I want to begin my first message to the Member Delegates of the NCSL by offering a few thank-you's. First, I think we all owe a sincere message of appreciation to George Rice for his dedicated leadership and personal contributions during 1984. There were many significant accomplishments for the organization during his administration. Secondly, I personally want to express my thanks to all Member Delegates for providing an excellent team of Officers and Directors to assist me during 1985. I think that 1985 will indeed be a pivotal year for the NCSL. We will be faced with many challenges and opportunities and one of my primary objectives will be to maintain the momentum of the organization that has been established over the past several years.

As most of you should know by now, we re-structured the Board during 1984 (effective January 1985) by adding a fifth Vice President. We also created some new standing committees and consolidated others. The NCSL now has a total of twenty-two committees — a gain of seven over 1984. There are also several subcommittees actively pursuing ambitious goals for 1985 and beyond, as well as six separate ad hoc committees working on issues and concerns for the near-term. Another thank you for all of those who stepped forward to volunteer their services and the support of their respective organizations. The NCSL depends heavily upon this principle of volunteerism.

The recent resignation of Cliff Koop as Vice President of Industrial Technology has necessitated additional changes in the Board organization. Last month Hillary Taff was elevated to the office of Vice President and Bill Simmons was appointed to a Directorship — both for the remainder of 1985. Those of us on the Board of Directors who worked with Cliff Koop over the past several years will truly miss his contributions as well as his comradeship.

By now, all Member Delegates should be in possession of the NCSL Long Range Plan: 1985—1989. I encourage you to review this document and comment back to your Region and Section Coordinators on the objectives, goals, issues, etc. We on the Board are concerned with the future role and direction of the organization and actively solicit your comments and inputs. We want to remain a dynamic professional organization which is sensitive to the needs of the general membership and, when and wherever possible, be responsive to them.

It has been the tradition for the past several years for the NCSL President together with his Executive Vice President and the Immediate Past President to meet early each year with the Director of the NBS and members of his staff. This year the meeting was held on February 5 and included fourteen members of Dr. Ambler's senior staff as well as our NCSL Vice President of Laboratory Management, Del Caldwell and former NCSL President, Hartwell Keith. Among the issues discussed were the NBS-NCSL relationship, the NCSL Secretariat support from the Bureau, Lab Accreditation, the proposed change in the Legal Volt and Ohm, the NBS Industrial Measurement Series, and our National Measurement Requirements Survey.

Two areas discussed at some length deserve further expansion — the NCSL Secretariat and the NBS sponsorship. Agreements in principle were established which will require the NCSL to assume the major (if not the total) cost of this office by October, 1986. Also the current formal sponsorship relationship between the NBS and the NCSL will probably change at the same time. Your Board of Directors, through established ad hoc committees, are continuing to assess the impacts and evaluate the various options in regard to these two issues.

Our recently formalized Government Affairs Committee, under the leadership of former President, Hartwell Keith, has been active during the first quarter of 1985. The actions taken were on behalf of our domestic non-governmental members. By the time you read this NEWSLETTER, both written and in-person testimony will have been presented to the House Subcommittee on Science, Research and Technology as well as the Senate Subcommittee on Science, Technology and Space. These two Congressional subcommittees were conducting budgetary hearings for fiscal 1986 for the NBS. Our solicited testimony addressed the importance of measurement services provided by the Bureau and more specifically, the budget item identified as Process and Quality Control. Some of you may have received a special informational package by our committee soliciting timely responses to your elected congressional representatives. For those of you whose organizational policy permits such responses, and if you in fact responded, I thank you for your involvement.

(continued on page 2)
PRESIDENT'S MESSAGE (continued from Page 1)

I also want to remind everyone of this year’s annual NCSL Workshop and Symposium which will be held in Boulder, Colorado on July 15-18. The theme for the conference is ‘Managing Measurements to Achieve Quality’ and from all indications, will be an interesting and productive conference. I invite you to make plans now to attend. For additional information please contact our Conference Director, Roland Vavken (714) 632-3560 or Ken Armstrong in Boulder (303) 497-3787.

Let me conclude this message with an appeal to each member delegate to increase your level of involvement in NCSL activities. And, together with your help and participation, we will — I’m sure — maintain the momentum for 1985.

R.B. (Pete) England, President

EDITOR'S MESSAGE

William Wildhack — Our Founder

We have learned that William Wildhack’s health is not so good. Some of his friends may wish to write Bill at this address:

Mr. William Wildhack
415 North Oxford
Arlington, VA 22203

Attention Equipment Manufacturers

It occurred to me recently that there is certain news from instrument manufacturers that would be of use to you readers. Certainly, the crass commercial stuff like Product News doesn’t qualify.

But I do believe that there is service-oriented news, news about office location moves like the Guideline move, application publication availability, etc. that probably does qualify. As examples, the last several issues contained information about 2 publications which listed thousands of HP part numbers of semiconductors vs their generic part numbers. In this issue, I’m running an HP story (page 28) on a changeover to metric fasteners that has some service and repair implications to readers, I think.

But I’m interested in what you, the readers, think? Am I on thin ice? You manufacturers might want to send me similar news from your companies.

John Minck, Editor
HIGHLIGHTS OF THE NCSL BOARD MEETING

January 14-16, 1985
Marriott Hotel
Santa Clara, California

SECRETARY'S REPORT - Chet Crane

Chet reported that there were 39 new members processed during the 4th quarter. A list of New Members giving the name of their Delegate and his telephone number went to all Directors and Coordinators.

Chet reported that his records indicated 663 members at the end of 1984.

A motion was made that applications for memberships from non-United States based companies be reviewed by the International Director and his recommendations be forwarded to the Secretariat.

Bob Kamper suggested that a list of approved countries be developed. The Federal Register on High Technology was a suggested reference. Dean Brungart was assigned an action to change the guidelines to reflect the rules developed in Board meeting in October. Bob Kamper and membership chairman were assigned an action to develop guidelines and a list to use for accepting new applicants from outside the USA.

TREASURER'S REPORT - Gary Davidson

Gary reported that he has sent a copy of the revised by-laws to the IRS. He has not been notified of approval but does not expect any problems.

Gary will put together a procedures for finances controls and reporting for the 1986 Conference.

Gary presented a financial summary as follows:

Financial Summary (YTD)

<table>
<thead>
<tr>
<th>Expenses</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Committee Accounts</td>
<td>26,415.04</td>
</tr>
<tr>
<td>Operations Accounts</td>
<td>24,114.71</td>
</tr>
<tr>
<td>Self-sustaining Accounts</td>
<td>520.26</td>
</tr>
<tr>
<td>Total Expenses</td>
<td>51,050.03</td>
</tr>
</tbody>
</table>

Gary made the motion to change signature authorizations as outlined in his proposals. Seconded by C. Crane. The motion was approved with no opposing votes.

Gary presented a proposed budget for the 1985 calendar year. A copy is attached as appendix I.

Motion was made by Harry Haymes to accept the budget as submitted. The motion was seconded by Bryan Werner. The motion was carried with no opposing votes.

SPONSOR'S DELEGATE'S REPORT - Bob Kamper

Bob reported that there has been some discussion at NBS of the possibility of organizing a national calibration service that would provide calibration laboratory accreditation in a similar fashion to BCS in Great Britain. One advantage of such an organization might be that it could form the basis for international agreements for mutual acceptance of calibration certificates, thereby facilitating international trade in measuring instruments. Probably the most practical approach to forming such an organization would be through a partnership between NBS and some of the voluntary standards organizations, NCSL/ASTM are two possibilities.

Letters have been sent to twelve voluntary organizations (including NCSL) that are most likely to be interested in participating. Their replies will determine whether or not the discussion at NBS will proceed any further.

Bob reported that a new edition of SP-250, "Calibration and Related Measurements Services of NBS," is in draft form. The descriptions of NBS calibration services have been updated, and the numbering system has been revised to be more logical and compatible with storage of information by computer. The same numbering system will be used in the semi-annual appendices.
Bob reported that Keith Kirby has retired from the federal service. His position as chief of the office of Physical Measurement Services will be taken temporarily by Bill Reed.

Bob reported that The International Organization for Legal Metrology (OIML) held a meeting in Helsinki last October. About 20 Standards of performance for commercial measuring instruments of various kinds were formally accepted. Topics under discussion include performance standards for pollution-monitoring instruments. There will be a council meeting at PTB at the end of September 1985, at which the topic of recommended procedures for calibration of measuring instruments will be discussed.

The NBS representative to OIML is Dave Edgerly. He has written a report on the Helsinki meeting and would be pleased to provide a copy, or any further information that is desired. His telephone number is (301) 921-3287.

George Uriano reviewed some recent developments in the budget as it affects the NBS. The Administration's budget will be released February 3. George covered the highlights of the NBS planning report. George said that he would keep Pete England and George Rice advised on hearings and changes in committees.

SECRETARIAT'S REPORT - Ken Armstrong

Ken reported that 25 training tapes are overdue from ten members. No tape is more than 30 days past due. There is a backlog on TA104, "Logical Troubleshooting." The backlog is presently seven months. All copies are out and past due. There also is a backlog on TA 105 "Troubleshooting Transistor Circuits Faster." Mike Zall has been asked for additional copies and they are promised in February.

Other training aids that are proving popular are TA 153 "Square Waves, Differentiators, and Integrators," TA 302 "Philosophy of Calibration," and TA 303 Captain Hopper's address.

In the past the strategic plan was made available to all member delegates. They will be mailed to only those who request them this year since it was felt that not everyone had a need for it.

OLD BUSINESS

A proposal on changes in membership policies was submitted by Joe Simmons and presented by Art McCoubrey.

The general structure of this proposal was principally changes in the membership structure and fees for membership. Joe's proposal provides for four levels of members:

Corporate members - Same requirements as present member at the same fee with the same privileges.

Associate members - people interested in the goals of the organization, these would be workers with no vote on organization policies but having all the other privileges with fees of $40. Sustaining members - an honorary non-functional member, probably companies who desire to have their name listed as a sustaining member in various publications. Fees should be approximately $250.

Student member - must be a full time student with an interest in the field of measurements, primarily to bring in new younger blood. Fee should be $5 or $10 dollars. They would receive selected publications and privileges.

Pete England appointed George Rice to chair an ad-hoc committee with Joe Simmons to be a member. The purpose will be to study this question and make recommendations to the Board.

NEW BUSINESS

A motion to adopt the "Long Range Plan" for NCSL was made by Bryan Werner and seconded by Gary Davidson. The motion was passed with no opposing votes.

Pete suggested that the twelve issues listed in the Long Range Plan should be published and discussed at regional meetings. The motion was made and seconded to send a copy of the Long Range Plan to all member delegates. The motion passed without opposing votes.

Pete announced the meeting location for April Board meeting as Port St. Luci Florida. The July Board meeting will be at Boulder, Colorado and the October meeting is tentatively set for Ottawa, Ontario.

Dean Brungart accepted an action to chair an ad-hoc committee to study whether all ex-presidents should hold some Board status. This committee will also consider some mechanism for voting by proxy, a recommendation is due at April Board meeting.

Pete is asking for volunteers to put together a special publication to commemorate 25th anniversary and someone to form an anniversary committee.
1984 CONFERENCE CHAIRMAN'S REPORT - Moe Corrigan

Moe reported that the Conference was very successful with receipts of seventy thousand dollars. The surplus should be between five and ten thousand dollars.

1985 CONFERENCE CHAIRMAN'S REPORT - Roland Vavken

Roland reported that Ken Armstrong is taking care of the facilities and arrangements and that Jerry Hayes and Joe Simmons are working together on speaker selections. Roland reported that he received twenty responses to his call for papers and seven offers for workshop presentations.

United Airlines offered a 35% discount for flights to Denver in exchange for being named the official conference airline.

