) require great distances and heights above the ground to avoid huge errors from ground reflections.

The new extrapolation and near-field scanning techniques provide more accurate, economical and convenient microwave antenna measurements on much smaller ranges than the traditional methods. NBS scientists can use the extrapolation technique to evaluate high-gain antennas up to 1.8 meters (6 ft) with gains up to 10,000. These, in turn, can be used to evaluate giant antennas for any purpose.
The NBS extrapolation range is a pair of 6-meter-high antenna towers on platforms, which move on a 60-meter-long, precision laid track. (A conventional range would require towers 60 meters tall and 600 meters apart.) Smaller extrapolation ranges are used in the laboratory for small antennas at higher frequencies. The method corrects for measurement problems arising from close proximity of the antennas and multiple reflections between them. In principle, the same technique can be used to evaluate the far-field of lasers.

For near-field scanning measurements, NBS has built an automated computer-controlled scanner that can scan a 4.5-meter-square plane. It is housed in a two-story room in the Boulder laboratory and can handle most microwave antennas. (Although scanners can be large, scanning ranges require a hundredth or less the distances of traditional ranges. An indoor scanning system also avoids radio interference and weather problems.) In addition to antenna gain, complete field patterns can be obtained.

The near-field scanning technique is useful in evaluating radar antennas for aircraft or ships (where the scanner may be brought to the antenna site), satellite TV antennas for continental coverage, or earth resource sensing antennas. The detailed pattern information on these antennas has been very difficult and expensive to obtain by other methods.

The NBS scanning system is now being used as a model for similar installations in government and industry around the country. Systems are being built or considered by Wright-Patterson Air Force Base, Texas Instruments, the Naval Ship Engineering Center, and several others.

For air safety and defense, scientists use the scanning technique to evaluate a phased array antenna, a group of fixed antennas working together which can track several missiles or airplanes at the same time. When tracking aircraft, an air traffic controller could change the beam direction instantaneously through computer and electronic control. In a single mechanical scan, the equipment could evaluate the array in many directions at once. (Using the traditional technique, the equipment must be put aboard a platform and rotated for measurement in each direction.)

It is impossible to accurately evaluate millimeter-wave antennas in the far field because the waves are strongly absorbed by the atmosphere in an unpredictable manner. In contrast, the short distance employed in the scanning method make it ideal for evaluating millimeter-wave antennas for space applications since the absorption is negligible.

A new near-field spherical scanning technique for evaluating fields over a spherical surface about an antenna is now being developed by Dr. Wacker. (The current near-field scanning method requires scanning a plane larger than the antenna size. It is impractical to scan a plane 60 to 90 meters in the air above a
30 to 60 meter diameter antenna.) With the spherical scanning method, measurements can be made from a fixed probe above the antenna. Fields on a spherical surface in front of the antenna are determined by moving the antenna on its mounting beneath the fixed probe.

Dr. Wacker had to solve a monumental data reduction problem to demonstrate the feasibility of this technique. But it now appears economically useful for antennas which can be rotated, and the method could be widely used at industrial antenna measurement facilities with little additional equipment. The method also appears useful in evaluating large dish-shaped antennas intended for satellite communications and the study of microwave signals from outer space.

NEAR-FIELD/FAR-FIELD — National Bureau of Standards (NBS) scientists have shown that if one can measure the radiation field of an antenna in its immediate vicinity (the "near-field"), then one can calculate the "far-field" — the directional distribution of signal power at the distant points where the target receivers are located. Here the far field is shown as the pattern extending from the antenna to the far right; the near-field is represented by the small inner pattern just to the right of the antenna.