The school at Hutchinson has made a tentative proposal that they tape selected sessions as an exercise in their training.

Tours of the NBS Laboratories with presentations of what is there are planned.

Brian Belanger will talk on what measurement requirements are already foreseen as near term measurement requirements.

OPERATIONS VICE-PRESIDENT'S REPORT - Bob Weber

Publications Committee Chairman's Report - Bob Weber for Ralph Bertermann

Ralph reported that the new Directory has been printed and is in the process of being mailed to all member delegates.

Ken Armstrong has requested an additional printing of 500 copies of the "Calibration and Laboratory Manager's Handbook" during the first quarter of 1985.

Business Systems Committee Chairman's Report - R. Vavken

Roland reported on the status of the computer system and various programs. It is planned to run both the new and the old systems in parallel for about a month. Ken Armstrong reported that the new system has worked perfectly so far in all the jobs tried. Roland estimates that implementation will be complete by March 1985.

Meetings and Programs Committee Chairman's Report - Moe Corrigan

Moe reported that his new schedule has real regional meeting dates.

Moe reported that information has been slow in coming from Regional Coordinators and Directors.

Information for the Meetings and Programs report in the Newsletter should be submitted before March 1st.

Bryan Werner accepted an action item to have liaison delegates submit the key dates for each of their organizations.

Administrative Guidelines & By-laws Chairman's Report - Dean Brungart

Dean reported that the Administrative Guidelines have all been reproduced in the new format, and have been distributed to all previous manual holders. There are a number of new guidelines that need to be written as indicated by asterisks in the table of contents. It is suggested that the Vice Presidents get together with these committee chairmen and put together an input on these.

LIAISON DELEGATE'S REPORTS

IECQ Liaison - Tim Driver

The U.S. IECQ System now has a total of seventeen facility qualification approvals. Within the U.S. IECQ System there are three component class qualifications. IECQ International meetings are scheduled to take place in Los Angeles during April 1985. If interested in attending please contact Tim.

The ECCB hosted a meeting with representatives of the DOD in August 1984. The results were that DOD representatives concluded that the IECQ System had appeal and might benefit the DOD and the DOD agreed to have staff members do additional exploratory work including consideration of policy changes that would include DOD field activity participation.

IEEE Instruments & Measurements Society - Bob Kamper

Bob reported that Reuven Kitai is now editor of the "Transactions," and that Fred Liguori is the President. Fred is at the Naval Air Engineering Center at Lakehurst, New Jersey.
Board Meeting

Measurement Science Conference - Dean Brungart

Dean reports that everything is going well and attendance for the Conference is anticipated to be greater than 400.

VICE-PRESIDENT'S REPORT - MARKETING - Bob Lady

Bob reviewed and coordinated the budget forecast for the committees reporting to VP Marketing and all Administrative Guidelines for them. He is looking for a chairman for the Metrology Compendium Committee.

Bob reported that the office of Vice-President Bush contacted him to obtain information on NCSL activities in the South.

Newsletter - John Minck

John is asking for an input from everyone on the number of copies of the Newsletter you want to receive. John requested inputs for two columns "Whatever Happened to Whose-His-Name?" and "Someone You Should Know."

Membership Committee - Anthony Anderson

Tony reported that he received a listing of all non-members which are in the new directory. He has sent each of them a letter pointing out the many benefits of becoming a member. He sent the same letter and material to the non-members that attended the Canadian Section meeting.

Ed Nemeroff reported that Al Herman is doing new slides for the NCSL slide presentation. Conversion of this presentation to video tape is being considered, it has been suggested that it be made available in several languages for use by international members.

Honors & Awards Committee - J.R. Varvel

Jay reported that he intends to retire in December of this year but will complete all responsibilities of his current appointment including the 1986 letterhead.

Metrology Compendium Committee - Jim Ingram

Jim explained what he had intended to accomplish in the way of publication and presented a proposed format for an input form. He requested that people on the Board with suggestions/inputs communicate with him or Bob Lady.

VICE-PRESIDENT'S REPORT - LAB MANAGEMENT - Delbert Caldwell

Del reported that Frank Koide and he made presentations on October 4, 1984 at the NCSL Conference in Gaithersburg. Del provided results of the NMRC subcommittee reviews of the NBS response to the 1982 National Measurement requirements Survey. Frank described his involvement in the IEEE ad-hoc committee to promote National Microwave Standards (PNMS).

Frank also participated in the 28 November meeting of the IEEE-PNMS Committee. Frank presented the activities of the NMRC Microwave subcommittee and his efforts to develop an integrated matrix of national microwave standards requirements. The final version of this matrix is expected in March 1985.

The National Measurement Requirements Committee met on 16 November at the Navy Metrology Engineering Center. Plans for updating the National Measurement Requirements Report during 1985 were formulated.

Laboratory Evaluation Committee - Del Caldwell for Carl Quinn

Del reported that Carl has mailed the Secretary the survey of Member Delegates on Laboratory Accreditation activity. He hopes to have the results ready by the Boulder Conference.

Carl receives information from the British Calibration Service with updates to the Directory of Approved Calibration Laboratories including the uncertainty assigned by specific parameter. The British Calibration Service Program Manual is also updated with new or revised criteria.

Measurement Assurance Committee - Del Caldwell for Arno Ehman

The Region 8 Volt MAP done in April/May was repeated in October. The mean offset of the group was less than 0.1 microvolt different from the earlier MAP. Offsets between labs were independently verified by passing a Fluke 732A Solid State Voltage Standard around. Agreement with repeat MAP data to date is in the order of 0.1 microvolt.

A round robin between 14 labs from the three California MAP groups is scheduled to start after the Measurement Science Conference in January 1985. Two solid-state voltage standards (one donated to NCSI by the Fluke Manufacturing Company and one loaned by Standard Reference Labs) will be used.
Towards the end of 1985 the Committee hopes to be able to extend an invitation to any member lab seriously interested in participating in round-robins at 1.018 volts, 10 volts, 1 ohm, or 10 kilohms to communicate with them.

Due to delays no equipment purchases were made in 1984. The Committee has proposed that the same amount be budgeted for 1985 instead.

National Measurement Requirements - Del Caldwell for K. Jaeger

Pete England asked whether the form for the survey could use a standardized approach, whether a standard method for listing parameters and stating accuracy and capabilities would be beneficial.

John Minkel suggested that a survey of member performance data might be of interest to the members, sort of workload-standard hours-intervals kind of information. Perhaps some kind of productivity comparisons -how much time should a particular job take. Another idea would be a survey of reliability factor for manufacturer's equipment by model.

CALIBRATION SYSTEMS MANAGEMENT - Selden McKnight

The National Measurement Requirements Committee has been divided into five sub-committees:

DC and low frequency - Chairman Lyle Schmidt
RF and microwave - Chairman Frank Koide
Electro Optics - Richard Miller Chairman
Temperature and Pressure
Physical and Dimensional

LABORATORY EVALUATION - Carl Quinn

Carl reported that the results of the survey will be reported at the Boulder Conference if at all possible.

VICE-PRESIDENT'S REPORT - EDUCATION - Ed Nemeroff

Ed reported that the following committee chairpersons have been appointed:

1. Training and Information/directory
   Dave Lorenzen
   McDonnell Douglas Corporation
   Huntington Beach, California

2. Adjunct Training
   Richard Drew
   Martin Measurement Systems
   Orlando, Florida

3. Education Liaison
   Kate Webster
   Bionetics Corporation
   Brook Park, Ohio

4. Publicity
   Allen Herman
   Cooper Cameron
   Clifton, New Jersey

5. Training Aides
   Bill Simmons
   Barrios Technology

Education and Training Committee - John Martin

Jim Teza of Butler College was at NBS for the summer on a six month sabbatical, and on November 2, members of the College faculty and administration, the Board of Trustees, the Butler College Chamber of Commerce and John met with the NBS staff on the possibility of starting a training program in Automated Manufacturing Robotics. Dr. Marrifield, Assistant Secretary of Department of Commerce gave a talk on the recent change in Anti-Trust legislation and on R & D limited partnerships and the incentives industry now has for developing high technology training and research program with educational institutions.

Pete will appoint a liaison to the Tri Services Calibration Coordination group. He will contact Fred Seeley as a possible liaison.

BIOMETRICAL AND PHARMACEUTICAL METROLOGY COMMITTEE - Bob Lady for Bill Fitzgerald

Bill reported that he had made a presentation for a validation group on November 27. His subject was Metrology and Calibration as it pertains to validation in the pharmaceutical industry wherein the following topics were discussed: basic requirements for an effective Metrology and calibration program, Metrology and Calibration as a means of validation of critical measurements in control systems, review of the NCSL Medical Products and Pharmaceutical Industry Calibration System Control Guidelines, introduction to the National Conference of Laboratories. Bill also requested lists of NCSL training material be sent to two member delegates who were in attendance.

PRODUCT DESIGN & SPECIFICATION COMMITTEE - Warren Collier

During a committee meeting held October 4, 1984 at the NBS, Bob Willet decided to take a new look at his proposal for changing RP-3. He agrees that the term "Verification" should
not replace "Calibration" in the RP3, although other changes suggested are valid and useful. They also discussed the feasibility of publishing a list of terms relating to calibration and metrology.

Continued interest was expressed in a proposal by Warren to create an RP covering certificates of calibration. A draft has been completed and is being routed to the committee for comments.

Del Caldwell commented that there is a need for standardization in hardware specifications among manufacturer's since buying/selling equipment should be possible from review of specifications and terms and parameters should mean the same things in different manufacturer's manuals and instruction sheets.

ELECTRIC UTILITIES - Hillary Taff for Paul Messinger

Hillary reported that the committee's goal was to get some general agreement on certification of suppliers of nuclear products and instrumentation. George Rice asked who was on the committee. Hillary said that it was approximately fifty percent nuclear generating people.

Bryan Werner commented that all board members should be aware that members of the Executive Board should be contacted and informed of any requests for information concerning NCSL from official sources. Such occasions may present an opportunity for enhancing the stature of NCSL.

AUTOMATIC TEST AND CALIBRATION SYSTEMS - Jerry Niedrauer

Jerry discussed his survey on use of automated equipment. Possible areas for other surveys including procedures and calibration methods were discussed.

Jerry reported that a paper presently in draft form concerning the control of software is being circulated in committee. He expects to have it back from committee with comments in time for the Spring issue of the Newsletter.

Art McCoubrey asked whether a library of available procedures is available. No one present could provide a source.

Two questions that the committee wishes to address are:

1. How do you calibrate things with Automatic Calibration Systems?

2. How do you calibrate automated systems in production or Engineering areas?

OTHER AGENDA

Pete discussed a letter he has received requesting inputs from NCSL regarding the impact that may result from change in the legal US volt and legal US ohm. Pete requested that the subject be addressed at Regional meetings and initial input be provided to him or Art McCoubrey by March with detailed inputs from NCSL due in October 1985.

Art detailed the problem without present legal quantities and explained the dates requested are because they would like to standardize in 1986 at the time of CPEM. George Uriano stated that there could be many advantages, especially economic, to worldwide agreement on values.

Bob Kamper explained that the problem was universal and probably when an exact value is fixed everyone will make some adjustment. The US will make one of the largest adjustments because of an earlier calculation involving the volt and the calculable capacitor.

George Uriano will format the letter and also to put some words together for publication in the Newsletter. Del Caldwell will chair an ad-hoc committee with Ed Nemeroff and Arno Ehman as members to address the requirement and make a report.

REGIONAL REPORTS

Regions 1 & 2 Director's Report - Harry Haymes

Harry reports that he has contacted all attendees at the conference that were not members. This has resulted in three new members. A copy of this letter was sent to Ed Nemeroff for the membership committee. Harry suggests that other directors follow this procedure.

Region One Report - H. Haymes for Bill Robinson

Region 1 held a meeting on November 8, 1984 at Tektronix, Inc., Lexington, MA. This meeting was a dual session with a separate seminar for technical training. Warren Collier led a discussion of the newly approved Handbook 52A and Tim Driver discussed the latest on IECQ. Harry gave a report.
Sixteen technicians attended the technicians seminar on high efficiency power supplies presented by Charlie Rawls of Tektronix.

The next meeting has been tentatively scheduled for March 12, 1985.

Region Two Report - M. Haymes for Bill Brenant

Bill reports that as an advisory member for the Hutchinson-area Vocational-Technical Institute he was involved in a meeting to discuss Training areas, Equipment, Costs, Instructors, and General Training Placement Guidelines and needs of industry.

Three meetings are scheduled for 1985 as follows:

1. March 12, 1985 at Lockheed, NJ
2. June 19, 1985 in Philadelphia, PA
3. October 23, 1985 in New York City Area.

Region Three Report - Hillary Taff

No replacement has been found for Merlin Johnson. He continues to devote time to keep Regional affairs together. He is trying to schedule a MAPS seminar for around the end of March. He is trying to schedule a Regional meeting for mid-February to help develop interest for the seminar.

The NCSL Utilities Committee was established. Paul Messinger was proposed as Committee Chairman.

Region Four Report - Hillary Taff

There was no formal report for the Coordinator, however Ed Nemeroff reports attending a Regional meeting and there are activities.

Region Five Report - Pete England for Phil May

Pete reports that there are two meetings planned, the first tentatively planned for the first quarter at the Air Force Primary Standards Lab in Newark, Ohio. This to be in conjunction with PMA Sectional meeting.

A survey of Region 5 members to investigate the possibility of sectioning the region. Should this prove feasible, sectional meetings will be scheduled.

Region Six and Eight Director's Report - John King

John reports the following Section Coordinator appointments:

Region 6 Coordinator - H.F. Gonzales
White Sands/El Paso Section - Hank Gonzales (acting)
Dallas/Ft. Worth Section - Bob Willet
Denver/Boulder - Dave Workman
Houston - W.A. Bill Simmons

Region 8 Coordinator - Rolf Schumacher
Los Angeles Section - Bob Smith
San Diego Section - Kevin Clark
Phoenix/Tucson - April 3 - October 23
San Diego - February 20 - October 9

The Salt Lake Section does not have a planned meeting. They are invited to all the listed section meetings.

Region Six and Eight Director's Report - Bill Simmons

Bill reports that a Region 6 meeting was held in Dallas on November 14, subjects discussed were productivity and bar coding.

A Region 8 meeting was held in Phoenix on October 25.

Bill viewed a film while at NASA Metrology Workshop titled "Measurement: The Vital Link." He suggests that this film be added to the NCSI video tape library.

The total 1984 attendance for Region 8 was 257. The Section Coordinator for Phoenix/Tucson, Mr. Cecil Cole, may not be able to serve much longer. Nominations for a replacement will be gratefully accepted.

John stated that utilizing the NCSL slide presentation at meetings where non-members are in attendance helped increase the membership in the San Diego Section.

Region Seven and Nine Director's Report - Jim Ingram

Region Seven Report - Jim Ingram for Ashley Harkness.

Region 7 held a meeting on November 14, 1984, hosted by Bob Weber at Lockheed
Board Meeting

Missiles and Space Company Metrology Lab in Sunnyvale, CA. The data base established as a catalog of metrology publications has been transferred to an IBM/XT for easier portability. This is ready for use and will be maintained at U.S. Instrument Rentals by Darlene Olsen.

Region Nine Regional Report - Jim Ingram for David Goodhead

David reports that Region 9 held a meeting at the Tektronix Factory Service Center in Beaverton, Oregon December 14, 1984. Principal discussion subjects were productivity and a presentation titled "Artificial Intelligence." Feedback to Phil May on reasons response to salary survey was sparse because the survey was too time consuming.

By a vote of the members present the meeting dates were changed from the second week of June and December to the second week of April and September.

The next meeting will be held in Richland, Washington.

Region Ten Coordinator's Report - Pete England for Graham Cameron

Sixty-one persons attended the Fourth Annual Canadian Section meeting of the region, held on November 28th in the Department of National Defense Ottawa South Social Centre. Due to attendee interest in the NBS film "The Automated Manufacturing Research Facility" a request has gone to Dennis to provide a video tape copy to the NCSL Library.

Graham expressed his appreciation for support of all who attended the International Regional Dinner and to Carl Quinn, Nancy and Cliff Koop, Nancy and Bryan Werner and Gary Hysert for their generous sharing of their talents. A thank you also to Andy Dunn and to Keith Kirby for making it possible.

Graham reported that negotiations are completed with the meeting hotel for dates October 7, 8, and 9 at the Delta Hotel in Ottawa Ontario. Room rates are $80 (Canadian) single or double occupancy. A special weekend rate of $60 (Canadian) is available for the Friday and Saturday nights before the meeting.

GIDEP Liaison Delegate's Report - Phil Painchaud

GIDEP has established a fifth databank on value engineering.

Phil presented information from the October 1, 1984 GIDEP Metrology meeting held in Spokane, Washington regarding a subcommittee chaired by Herman Chapman of the Naval Nework Facility, Alameda, CA. The purpose of the subcommittee is to sample and evaluate the measurement community's desire for and the usefulness of test equipment specifications generated by the purchasers of the equipment. Comments should be sent to Herman through NCSL channels and Phil.

Document enhancement by digital techniques was discussed. Please send comments to Data Enhancement Subcommittee Chairman George Nickel, through NCSL channels and Phil.

The next meeting will be held at NBS Gaithersburg, Maryland on April 15, 1985.

PMQ Liaison Delegate's Report - Bryan Werner for Glenn Rasmussen

Glenn reported that Frank Koide was elected National President for 1985. The PMQ and the National Scale Men's Association are co-sponsoring a technical seminar to be held May 27th through May 30th at the Disneyland Hotel in Anaheim, CA. PMQ will provide a technical program to cover topics of interest to NSMA to fill a growing need in measuring/weighing technology.

The San Fernando Valley Section was the winner of the 1983/84 John Quincy Adams Award for best section participation.

A new section was recently formed in Ohio, officially North Coast Section.

ASTM Liaison Delegate's Report - Bryan Werner

Bryan reports that there seems to be a difference in philosophy in the approach to laboratory qualification and accreditation between NCSL and ASTM. There is an inherent difference between testing and calibration in that most ASTM type tests are destructive and are sample dependent. Bryan suggests that any NCSL committee looking at accreditation establish their own liaison link to ASTM. This applies also to education and training which could prove valuable.

ANSI Liaison Delegate's Report - Bryan Werner for Rolf Schumacher

Method of Controlling Quality During Production are being revised. Draft 3, Revision 0 is now being circulated for comments and votes.

After the deadline for comments and votes to the proposed standard for Calibration Systems, additional comments and votes have been received. All are being considered, delaying the submission of the proposed standard to ANSI probably until March 1985.

**ASQC LIAISON DELEGATE'S REPORT** - Bryan Werner for Karl Speitel

Karl reported that he sent a membership history for the Metrology Technology Committee of ASQC to Roland Vavken. Karl sent additional graphs and information to those attending his paper "Guardbanding" presented at the 1984 NCSL Conference if they requested it. There is an ASQC meeting scheduled for February 7, 8, and 9 in Culver City, CA.

**ISA LIAISON DELEGATE'S REPORT** - Mike Suraci

Mike reported that the ISA conference in Houston was quite successful.

**CORM LIAISON DELEGATE'S REPORT** - Bill Simmons

Bill reported that CORM 85, the annual meeting and conference of the Council for Optical Radiation Measurements, will be held in Gaithersburg, Maryland in conjunction with the NBS May 29-30. The sessions are:

I. Infrared Radiometry and Optical Pyrometry
II. Array Radiometry
III. Spectrophotometry

For further information contact the conference chairman:

Mr. Alton Karoli
The Eppley Laboratory, Inc.
12 Sheffield Avenue
Newport, RI 02840
(401) 847-1020

**ATTENDEES:**

George Rice - Rockwell International
Pete England - General Dynamics
Hartwell Keith - TRW Inc.
Bryan Werner - Westinghouse SMP
Bob Lady - Lockheed Georgia
Bob Weber - Lockheed Missiles & Space Co.

Edward Nemeroff - Navy Metrology Engineering Center
Gary Caldwell - Teledyne Microelectronics
Chet Crane - Tennessee Valley Authority
Hillary Taft - U.S. Instrument Rentals
Jim Ingram - Westinghouse
John Martin - Sanders Associates Inc.
Harry Haynes - General Dynamics/Convair
John King - Rockwell International
Jay Varvel - Teledyne Systems Co.
Dean Brungard - Simco
Carl Quinn - Hewlett Packard
John Minck - Lockheed Electronics Co.
Moe Corrigan - Lockheed M & S
Klaus Jaeger - Rockwell International
Roland Vavken - Guildline
Tony Anderson - Bob Kamper
Bob Armstrong - NBS
Art McCoubrey - NBS
George Uriano - NBS
Mike Suraci - Lockheed Missiles & Space
Tim Driver - Sprague Electric Co.
Bill Simmons - Barrios Technology Inc.
Rusty Jarmombe - TRW Microwave

* * * * * * *
**NCSL FINANCIAL REPORT SUMMARY**  
**Calendar Year 1984**  
**(January 1, 1984 through December 31, 1984)**

### Committee Accounts

<table>
<thead>
<tr>
<th>Account</th>
<th>Budget</th>
<th>CY Start</th>
<th>CY End</th>
<th>Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A - Meetings and Programs</td>
<td>3,000.00</td>
<td>1,304.56</td>
<td>1,695.44</td>
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<tr>
<td>1B - Honors and Awards</td>
<td>4,300.00</td>
<td>2,698.86</td>
<td>1,601.14</td>
<td></td>
</tr>
<tr>
<td>1C - Education and Training</td>
<td>4,000.00</td>
<td>1,457.10</td>
<td>2,542.90</td>
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</tr>
<tr>
<td>2A - Measurement Requirements</td>
<td>3,300.00</td>
<td>3,300.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>2B - Laboratory Evaluation</td>
<td>150.00</td>
<td>43.00</td>
<td>107.00</td>
<td></td>
</tr>
<tr>
<td>3A - Measurement Assurance</td>
<td>7,000.00</td>
<td>7,000.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>4A - Newsletter</td>
<td>20,500.00</td>
<td>5,903.93</td>
<td>14,596.07</td>
<td></td>
</tr>
<tr>
<td>4B - Information and Directory</td>
<td>500.00</td>
<td>500.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>4C - Publicity</td>
<td>5,000.00</td>
<td>(251.10)</td>
<td>6,251.10</td>
<td></td>
</tr>
<tr>
<td>4D - Membership</td>
<td>500.00</td>
<td>500.00</td>
<td>0.00</td>
<td></td>
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</tbody>
</table>

Total Committee Accounts: 49,250.00

### Operational Accounts

<table>
<thead>
<tr>
<th>Account</th>
<th>Budget</th>
<th>CY Start</th>
<th>CY End</th>
<th>Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 - Wildhack Award</td>
<td>1,000.00</td>
<td>(317.00)</td>
<td>1,217.00</td>
<td></td>
</tr>
<tr>
<td>P1 - President's Expenses</td>
<td>4,900.00</td>
<td>53.81</td>
<td>4,846.19</td>
<td></td>
</tr>
<tr>
<td>R1 - Regional Meeting Support</td>
<td>750.00</td>
<td>1,354.50</td>
<td>604.50</td>
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</tr>
<tr>
<td>S1 - Secretariat Expenses</td>
<td>9,000.00</td>
<td>(722.19)</td>
<td>9,722.19</td>
<td></td>
</tr>
<tr>
<td>S1A - Computer Hardware</td>
<td>9,000.00</td>
<td>2,115.30</td>
<td>6,884.70</td>
<td></td>
</tr>
<tr>
<td>T1 - Treasurer's Expenses</td>
<td>2,900.00</td>
<td>298.93</td>
<td>2,601.07</td>
<td></td>
</tr>
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</table>