MOVABLE Probe — National Bureau of Standards scientist John Green examines a moveable probe that measures the microwave antenna field in an area covered by microwave absorbing cones (background). The field comes from a nearby, track-mounted antenna (foreground). From these measurements, scientists may compute the field pattern any distance away.
<table>
<thead>
<tr>
<th>1975</th>
<th>Courses &amp; Conferences</th>
<th>Location</th>
<th>Further Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 24-30</td>
<td>International Federation of Automatic Control, Sixth Triennial World Congress</td>
<td>Boston, Massachusetts</td>
<td>Contact: International Federation of Automatic Control, Phone: 617/738-8108</td>
</tr>
<tr>
<td>Aug. 26-28</td>
<td>Space Shuttle Missions of the 80's</td>
<td>Brown Palace Hotel Denver, Colorado</td>
<td>Contact: American Astronautical Society, P.O. Box 392, Littleton, Colorado 80120 Attn: Duaine Schilling</td>
</tr>
<tr>
<td>Sept. 1-4</td>
<td>Fifth European Microwave Conference/Microwave 75</td>
<td>Hamburg, Germany Congress Centrum</td>
<td>Contact: Dr. J. J. Schmits, Conference Chairman, Philips Forschungslaboratorium Hamburg, D 2 Hamburg 54, Vogt-Koellnstrasse 30, Germany</td>
</tr>
<tr>
<td>Sept. 9-12</td>
<td>Reliability &amp; Maintainability Techniques</td>
<td>ARINC Res. Corp. Headquarters Annapolis, MD.</td>
<td>Contact: Registrar, 2551 N. A. Road, Annapolis, MD. 21401 Phone: (301) 369-4000 or 261-1600</td>
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<tr>
<td>Sept. 8-13</td>
<td>Engineering and Management</td>
<td>UCLA Extension Los Angeles, CA</td>
<td>Contact: Tom R. Minter, Coordinator, Engineering &amp; Management Course, CH2M HILL, Boelter Hall, Univ. of California, Los Angeles, CA 90024, Phone: 213/825-3858, 213/825-8562</td>
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<tr>
<td>Sept. 9-11</td>
<td>COMCON FALL</td>
<td>Mayflower Hotel Washington, D.C.</td>
<td>Contact: Merlin Smith, J.J. Watson Res., Ctr., P.O. Box 218, Yorktown Heights, N.Y. 10598</td>
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<tr>
<td>Sept. 14-15</td>
<td>International Symposium on Environmental Monitoring</td>
<td>Frontier Hotel Las Vegas, Nevada</td>
<td>Contact: Environmental Protection Agency, National Environmental Research Center, P.O. Box 15027, Las Vegas, Nevada 89114 Phone: 702/736-0028</td>
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<tr>
<td>Sept. 14-19</td>
<td>Environmental Sensing &amp; Assessment Int'l Conf.</td>
<td>Stardust, Las Vegas, Nevada</td>
<td>Contact: K. Barth, Environmental Protection Agency, P.O. Box 15027, Las Vegas, Nev. 89114</td>
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<tr>
<td>Sept. 15-19</td>
<td>EMC-Design and Measurement for Control of EMI</td>
<td>Washington, D.C.</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767 Phone: 301/948-0628</td>
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<tr>
<td>Sept. 16-17</td>
<td>Optical Fibre Communication</td>
<td>London, England</td>
<td>Contact: IEE Conference Department Savoy Place, London WC2R OBL</td>
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<tr>
<td>Sept. 22-24</td>
<td>Ultrasonics Symposium</td>
<td>Los Angeles Hilton, Los Angeles, CA</td>
<td>Contact: R. G. Webber, Univ. of Cal., School of Engrg. &amp; Applied Sci., Los Angeles, CA. 90024</td>
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<tr>
<td>Sept. 23-24</td>
<td>EMI Control in Medical Electronics and Hospitals</td>
<td>Washington, D.C.</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767, Phone: 301/948-0628</td>
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CALENDAR OF EVENTS

<table>
<thead>
<tr>
<th>Date</th>
<th>Courses &amp; Conferences</th>
<th>Location</th>
<th>Further Information</th>
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<tr>
<td>Sept. 29-Oct. 1</td>
<td>Int'l. Electrical/Electronics Conf. &amp; Exhibition</td>
<td>Automotive Bldg., Expos. Toronto, Canada</td>
<td>Contact: T. W. Purdy, 237 Parkview Ave., Willowdale, Ontario, Canada</td>
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<td>Sept. 29-Oct. 3</td>
<td>Application of Reliability and Maintainability Techniques</td>
<td>Annapolis, MD 2551 Riva Rd.</td>
<td>Contact: Educational Programs Office, ARINC Research Corporation, 2551 Riva Rd., Annapolis, MD 21401, Phone: 301/268-4600; 301/261-1600</td>
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<tr>
<td>Sept. 30-Oct. 2</td>
<td>EMI Control in Design and Installation of Computers</td>
<td>Circus Circus, Las Vegas, Nevada</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767 Phone: 301/948-0028</td>
</tr>
<tr>
<td>Oct. 2-8</td>
<td>World Telecommunications Forum (TELECOM '75)</td>
<td>Geneva, Switzerland</td>
<td>Contact: W. G. G. Wolter, 39 Avenue de Mayrin, CH-1212, Meyrin-Geneva, Switzerland</td>
</tr>
<tr>
<td>Oct. 6-7</td>
<td>Shielding</td>
<td>San Antonio, Texas</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767 Phone: 301/948-0028</td>
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<tr>
<td>Oct. 6-8</td>
<td>World Telecommunications Forum</td>
<td>Palais de Expositions Geneva, Switzerland</td>
<td>Contact: W.G.G. Wolter, 39 Avenue de Mayrin, Ch-1212, Meyrin-Geneva Switzerland</td>
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<tr>
<td>Oct. 7-9</td>
<td>IEEE International Symposium on Electromagnetic Compatibility</td>
<td>El Tropicano Motor Hotel 110 Lexington Ave, San Antonio, TX, 78204</td>
<td>Contact: Gus Van Steenberg, Southwest Research Institute, P. O. Drawer 28510 San Antonio, TX, 78204</td>
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<tr>
<td>Oct. 9-10</td>
<td>Grounding</td>
<td>San Antonio, Texas</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767 Phone: 301/948-0028</td>
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<tr>
<td>Oct. 13-17</td>
<td>EMC-Design and Measurement for Control of EMI</td>
<td>London, England</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767 Phone: 301/948-0028</td>
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<tr>
<td>Oct. 14-16</td>
<td>International Telemetering Conference</td>
<td>Sheraton Inn Silver, Spring Maryland</td>
<td>Contact: General Chairman Dr. Neil Birch 3111 Marlborough Way College Park, Md. 20740 Phone: 301/935-6584</td>
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<tr>
<td>Oct. 14-16</td>
<td>Fiber Optics and Optical Isolators</td>
<td>Washington, D.C.</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767 Phone: 301/948-0028</td>
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<tr>
<td>Oct. 28-30</td>
<td>Microwave Solid State Circuits</td>
<td>Washington, D.C.</td>
<td>Contact: Don White Consultants, Inc. International Training Institute 14800 Springfield Road Germantown, Maryland 20767 Phone: 301/948-0028</td>
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