Total Operations Accounts: 27,550.00

### Self-Sustaining Accounts

<table>
<thead>
<tr>
<th>Account</th>
<th>Budget</th>
<th>CY Start</th>
<th>CY End</th>
<th>Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1-084 1984 Conference</td>
<td>3,000.00</td>
<td>25,418.64</td>
<td>(22,418.64)</td>
<td></td>
</tr>
<tr>
<td>C1-085 1985 Conference</td>
<td>1,000.00</td>
<td>479.72</td>
<td>520.28</td>
<td></td>
</tr>
<tr>
<td>C1-007 Training Aid Deposits</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
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</table>

Total Self-Sustaining Accounts: 4,000.00

Total Budget Accounts: 80,800.00

### Income Accounts

<table>
<thead>
<tr>
<th>Account</th>
<th>CY Start</th>
<th>CY End</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-001 Dues</td>
<td></td>
<td></td>
<td>71,940.29</td>
</tr>
<tr>
<td>11-002 Interest</td>
<td></td>
<td></td>
<td>6,034.65</td>
</tr>
<tr>
<td>11-003 Sales</td>
<td></td>
<td></td>
<td>809.00</td>
</tr>
<tr>
<td>11-004 Newsletter</td>
<td></td>
<td></td>
<td>396.00</td>
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</tbody>
</table>

Total Income Accounts: 78,179.94

Increase/Decrease in Funds: 48,518.00

### Assets (Cash)

<table>
<thead>
<tr>
<th>Account</th>
<th>CY Start</th>
<th>CY Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking Accounts</td>
<td>29,712.76</td>
<td>29,032.66</td>
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<tr>
<td>Savings/Certificate Accounts</td>
<td>34,641.66</td>
<td>20,498.68</td>
</tr>
<tr>
<td>NBS Account</td>
<td>1,104.82</td>
<td>(746.82)</td>
</tr>
<tr>
<td>Post Office Account</td>
<td>461.62</td>
<td>(266.52)</td>
</tr>
<tr>
<td>Cash</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Total: 65,920.86

Increase/Decrease in Funds: 48,518.00
NCRL
BUDGET SUMMARY
for
CALENDAR YEAR 1985
(January 1, 1985 through December 31, 1985)

EXPENSES - Committee Accounts

<table>
<thead>
<tr>
<th>Item</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 Publications</td>
<td>8,000</td>
</tr>
<tr>
<td>24 ADM Guidelines and By-laws</td>
<td>100</td>
</tr>
<tr>
<td>31 Newsletter</td>
<td>18,000</td>
</tr>
<tr>
<td>32 Membership</td>
<td>500</td>
</tr>
<tr>
<td>34 Honors and Awards</td>
<td>3,800</td>
</tr>
<tr>
<td>42 Measurement Assurance</td>
<td>7,000</td>
</tr>
<tr>
<td>43 Measurement Requirements</td>
<td>3,000</td>
</tr>
<tr>
<td>44 Laboratory Evaluation</td>
<td>150</td>
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<tr>
<td>61 Training Aids</td>
<td>1,500</td>
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<tr>
<td>62 Training Information</td>
<td>1,500</td>
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<tr>
<td>65 Publicity</td>
<td>9,000</td>
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</tbody>
</table>

Total Budget - Committee Accounts: 52,550

EXPENSES - OPERATION ACCOUNTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 President's Expenses</td>
<td>6,000</td>
</tr>
<tr>
<td>04 Meeting Expenses</td>
<td>2,000</td>
</tr>
<tr>
<td>06 Wildhack Award</td>
<td>1,500</td>
</tr>
<tr>
<td>08 Treasurer's Expenses</td>
<td>3,100</td>
</tr>
<tr>
<td>10 Secretariat Expenses</td>
<td>9,000</td>
</tr>
<tr>
<td>10 Computer Supplies</td>
<td>600</td>
</tr>
<tr>
<td>34 Resale Items</td>
<td>2,500</td>
</tr>
<tr>
<td>7X Regional Meeting Support</td>
<td>1,675</td>
</tr>
</tbody>
</table>

Total Budget - Operations Accounts: 26,375

EXPENSES - SELF-SUSTAINING OPERATIONS ACCOUNTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-084 1984 Conference</td>
<td>15,000</td>
</tr>
<tr>
<td>90-085 1985 Conference</td>
<td>3,000</td>
</tr>
<tr>
<td>90-086 1986 Conference</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Total Budget - Self-Sustaining Operations Accounts: 19,000

INCOME ACCOUNTS - ESTIMATES

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimated Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 Dues</td>
<td>65,000</td>
</tr>
<tr>
<td>102 Interest</td>
<td>4,000</td>
</tr>
<tr>
<td>10X Sales</td>
<td>1,000</td>
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</tbody>
</table>

Total Estimated Income: 70,400

*ESTIMATED INCREASE/(DECREASE) IN FUNDS: (6,125)

* Treasurer's estimate based on estimated income and estimated actual expenses
ANOTHER NEW CLASS OF BUTLER COLLEGE METROLOGY STUDENTS AVAILABLE FOR INTERNSHIPS

EDITOR'S NOTE: Can you remember your first big-time summer job? I can. General Electric Co. at Electronics Park in Syracuse, 1951. Test Engineering, working on the SPS-8 radar, on the roof at the Thompson Road Plant. I remember breaking an L0 Klystron because of inexperience, and have been careful with them ever since. Just as vivid as if it were yesterday, I remember a brunette from Pasadena, Texas, and a tall, blond mail-delivery person. Well, you get the idea.

Here's your chance to offer a once-in-a-lifetime summer experience to a young metrology hopeful from the Butler College Metrology Program. They have summarized their situations here along with pictures. If you'd like to know more information, give Butler a call. I've heard endless complaints about the shortage of metrology technicians, so here is your chance to do something about it.

SECOND YEAR METROLOGY STUDENTS MEASURE LASER BEAM INTENSITY AT DIFFERENT LOCATIONS IN OPTICAL PATH

Butler County Community College will have 11 students available for internships beginning May 23, 1985. Some of these have already been placed in positions with the National Bureau of Standards. All students will be available for permanent positions in August. The final course of the program is a Work/Research Internship in which the student completes a project in the metrology field. A brief biography of each member of the class follows. Interested firms should contact Mrs. Lynn Thompson at (412) 287-8711, ext. 188 for further information.

The preceding graduating class have all successfully completed an internship. They are currently employed with firms such as AVCO Systems Division, D & H Instruments, Multi-Amp Testing Services Co., Medrad, National Bureau of Standards, Sandia National Laboratory, and Teledyne.

The metrology faculty recently updated and refined the curriculum after the initial three year implementation plan. The College has also hired an additional professor in the department. He is Mr. Ken Cumblidge, a nuclear engineer who is retired from the U.S. Navy. He shares the workload with Mrs. Thompson and other part-time faculty in instructing the students.

DONALD D. ANDREWS
Age: 26, Veteran

Geographic preference: I am willing to relocate anywhere including overseas, but would prefer the northwestern USA. I desire entry level employment as a measurements laboratory technician. My areas of interest include optics, thermodynamics, and physical measurements. I possess an A.S. in Mechanical Engineering Technology from Penn State and will complete an A.A.S. in Metrology in May. If possible, I would like to continue my education toward a B.S. in a Physics discipline.

ERIC BRIGHT
My areas of interest are electrical and optical measurement systems. Standards and Calibration Laboratory work is what I prefer. I am willing to relocate anywhere in the US. My overall quality point average is 3.35 on a 4.0 scale. Continuing my education toward an engineering degree is in my future plans.

SCOTT H. HENNON
Age 27

I desire a position in measurement science which will give me the opportunity to utilize my present level of education as well as continue toward a Bachelor of Science Degree in a related engineering field. I currently have a 4.0 grade point average in the Metrology Program at Butler County Community College and will graduate in August 1985 upon completion of my summer work practicum at the National Bureau of Standards. My areas of interest include Research and Development, Quality Control, Calibration, and Primary Standards Laboratory; in both the electrical and dimensional fields of metrology.

PAUL S. HETRICK

I am looking for a position in the area of microprocessor and computer controlled measuring systems. I have tentative plans to do my summer internship at the National Bureau of Standards. I would be willing to relocate to anywhere in the U.S. or abroad. I plan to continue my education towards a B.S.E.E.

My name is Joseph L. Kepple. I am a student at Butler County Community College enrolled in the Metrology program. Graduation from this program will be in August 1985. Employment opportunities East of the Mississippi River are desirable to me. My area of interest is any metrology related job that would enable me to utilize my educational experience.

JOSEPH L. KEPPLE
Age 21

EDMOND S. KUMINKOSKI, R.T.R.

I am currently employed as chief technologist with a Pittsburgh medical services company. A career in medical research and development is desired. I currently hold a certificate in radiology. An academic background in the field of nuclear medicine and an A.A.S. degree in electronics will assist me in developing this field of interest.

PAUL S. HETRICK

ERIC LASH
Age 21
I am currently enrolled in the Metrology Program at Butler College and will graduate in August. Part of the requirements for graduation is a summer internship. The Electrical Dissemination Services Division of the National Bureau of Standards is where I will complete my graduation requirements while working with automated capacitance bridges. A position in an electrical standards laboratory is my preference and will enable me to utilize my acquired education. I wish to relocate to a warm climate for permanent employment.

RUTH J. SCHMIDT

I am interested in employment opportunities in the Pacific Northwest in the areas of physical and electrical metrology. I would prefer to work in a repair and calibration laboratory or in a standards laboratory. I am a U.S. Army veteran and am currently employed with the U.S. Postal Service as an electrician and mechanic for mail processing equipment.

MICHAEL E. TERPILOWSKI

As an August 1985 graduate of the Metrology program, I hope to obtain an entry-level position in Quality Assurance or Research and Development. My summer internship will be performed in the electrical standards laboratory of the National Bureau of Standards. While at NBS I hope to refine their in-house statistical techniques which will enable them to intercompare secondary electrical standards. I am also a 1981 graduate of the University of Pittsburgh with a degree in Business Administration. My plans are to continue my education towards an engineering degree in an area which would meet the objectives of my employer. Relocation is no problem for me and I have no geographic preference.

SANDRA J. WALKER

I will have an A.A.S. in Metrology as of August 1985. All areas of measurement science interest me, but I prefer work in the chemical, optical, or electrical measurement fields. I plan to continue my education towards an engineering degree in an area which would meet the objectives of my employer. Relocation is no problem for me and I have no geographic preference.

STEVEN M. ZARNICK

I will be graduating from Butler County Community College in August 1985 with an Associate degree in Metrology. The Metrology curriculum has resulted in a high level of confidence in the ability to obtain a measurement and understand what is being measured. I am interested in various fields of Metrology and willing to relocate if necessary. I have plans to further my education towards a Bachelor's degree.
TITLE OF COURSE: Antenna Parameter Measurement by Near-Field Techniques

LOCATION: National Bureau of Standards, Boulder, Colorado

DATES: June 10 through June 14, 1985

CONTACT: Richard L. Lewis
Section 723.05
Electromagnetic Fields Division
Boulder, Colorado 80303
Phone: (303) 497-5196

SHORT DESCRIPTION:
This course is designed for engineers and scientists concerned with the accurate measurement of microwave antenna parameters. Major emphasis will be placed on the Scattering Matrix Theory of Antennas and Antenna-Antenna Interactions, its application to near-field scanning on planar, cylindrical, and spherical surfaces, and the computation of desired antenna characteristics from near-field data. Time will be appropriately divided between theory, practical implementation, and data processing techniques. Recent results comparing planar, cylindrical, and spherical scanning methods will be presented and the limitations and advantages of each method discussed.

* * * * * * * * * *

COURSE SCHEDULE

GAS FLOW MEASUREMENT
25-29 March, 1985
Houston, Texas
8-12 July, 1985
Fort Collins, Colorado

LIQUID FLOW MEASUREMENT
20-24 May, 1985
Chicago, Illinois
9-13 September, 1985
Norfolk, Virginia
7-11 October, 1985
San Diego, California

INTRODUCTION
Liquid and Gas Flowmeters are used in a wide variety of applications. These flowmeters must be selected carefully and maintained properly to provide the desired performance. In addition, they must be calibrated periodically to assure their continued accuracy. These courses will provide solutions to these Flow Measurement problems.

announced of accuracy, limitations, maintenance and repairs. Typical applications will be reviewed. Potential errors will be analyzed. Installation requirements and troubleshooting will be discussed in detail. Calibration equipment will be described and methods of calibration will be explained.

WHO SHOULD ATTEND
These Flow Measurement Training Courses will benefit Managers, Engineers, Designers, Technicians, and Quality Control personnel who are involved with specifying, calibrating or using flowmeters. Numerous flow measurement applications are found in Metrology Laboratories, Field Calibration, Overhaul Facilities, Repair Shops, Shipboard Maintenance, Utility Management and others.

The Tuition for each five-day training course is $795 per person. This includes all course materials, a comprehensive Flow Measurement Handbook and refreshments during the class hours. It does not include meals or hotels.

If you would like more information, please contact:

Kim Taylor
DALFI, Inc.
10080 Carroll Canyon Road
San Diego, California 92131
(619) 578-9500

* * * * * * * * * *

ANNOUNCEMENT OF 1985 CORM CONFERENCE
CALL FOR PAPERS

CORM 85, the 1985 annual meeting and conference of the Council for Optical Radiation Measurements, will be held in Gaithersburg, Maryland in conjunction with the National Bureau of Standards on Wednesday and Thursday, May 29-30, 1985. The conference will include symposia session and invited papers.

Session I - Infrared Radiometry and Optical Pyrometry
Session II - Array Radiometry
Session III - Spectrophotometry

For further information contact the conference chairman, Mr. Alton Karoli, The Eppley Laboratory, Inc., 12 Sheffield Ave., Newport, RI 02840 (401) 847-1020 or the CORM Secretary, Mr. Norbert Johnson, 3M Center, Bldg. 582-1-15, 3M Company, St. Paul, MN 55144 (612) 733-5939.
Mr. Douglas Rytting  
Hewlett Packard Company, NMD  
1400 Fountain Grove Parkway  
Santa Rosa, CA 95404

Subject: Preliminary Response to PNMS Committee

Dear Doug:

I understand that the Committee to Promote National Microwave Standards wants some indication of what we plan to do at NBS to meet the needs that the committee sees for improved and extended microwave calibration services. The final page of this letter shows a chart of the needs and priorities that you set down at your first meeting, as we understand them.

What follows is a description of our present plans with as much detail as we feel justified in giving. There are large uncertainties in our ability to find external funding and recruit staff to accomplish what we plan, and we have tended to be optimistic. For that reason you should regard the completion dates more as an expression of priority than a firm commitment. Also, these are multi-year plans and even the priorities may change before we are through with them.

Throughout this letter, the completion dates refer to developing the capability to make the specified measurements, and the quoted uncertainties are objectives that we have reasonable expectation of meeting. Improved calibration services will not be offered to the public until each new measurement system has been thoroughly evaluated, the uncertainty statement established, and approval granted by our committee that oversees the calibration services. This will take several months for each new measurement system or standard.

GENERAL COMMENTS

In the near future, the improvements in our calibration services will be dominated by the advent of the 6-port systems and the automated radiometer (which uses a 6-port to eliminate the need for impedance matching). The essential characteristics of the dual 6-port are as follows:

1. It does not require physical standards of dimensionless quantities. It is calibrated with standards of power and impedance (the characteristic impedance of a standard transmission line). It will then make absolute measurements of attenuation, phase, and reflection coefficient with no further standards. The only exceptions are when dynamic range in excess of 60 dB is required.

2. The significant sources of error are the connectors on the devices to be measured and the primary standards. The systematic error introduced by the connectors when the 6-port is calibrated can be expressed as a standard deviation in reflection coefficient of 0.002 for good coaxial connectors or about an order of magnitude less for waveguide flanges in the microwave range. This degrades somewhat at higher frequencies. This systematic error may be randomized and reduced by multiple reconnections.

3. The resolution of the 6-port is limited by its detectors. With thermistors it can be expressed as a standard deviation of $2 \times 10^{-5}$ in reflection coefficient (or $1 \times 10^{-5}$ in $S_{12}$). The resulting uncertainty may be reduced statistically by multiple measurements.

4. Being an automated system, the 6-port is convenient for multiple measurements to support statistical analysis.

5. We have already completed dual 6-port systems for measurements in coaxial line in the frequency range 0.02 to 18 GHz. These can also be adapted to make waveguide measurements using adaptors and waveguide standards. We intend to construct a dual 6-port console for measurements in the waveguide bands: WR-42, 28, 22 (or possibly 19), 15, 10. This will completely cover the frequency range 18 to 110 GHz. It can be adapted to make measurements in coaxial lines using adaptors and coaxial line standards.

IMPE
DANCE

Present Capability:

We calibrate 7 mm coaxial line reflectors on our modified HP ANA in the frequency range 0.1 to 18 GHz, with an uncertainty of \( \pm (0.005 + 0.005 \% ) \). There is no service in 3.5 mm or 2.9 mm coaxial line.

-18-
We calibrate waveguide reflectors using tuned reflectometers in the bands: WR-187, 137, 90, 62, 42, 28 (4 to 40 GHz), with an uncertainty of ±0.001 to 0.003. We can measure waveguide reflectors at 94 to 96 GHz with an uncertainty of ±0.01 using a dual 6-port system.

Planned Capability:
All these calibrations will be performed on 6-port systems, which have an uncertainty (limited by the transmission line standards) of about ±0.002 over the entire complex plane in the microwave range, degrading to ±0.01 at 100 GHz.

Preliminary calibration service will be available for coaxial line (both 7 mm and 3.5 mm) at frequency up to 18 GHz in April 1985. Calibration service for 2.9 mm coaxial line must await standardization of the connectors by the industry. The frequency range will be extended to 26 GHz in October 1985. The waveguide calibration services will be transferred to 6-port systems (with uncertainty of ±0.002) according to the following schedule:

- <18 GHz - October 1985
- 18 - 26 GHz (WR-42) - April 1985
- 26 - 40 GHz (WR-28) - October 1986
- 33 - 50 GHz (WR-22) - October 1985
- 50 - 75 GHz (WR-15) - October 1987

ATTENUATION

Present Capability:
We calibrate 7 mm coaxial line attenuators on our modified HP ANA in the frequency range 0.1 to 18 GHz, with an uncertainty of ±0.03 dB per 10 dB in the range 0 to 60 dB. We have a special service for piston attenuators at 30 MHz, with an uncertainty of ±0.003 dB per 10 dB in the range 0 to 140 dB. There is no service in 3.5 mm or 2.9 mm coaxial line.

We calibrate waveguide attenuators using manual calibration systems in the bands: WR-187, 137, 90, 62, 42, 28 (4 to 40 GHz), with uncertainty of ±0.05 dB to ±0.5 dB in the range 0 to 50 dB.

We can measure waveguide attenuators at 94 to 96 GHz with an uncertainty of ±0.06 dB per 10 dB in the range 0 to 50 dB, using a dual 6-port system.

Planned Capability:
We have not yet determined the need to upgrade the uncertainty of the calibration service for piston attenuators at 30 MHz or to increase the dynamic range of our calibration services at other frequencies.

These projects therefore have low priority. We will be capable of measuring nominal 6 dB voltage ratio at 1.25 MHz with an uncertainty of ±0.0001 dB by the end of October 1984.

We will transfer all other attenuation calibration services to dual 6-port systems, with a significant improvement in uncertainty and complete frequency coverage up to 100 GHz. The uncertainty will range from ±0.002 dB to ±0.1 dB in the range 0 to 60 dB.

Preliminary calibration service with this reduced uncertainty will be available for coaxial attenuators with 7 mm and 3.5 mm connectors in the frequency range 0.1 to 18 GHz in April 1985, with extension to 26 GHz in October 1985.

The waveguide calibration services will be transferred to 6-port systems (with uncertainty ranging from ±0.002 dB to ±0.1 dB in the range 0 to 60 dB) according to the following schedule:

- <18 GHz - October 1985
- 18 - 26 GHz (WR-42) - April 1985
- 26 - 40 GHz (WR-28) - October 1986
- 33 - 50 GHz (WR-22) - October 1985
- 50 - 75 GHz (WR-15) - October 1987

POWER

Present Capability:
We offer microwave power calibration at a nominal level of 10 mW only. The uncertainty is limited by the microcalorimeter standard, as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Band</th>
<th>Frequency (GHz)</th>
<th>Uncertainty (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coaxial</td>
<td>7 mm</td>
<td>1-18</td>
<td>±0.5 to ±1</td>
</tr>
<tr>
<td></td>
<td>3.5 mm</td>
<td></td>
<td>no service</td>
</tr>
<tr>
<td>Waveguide:</td>
<td>WR-187</td>
<td>4-18</td>
<td>±0.5 to ±1</td>
</tr>
<tr>
<td></td>
<td>WR-137</td>
<td></td>
<td>±1</td>
</tr>
<tr>
<td></td>
<td>WR-112</td>
<td>18-26</td>
<td>±1</td>
</tr>
<tr>
<td></td>
<td>WR-90</td>
<td>26-40</td>
<td>±2</td>
</tr>
<tr>
<td></td>
<td>WR-62</td>
<td>33-50</td>
<td>no service</td>
</tr>
<tr>
<td></td>
<td>WR-42</td>
<td>50-75</td>
<td>±3</td>
</tr>
<tr>
<td></td>
<td>WR-28</td>
<td>50-75</td>
<td>±3</td>
</tr>
<tr>
<td></td>
<td>WR-22</td>
<td>50-75</td>
<td>±3</td>
</tr>
<tr>
<td></td>
<td>WR-15</td>
<td>94-96</td>
<td>±3</td>
</tr>
<tr>
<td></td>
<td>WR-10</td>
<td>94-96</td>
<td>±3</td>
</tr>
</tbody>
</table>

Planned Capability:
We will offer calibration service in 3.5 mm coaxial line in October 1985, and in WR-22 waveguide in April 1985. The frequency range of the service in WR-10 waveguide will be extended as necessary to the full 75 to 110 GHz band.
Improving the uncertainty of calibration service is a long-term project. A modest improvement will become available when automation of the microcalorimeter is completed in mid-1985. This will improve the transfer process. For more radical improvement (an order of magnitude or better) the microcalorimeter must be replaced by some superior technique which we must develop. The most promising idea is to revisit the impedance method of measuring efficiency, which may become very precise with the application of the 6-port. At present we do not have the manpower to work on this problem, so we cannot promise anything for a few years.

We are working on the systematic use of 3-port couplers to offer calibration service over a range of power. We expect to extend our range down to 10 nW in October, 1985, and up to 200 W by October, 1987, in frequency ranges in which we can justify the expense of a high-power source.

**THERMAL NOISE**

**Present Capability:**

We offer calibration service for coaxial noise standards (with both 7 mm and 3.5 mm connectors) at 30 MHz and 60 MHz. The uncertainty is ±2 percent in the range 77K to 20,000K. We also offer calibration service in the waveguide bands WR-90 and 62 (8 to 18 GHz) and WR-15 (50 to 75 GHz) with an uncertainty of ±3 percent, and WR-10 (94 to 96 GHz) with an uncertainty of ±4 percent.

**Planned Capability:**

The automated radiometer is already in service for some of the bands listed above. The coverage will be extended according to the following schedule:

Coaxial Line: (7 mm and 3.5 mm)

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4 GHz</td>
<td>January, 1985</td>
</tr>
<tr>
<td>4-8 GHz</td>
<td>July, 1985</td>
</tr>
<tr>
<td>8-12 GHz</td>
<td>October, 1986</td>
</tr>
<tr>
<td>12-26 GHz</td>
<td>Far future</td>
</tr>
</tbody>
</table>

Waveguide:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4 GHz (WR-284)</td>
<td>January, 1985</td>
</tr>
<tr>
<td>4-6 GHz (WR-187)</td>
<td>January, 1986</td>
</tr>
<tr>
<td>6-8 GHz (WR-137)</td>
<td>January, 1986</td>
</tr>
<tr>
<td>7-10 GHz (WR-112)</td>
<td>January, 1987</td>
</tr>
<tr>
<td>8-12 GHz (WR-90)</td>
<td>January, 1987</td>
</tr>
<tr>
<td>18-26 GHz (WR-42)</td>
<td>October, 1987</td>
</tr>
<tr>
<td>26-40 GHz (WR-28)</td>
<td>No plans</td>
</tr>
<tr>
<td>33-50 GHz (WR-22)</td>
<td>October, 1987</td>
</tr>
</tbody>
</table>

The Time and Frequency Division of NBS has some capability to measure phase noise in oscillators of high quality. We do not have any plans for other extensions of our phase noise calibration service.

**PHASE SHIFT**

**Present Capability:**

We calibrate coaxial line phase shifters (7 mm connectors only) in the frequency range 0.1 to 18 GHz using our modified HP ANA. The uncertainty is ±0.5° for small insertion loss. At 30 MHz we can reduce the uncertainty to ±0.1°.

**Planned Capability:**

Calibrations of phase shift will be transferred to the dual 6-port systems as they become available. The uncertainty will vary from 0.01° at 18 GHz to 0.05° at 75 GHz, for small insertion loss. This will enable us to offer service for 3.5 mm connectors in the frequency range 0.1 to 18 GHz in April 1985, with extension to 26 GHz in October 1985.

We will become capable of calibrating waveguide phase shifters (with the same uncertainty) according to the following schedule:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18 GHz</td>
<td>April, 1985</td>
</tr>
<tr>
<td>18-26 GHz (WR-42)</td>
<td>April, 1985</td>
</tr>
<tr>
<td>26-40 GHz (WR-28)</td>
<td>October, 1986</td>
</tr>
<tr>
<td>33-50 GHz (WR-22)</td>
<td>October, 1985</td>
</tr>
<tr>
<td>50-75 GHz (WR-15)</td>
<td>October, 1987</td>
</tr>
</tbody>
</table>

These plans are based on our best understanding of what is needed and expectations for resources. We look forward to working with the PMMS Committee, NCSL, CCG, and other interested parties to refine them by an iterative process. If there is anything else we can do to help, please let me know.

Sincerely,

Robert A. Kamper
Chief, Electromagnetic Technology Division

**PRODUCT DESIGN AND SPECIFICATION COMMITTEE:**

The NCSL Product Design and Specification Committee is currently reviewing a proposed Recommended Practice that deals with Certificates of Calibration. This activity is the result of a workshop conducted by Harry Haymes at the annual conference in 1982.
Interested parties are invited to review the document, which is still in the draft stage. Call or write to the committee chairman:

Warren Collier  
Chairman, NCSL Product Design and Specification Committee  
c/o Tektronix, Inc.  
P.O. Box 500, N/S 78-529  
Beaverton, Oregon 97077  
(503) 627-1678

Warren Collier, Chairman

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AUTOMATIC TEST & CALIBRATION SYSTEMS COMMITTEE

Introduction

The Automatic Test and Calibrations System Committee conducted a Laboratory Automation Survey in November of 1984. Areas of interest covered: the types of controllers used for both centralized and decentralized systems; types of measurements made with each system; if the systems were home brewed or production types; which programming language was commonly used; the type of bus structure used to control the instrumentation; and if modifications were necessary to the systems, and in which areas (software/hardware). The results characterized the current state of ATE systems calibrations and should provide additional direction for this committee.

Results

Number of responses = 83; 8 of which do not have ATE.

Number of systems surveyed = 295; 19 of which are planned acquisitions.

---

ATE CONTROLLERS (% of Systems Surveyed)

<table>
<thead>
<tr>
<th>Decentralized</th>
<th>Centralized</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP9825</td>
<td>13.9%</td>
</tr>
<tr>
<td>HP9836</td>
<td>12.5%</td>
</tr>
<tr>
<td>HP85</td>
<td>10.5%</td>
</tr>
<tr>
<td>FLUKE 1720</td>
<td>8.5%</td>
</tr>
<tr>
<td>HP9826</td>
<td>7.8%</td>
</tr>
<tr>
<td>HP9816</td>
<td>5.4%</td>
</tr>
<tr>
<td>HP86</td>
<td>4.7%</td>
</tr>
<tr>
<td>HP8645</td>
<td>3.7%</td>
</tr>
<tr>
<td>Other</td>
<td>21.0%</td>
</tr>
<tr>
<td>(approx) 88.0%</td>
<td></td>
</tr>
</tbody>
</table>

---

TYPES OF MEASUREMENTS (% of Systems Surveyed)

- Electrical/Electronic = 72.3%
- Physical = 16.8%
- Dimensional = 8.4%
- Optical = 1.9%
- Other = <1.0%

100.0%

CONFIGURATION (% of Systems Surveyed)

- Production = 57.3%
- Homebrew = 42.7%

PROGRAMMING LANGUAGES (% of Systems Surveyed)

<table>
<thead>
<tr>
<th>Language</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>68.3%</td>
</tr>
<tr>
<td>HPL</td>
<td>26.1%</td>
</tr>
<tr>
<td>Pascal</td>
<td>1.5%</td>
</tr>
<tr>
<td>C</td>
<td>1.5%</td>
</tr>
<tr>
<td>Fortran</td>
<td>1.5%</td>
</tr>
<tr>
<td>Machine</td>
<td>&lt;1.0%</td>
</tr>
<tr>
<td>Other</td>
<td>&lt;1.0%</td>
</tr>
</tbody>
</table>

100.0%

BUS STRUCTURE (% of Systems Surveyed)

- IEEE - 488 = 63.9%
- RS - 232 = 21.7%
- Parallel BCD = 10.2%
- Other = 4.2%

EASE OF PROGRAMMING (% of Systems Surveyed)

- Easy = 34.1%
- Medium = 58.0%
- Difficult = 7.9%

MODIFICATIONS

Percentage of systems requiring modification = 55.6%

Of those percentage of systems requiring modifications on:

- Hardware = 60.4%
- Software = 89.0%

TAPE EXCHANGE UTILIZATION

Percent of respondents utilizing Tape Exchange Program = 18.7%
INFLUENCES ON SELECTION OF SYSTEMS

- Specifications
- Availability of Equipment
- Demonstrated Performance
- Cost
- Compatibility with Existing Equipment

Concluding Remarks

Although the number of respondents may appear low, some systems were surveyed by a focal point for several laboratories within an organization. The number of systems actually surveyed were quite acceptable.

Since no single instrument controller stood out significantly, this would suggest that software transportability would be difficult, but possibly utilizing a data file instead of a program structure would help, but data format and media would still be a significant problem. However, the most common bus structure was the IEEE-488 which would indicate that some methods of software transportability could be developed for the portion of software and data which interacts with the bus such as driver routines used to control instruments to set up or measure.

Electrical and electronic measurements were by far the most common use of ATE systems as expected, which would indicate a commonality of measurement equipment.

Although the controllers varied significantly, Basic programs and procedures were most often utilized. This should support the interchange of the software drivers if they are written as stand-alone sub-routines in Basic format. The specific ASCII data could be passed into and out of the subroutine to isolate the program from the bus. This would allow flexibility in equipment substitution by utilizing an alternate subroutine to control the bus instrument, and minimize system downtime.

I feel some benefit may be obtained from configuring systems to minimize overhead (such as programming), and downtime, if a greater utilization of shared resources such as the tape exchange program could be made to be more effective.

I welcome comments from ATE users where specific needs are, and where support might be incorporated from the design aspect.

METHODS TO CONTROL SOFTWARE

Control of software configuration is essential for consistency of calibration. Programs may have been altered as a result of computer error, engineering development, or perhaps as a result of troubleshooting. Computer programs for control of automatic calibration or testing should have some way of being easily checked for authenticity and fidelity with respect to the program content originally approved for use. The question of how one makes sure that computer programs provided to calibration areas remain as originally written was raised at the October, 1984 meeting of the Automatic Test and Calibration Systems Committee. Several members felt that answers to this question would be of interest to the NCSL membership, especially those who are just starting to automate their operations.

One or more of several techniques can be employed to control software, media, and supporting documentation. Some of these which are in common use are summarized below.

A. Document Change Control

Minimum identification of calibration software and supporting documentation should include a unique title, identification number, date of the most recent revision, and signature or name of the originator and approver. Such approvals would be made after validation and verification of the document.

Sequential revision letters or numbers are useful additions, as is a short summary of revisions and reasons for the revision. The latter provides traceability of procedural evolution.

B. Checksum

Account of the sum of the value of all bytes in a program can be determined and appended to the program and to documentation relating to the program, such as an index of procedures. A recomputation can be made when the program is used. Comparison of the recomputed sum with the value originally recorded will show if the program changed. The checksum comparison method of determining program integrity is generally perceptive and useful, although it is possible for a knowledgeable person to deliberately alter a program to yield the same checksum.

C. Media Control

Following validation, verification and approval of calibration programs, a Master Program Media (disk, tape, etc.)
can be established and maintained. Controlled and write protected copies of the Master disk are distributed to users. Comparisons of the Master and copies can be made as required by the auditing agency using a 'compare program', or old copies could simply be replaced with new.

D. Provide Executable Code

Remove Compilers from the calibration system computer, and furnish compiled program object code—for use. Store the Source code off line or use system protections. This action minimizes opportunities for unauthorized changes to the calibration system software.

E. Control Library Routines

Use software packages designed to control and protect program code and text files. Commercial software exists which provides a mechanism for maintaining current versions of routines, files, or modules that are continually in the process of change. The software acts as a responsible librarian and provides complete control over source code and text. Features available include library storage, the retrieval of previous file generations, extensive report capability, management of concurrent changes to the same file, etc. Software packages exist with features which include full auditing capability, including a record of individual terminal activities where tight security is essential.

J. J. Niedrauer

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IECQ CURRENT EVENTS

1. The U.S. IECQ System now has a total of seventeen (17) facility qualification approvals.

2. Within the U.S. IECQ System there are now three component class qualifications.
   1) Sprague Electric - Wet Tantalum Capacitors
   2) Union Carbide - Solid Tantalum Capacitors
   3) SFE Technologies - Monolythic Ceramic Capacitors

3. Taiwan's acceptance into the IECQ System is expected to be announced in approximately 1 month. As was mentioned in the April, 1984 NCSL BOD report, Taiwan will use the services of the U.S. NSI (Underwriters Laboratories) as their inspectorate.

4. IECQ International Meetings are scheduled to take place in Los Angeles, CA in April, 1985. Plans are not yet finalized, yet if anyone should be interested in attending, please see me.

5. Last, but not least, the EECB hosted a meeting with representatives of the DOD on 30 August, 1984 to discuss and seek DOD's endorsement support and active participation in the IECQ Specification System. The results of the meeting were:
   A. DOD representatives concluded that the IECQ System had appeal to the DOD and might possibly result in tangible benefits to the DOD.
   B. The DOD agreed to have staff members do additional exploratory work including consideration of policy changes that would include DOD field activity participation.

In talking with Mr. Harvey Berman of the U.S. IECQ System, DOD is expected to put a DOD cover on the IECQ specifications.

Timothy D. Driver

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REPORT FROM ANSI


ANSI/ASQC American National Standards Z1.1, Guide for Quality Control Charts, Z1.2, Control Chart Method of Analyzing Data, and Z1.3, Control Chart Method of Controlling Quality During Production, are being revised. Draft 3, Revision 0 is now being circulated for comments and votes. The numerous changes appear minor. Votes are due by March 5, 1985, and I intend to vote and comment as appropriate. I recommend that other NCSL members wishing to review the changes and commenting on them coordinate their comments with me.

The same control charts and methods are also used to control measurement and calibration processes.

E-2 is available for $5.00 to members of ASQC and $6.50 to non-members, and the proposed revisions to Z1.1 through Z1.3 are available for $5.00 from ASQC, 230 West Wells Street, Milwaukee, WI 53203.

After the deadline for comments and votes to the proposed standard for Calibration Systems, numerous additional comments and votes have been received. All are being
Committee News

considered in accordance with ANSI and ASQC procedures, delaying the submittal of the proposed standard to ANSI probably until March 1985.

Rolf B. F. Schumacher

LABORATORY EVALUATION COMMITTEE REPORT

January 7, 1985, completed and mailed Secretariat the survey of Member Delegates on Laboratory Accreditation activity. Hope to have report on results by Conference in Boulder.

I continue to receive information from the British Calibration Service. The information updates the Directory of Approved Calibration Laboratories including the uncertainty assigned by specific parameter.

The British Calibration Service Program Manual is also periodically updated with new or revised detailed criteria for approval on specific parameters.

A budget report was given to the Treasurer requesting the same funding level as 1984. Budget for this committee remains at $150.

Carl Quinn
Chairman, Laboratory Evaluation Committee

PRODUCT DESIGN AND SPECIFICATION COMMITTEE

1. A committee meeting was held on October 4, 1984, in conjunction with the annual meeting.
   a. Bob Willett agreed that the term "Performance Verification" should not be used to replace the term "Calibration" in the context of RP-3. He feels that other changes in his proposal are valid and useful. He will go back and take a fresh look at his proposal.
   b. The committee expressed a continued interest in my proposal for an RP covering certificates of calibration. I agreed to resume work on it.
   c. We considered the project of creating a glossary of terms relating to calibration and metrology.
   d. We discussed various aspects of RP’s vs Standards, relationship to military standards, etc.

2. I have completed a draft of my proposed RP and it is being routed to the committee for their comments.

Warren Collier, Chairman
C3 Committee

MEASUREMENT ASSURANCE COMMITTEE REPORT

1. Region 8 Volt MAP Repeat: As mentioned in the last report, the Volt MAP done in April/May was repeated in October. Mean offset of the group was less than 0.1 uV different from the earlier MAP, thus confirming the initial results.

Offsets between labs were independently verified by passing a Fluke 732A Solid-State Voltage Standard around the group (incomplete—only one lab to go yet). Agreement with repeat MAP data to date is in the order of 0.1 uV—very encouraging for our plans for next year (see below).

2. Region 8 Round-Robin Plans: A round-robin between 14 labs from the three California MAP groups is scheduled to start after the Measurement Science Conference in January 1985. Two solid-state voltage standards (one donated to NCSL by the Fluke Manufacturing Company and one loaned to us by Standard Reference Labs) will be used. Loosely structured, this experiment will be mainly concentrated on the 1.018 Volt level for transfer between saturated cell banks.

3. Future Plans: Study data obtained from above, optimize procedure, local repeat to verify results if necessary, explore 10 Volt to saturate cell level transfers. Towards the end of 1985, we hope to be at the point where we can extend an invitation to any member lab seriously interested in participating in round-robin at 1.018 Volts, 10 Volts, 1 Ohm, or 10 Kilohms to communicate with us.

4. Budget Item: Due to unforeseen delays in exploring solid-state voltage standards, no equipment purchases were made in 1984, and none of the $7,000 budgeting was spent. We have proposed a like amount for the 1985 budget plan instead.

Arno E. Ehman

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The following people were present:

Mr. Del Caldwell
Chairman
U.S. Navy
Pomona, CA

Mr. Joe Simmons
Deputy Director, Center for Basic Standards
National Bureau of Standards (NBS)
Gaithersburg, MD

Mr. Klaus Jaeger (Chairman Elect)
Subcommittee Chairman
Temperature, Pressure
Lockheed Missiles and Space Co.
Sunnyvale, CA

Mr. Frank Koide
Subcommittee Chairman
RF, Microwave
Rockwell International
Anaheim, CA

Mr. John Nelson
Subcommittee Chairman
Physical, Mechanical
U.S. Navy
Pomona, CA

Mr. Lyle Schmidt
Subcommittee Chairman
DC, Low Frequency
AF Aerospace Guidance and Metrology Center
Newark, OH

Absent but submitted written comments and suggestions:

Mr. Richard Miller
Subcommittee Chairman
Electro, Optical
Science Applications, Inc.
San Diego, CA

IMPACT OF NMRC REPORT

Dr. J. Simmons from NBS indicated that the report had had a very positive impact upon NBS. Several congressional groups were introduced to the summary report which yielded positive feedback. Joe mentioned that a hard-cover report from the NCSL is very important and that an update is definitely required at the beginning of FY 86. It was also urged to shorten summaries and in particular, establish priorities of need for the NBS. Joe would like to see a mechanism for establishing priorities using input from the entire metrology community.

It was also recommended that the NCSL address the impact of priorities. This appears to be a very difficult task since some companies would/could not be very specific so that only a broad sense of impact could be arrived at.

RECOMMENDED ACTIONS FOR THE COMMITTEES

A long discussion was held regarding the future activities of the NMRC subcommittees.

It is urged that all subcommittees broaden their base of respondents.

Each subcommittee should work on priorities. First prioritize the parameters and then within each parameter, prioritize different regions, etc.

The subcommittee chairman should recruit membership to ensure adequate coverage for all parameters.

Each subcommittee should find out from the NBS as to what input is of greatest importance. A good example is given in the NMRC Report, Pages 20-31.

Each subcommittee should establish contact with the NBS and address the areas that were not adequately addressed in their reply. If certain items were left out, it should be found out why, what can be done to rectify it, or if there exist other alternatives. In all cases, a new summary is required for each parameter.

Each subcommittee should make sure that all respondents receive replies indicating that the NBS has responded via document NBSIR84-2847 (National Bureau of Standards Response to the 1982 National Measurements Requirements Committee) and also via NBSIR84-2875 (NBS Physical Measurement Services Status Report, May 1984) as well as "NBS Calibration Services - A Status Report" by George A. Uriano.

Each subcommittee should obtain new information from the metrology community as to the needs in the near and long term future. Emphasis should be placed on priorities.

Frank Koide presented information on the "Promote National Microwave Standards," PNMS committee. The PNMS was organized in January 1984 by IEEE and will probably last until the middle of 1985. Frank distributed
his summary presented at the NCSL meeting in October 1984. In addition, he made copies of a reply letter from Bob Kamper available to us. Frank also discussed the meeting held with Brian Belanger and DOD officials in regard to mm requirements.

Special mm wave seminars are being organized by the PNMS with the next one scheduled for April 1985.

Klaus Jaeger presented a short review of the MILSTAR mm wave committee. Groups from Lockheed, Hughes, TRW, and CCG representatives from Newark Air Force Base and Navy, meet on a regular basis. Standards are being purchased in order to start MAP measurements between the various laboratories by April 1985. It is anticipated that first round results will be available by December 1985. NBS is represented through Boulder via software development. None of the required standards calibrations required by MILSTAR are presently available from NBS.

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NOTICE
NCSL DIRECTORY UPDATES

EDITOR'S NOTE: Pity the poor Directory Editor—or the Newsletter for that matter. Just when the copy hits the printer, the changes start—and they never seem to stop.

In that grand tradition, here are some updates to the NCSL Directory, recently sent to you. The first group is updates to the Listing of Standards Laboratories in USA (pages 2-47) and NCSL member delegates, USA (page 67-77).

Westinghouse Specialty Metals Division, Blair, PA - H. Bryan Werner, member delegate; add extension 363.

Navy Metrology Center, Pomona, CA - Delbert H. Caldwell, member delegate. Correct telephone number (714) 620-0525.

Lockheed Missiles and Space Company, Sunnyvale, CA - Bob Weber, member delegate. Proper telephone number (408) 756-0270.

Teledyne Microelectronics, Los Angeles, CA - Chester J. Crane, member delegate. Telephone number (213) 822-8229, ext. 2449.

Lockheed Electronics Co., Inc. - Plainfield, NJ - M.J. Corrigan, Jr., member delegate. Add extension 3023.

Teledyne Systems Company, Northridge, CA - Dean A. Brungart, member delegate. Proper telephone number (818) 886-2111, ext. 2508.

Tektronix, Inc., Beaverton, OR - Warren Collier, member delegate. Proper telephone number (503) 637-1678.


Phil Pajnochaud, Brea, CA. Correct telephone number (714) 685-0052.

Metron Corporation, Rancho Cucamonga, CA - Arthur J. Flourney, member delegate. Proper telephone number (714) 980-6168.

Updates to the Committee Chairman list (page 93-94).

41.0, CALIBRATIONS SYSTEMS MANAGEMENT:
Selden McKnight
USAFA-AGMC
Newark AFS, OH 43055
(614) 522-7450

43.0, NATIONAL MEASUREMENT REQUIREMENTS
Klaus Jaeger
Lockheed Missiles and Space Co.
Bldg. 195A, Org. 47-71
P.O. Box 504
Sunnyvale, CA 94086
(408) 756-0289

61.0, TRAINING AIDS
William A. Simmons
Barrios Technology, Inc.
18902 El Camino Real
Houston, TX 77038
(714) 483-2971

Add to Member Delegates, USA (p. 67-77):

Thomas E. Wolfe
Army, Dept. of
Attn: DRSDS-QM
Chambersburg, PA 17201-4170
Ph. (717) 263-7126

New Address for Hank Gonzales:

Hank Gonzalez
U.S. Army, TMDE Support Center
AMXTM-CW-WS
White Sands Missile Range
New Mexico 88002

Please bring your copy of the Directory up to date with the above information and check your own entry to see if it is up to date. If there are changes or corrections, please notify the NCSL Secretariat, National Bureau of Standards, 325 Broadway, Rm. 5001, Boulder, CO 80303.

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JOIN US AT THE 1985 WORKSHOP & SYMPOSIUM

CONFERENCE THEME

Improvement in product quality and reliability is a recognized objective of most industry leaders. Managing measurements to achieve quality, the theme of this conference, will focus on the important and key
role the metrology manager plays in product quality. For many, the measuring and test equipment utilized in product test and inspection are at levels of design, accuracy and complexity never before achieved. It is imperative that metrology organizations stay abreast of the latest technology in order to achieve quality calibrations and measurements. The 1985 NCSL Workshop and Symposium is dedicated to keeping you informed of both the managerial and technical advances and innovations that will in turn enable you to effectively contribute to an improvement in the quality of your organization's product.

**TOPICS**

* Controlling the Measurement Process
* Calibration of "Self Correcting" Instruments
* MAFS's--Who Needs Them?
* Measurement Accuracy Enhancement through Computers and Software
* Establishing Measurement Requirements
* Automated Calibration--Automated Testing
* The Need for Education and Training Today, Tomorrow
* Progress in Biological and Pharmaceutical Metrology
* Uncertainty Claims
* Engineering--Metrology--Product Testing, Are We Compatible?
* Metrology's Impact on the Quality of our Products
* The Cost of Low Quality
* Metrology Quality Circles

**FOR YOUR PERSONAL PLANNING**

Conference dates: July 15-18, 1985
Place: Hilton Hotel, Boulder, CO USA
Guest Program: Yes, bring your spouse
Conference fees: Member, $170
Non-member, $195
Late (after July 1) $220

Final program with registration and hotel reservation cards and full information will be mailed in April.

**HP MOVES TO METRIC-THREADED FASTENERS**

At an early point in the USA metrication program, HP stated its commitment to a full metric position to be consistent with its multi-national posture in scientific instrumentation and world trade strategies. HP has taken a phased approach to this metrication effort and began by directing an early effort to designing all new products with full metrics. As those products are introduced to the market, and older products are retired, the line will naturally become more metric.

Most current products will not be redesigned specifically for metric, however, starting in early 1985, HP will begin to ship those instruments that use the so-called System II cabinet configuration with metric-threaded fasteners in the frame parts. (System II is identified with front & rear bezel castings and removable handles).

Brackets and cabinet-joining hardware will attach with metric screws. Internal sheet metal will attach to the frames with metric screws although the internal structure will remain standard inch-threaded fasteners in the older instruments.

Instruments with these mixed inch-threaded metric-threaded configurations will be identified with labels inside each top and bottom cover. There will be a notification label attached to the rear panel of each such instrument. The accompanying operating & service manual will carry a notification addendum sheet. The frame parts themselves will have either an "M" designator or the word "metric" cast into a visible spot for identification.

Rack mount and front handle kits will be packaged in kits with both metric-threaded and inch-threaded fasteners, and carry short explanatory messages. Since the possibility exists where an inch-threaded cabinet could be joined with a metric-threaded cabinet, the lock link kits will be identified by one part number and will contain both metric- and inch-threaded screws.

For the technician servicing HP products, the important thing is to be aware of these coming changes and to be particularly alert to which fasteners are being used in the particular instrument being serviced. In other words, don't throw all your screws into one coffee cup.

HP does not plan to color code the metric hardware since such a plan is not deemed any more necessary than identifying the location of various length of number 8-32 screws.

**THEORY AND PROPERTIES OF THERMOELECTRIC MATERIALS IS TOPIC OF NEW ASTM BOOK**

PHILADELPHIA, PA -- Engineers concerned with temperature measurement and control will benefit from a new ASTM Special Technical Publication entitled Thermoelectricity: Theory, Thermometry, Tool (STP 852).

This publication's general purpose is to provide and explain the elementary theory and the bases for thermoelectric materials.
Specific information on the behaviors of thermocouples is included.


This new edition contains additional information in areas of interest such as extension wires and less commonly used thermocouples. Considerable material on thermoelectric properties of semiconductors has also been added. Physical and thermodynamic theories are presented in an uncomplicated manner.

STP 852 is of particular interest to engineers and engineering educators involved with:

- accurate temperature and control in their research work
- any manufacturing-production process involving thermal energy
- power generation


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W. EDWARDS DEMING NAMED HONORARY MEMBER OF ASTM

PHILADELPHIA, PA -- W. Edwards Deming, a management consultant, has been named an Honorary Member of ASTM.

Deming, of Butterworth Place in Washington, DC, was honored for "a half-century of outstanding leadership in the education of industrial management world-wide in their use of statistical methods as applied to problems of quality and productivity and for international efforts in standards development."

Honorary Membership is the highest recognition given by ASTM. It is granted to individuals who have made extraordinary contributions to the voluntary consensus standards system.

A native of Sioux City, Iowa, Deming received a B.S. degree from the University of Wyoming, 1921, an M.S. degree from the University of Colorado, 1924, and a Ph.D. degree from Yale University, 1928.

Deming became a consultant to research and industry in 1946 and is a professor of statistics in the Graduate School of Business Administration, New York University. He also conducts seminars in management of productivity at George Washington University. Prior to 1946, Deming was an advisor in sampling for the Bureau of Census for six years and a mathematical physicist for the U.S. Department of Agriculture for twelve years.

Throughout his career, Deming has participated in many international standards activities, including the UN Subcommittee on Statistical Sampling. He was a sampling or statistical consultant to India, Mexico, Germany, Turkey, and China. He has been a teacher and consultant to the Japanese industry, through the Union of Japanese Scientists and Engineers, since 1950. In his honor, the Union awards the Deming Prize each year to a Japanese statistician for contributions to statistical theory. The Deming Prize for Application is awarded to a Japanese company for improved use of statistical theory in organization, consumer research, design of product, and production.

Deming was the recipient of the Second Order Medal of the Sacred Treasure from the Emperor of Japan in 1960. He received the award for the improvement and quality of the Japanese economy through the statistical control of quality. Deming was an Award of Merit recipient from ASTM, and became a Fellow of the Society, in 1969. ASTM Committee E-11
on Statistical Methods honored him with the Harold F. Dodge Award in 1979 for outstanding work in the field of applied statistics. Other awards and honors include the Shewhart Medal, 1955, from the American Society for Quality Control; the Taylor Key Award, 1983, from the American Management Association; and election to the National Academy of Engineering, 1983.

Deming is an Honorary Life Member of the American Society for Quality Control, the Biometric Society, the Union of Japanese Scientists and Engineers, the Japanese Statistical Association, the Deutsche Statistische Gesellschaft, and the American Institute of Industrial Engineers. He is an Honorary Fellow of the Royal Statistical Society and a Fellow of the American Statistical Society and of the Institute of Mathematical Statistics. Deming is also a member of the International Statistical Institute, the Philosophical Society of Washington, the World Association for Public Research, the Market Research Council, and the Operations Research Society of America.

ASTM STANDARDS AVAILABLE FOR ELECTRONICS PROFESSIONALS

PHILADELPHIA, PA -- Over 200 standard procedures to improve fabrication processes and the performance and reliability of electronic devices and components, are currently available from ASTM, a world leader in the development of voluntary standards.

These test methods, practices, specifications, and definitions are available in Volumes 10.04 and 10.05 of the Annual Book of ASTM Standards. "The standards were designed specifically to promote good manufacturing practices and improve quality in the electronics industry," according to Robert L. Meltzer, Vice President, ASTM Publications and Marketing Division.

Volume 10.04 contains over 800 pages of standards for electronic device characterization, interlayer interconnects and bonding, electro-optics, hybrid circuits and substrates, microelectronic packaging, vacuum tube materials and processes, and hermetic seals. Extensive military and industrial cooperation is behind many of the standards.

Seven-hundred pages of standard test methods for silicon properties, fabrication process controls, semiconductors, other than silicon, photolithography, and environmental contamination control are continued in Volume 10.05. Each test method is backed by the intense interlaboratory testing in industry and government.

These books may be ordered from ASTM Customer Services, 1916 Race Street, Philadelphia, Pennsylvania 19103, 215/299-5505. ASTM standards are also available as separates. Volume 10.04: $43.00 ($38.70-ASTM Members), Volume 10.05: $53.00 ($47.70-ASTM Members)

In response to popular demand, the following items are available from the NCSL Secretariat, postpaid, at the prices indicated.

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<td>* Training &amp; Information Directory</td>
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<td>* NCSL Directory of Standards Labs (biennial)</td>
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<td>* Calibration Lab Managers' Guidebook</td>
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<td>* NCSL Newsletter (single copy)</td>
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Delegates of new member companies receive all the asterisk items as part of the new-member information package. Updated material, e.g., Training Information Directory and Directory of Standards Labs are automatically forwarded to all member delegates as they are published. Additional items are available at prices indicated. Telephone or mail all orders to the NCSL Secretariat, National Bureau of Standards, 325 Broadway, Rm. 5001, Boulder, CO 80303. Phone (303) 497-3237.

NCSL FOR-SALE ITEMS
NBS ASKS FOR FEEDBACK FROM NCSL MEMBERS

National Bureau of Standards
Office of the Director

January 23, 1985

Mr. R.B. (Pete) England
President, National Conference of Standards Laboratories
General Dynamics, Pomona
Mail Zone 2-60, P.O. Box 2507
Pomona, CA 91769

Dear Mr. England:

I am writing in regard to possible changes in the U.S. legal units of voltage and resistance which could be significant enough to be of interest to the U.S. scientific and industrial communities, and, indeed, could likely be operationally important to the instrumentation community.

As you may be aware, the U.S. legal or NBS as-maintained unit of voltage is defined and maintained constant in time via the ac Josephson effect using an adopted value for the Josephson frequency-voltage ratio 2e/h (e is the elementary charge and h is the Planck constant). Four different values for this ratio are used by the various national standards laboratories throughout the world to define their respective laboratory units of voltage and they differ by up to six parts-per-million. Moreover, these adopted values of 2e/h may turn out to differ from the SI value by between three and ten parts-per-million, implying that the various as-maintained units of voltage differ from the SI volt by the same amount.

The U.S. legal or NBS as-maintained unit of resistance is defined in terms of the mean resistance of five wire-wound one ohm resistors of the Thomas-type. The units of resistance of most other countries are defined in a similar manner. Because the various laboratory units of resistance are based on artifact standards, they change with time. Indeed, there is evidence that the NBS ohm is decreasing at a rate of about five to six parts in one hundred million per year and that it now differs from the SI ohm by about 1.5 parts-per-million. Because such drifts are inherent in artifact resistance standards, the major national standards laboratories including NBS are vigorously investigating the newly discovered quantum Hall effect with the aim of developing it to the point where it can be used to define their respective laboratory units of resistance and to maintain them constant in time to within a few parts in one hundred million. However, no laboratory has yet adopted a specific value for the quantized Hall resistance RH h/e2 for this purpose.

With the above situation in mind, the Consultative Committee on Electricity (CCE) of the International Committee on Weights and Measures (CIPM) decided at its March 1983 meeting to reconvene sometime in 1986 in order to try to reach international agreement on (1) adoption of a new value for 2e/h consistent with the SI value and which is to be used by every laboratory employing the Josephson effect to define and maintain its unit of voltage, and (2) adoption of a value for RH consistent with the SI value and which is to be used by every laboratory employing the quantum Hall effect to define and maintain its unit of resistance. I am enclosing two preprints of articles by Barry Taylor on this general subject for your information.

As NBS Director and recently elected President of the CCE, I am most concerned that the decisions to be made by the CCE at its meeting (now scheduled for 16-18 September, 1986), and which would likely be adopted as an international agreement by the General Conference of Weights and Measures at its meeting in 1987, be both reasonable and supportive of a national consensus. I am therefore writing to you and other members of the scientific and technological communities to give you the opportunity well ahead of time to provide me with advice and guidance on this topic. In particular, I would appreciate knowing the views of the National Conference of Standards Laboratories on the potential impact on industry of increases in the U.S. legal volt and ohm of about 1.5 parts-per-million, respectively, which will result from the decisions likely to be forthcoming from the CCE in 1986. Will the benefits of international uniformity of laboratory electrical units and consistency with the SI outweigh the cost of making the necessary changes? I am especially interested in gaining an appreciation of what the effect might be on the instrumentation industry within the U.S. and, if changes are made, how best to help all of U.S. industry properly adjust their units of voltage and resistance.

I would appreciate receiving first comments by March 1985; more detailed comments can reach me until October 1985 when I shall have to begin deciding what positions to take in negotiating international agreements.

Sincerely,

Ernest Ambler
Director

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POSSIBLE CHANGES IN THE U.S. LEGAL UNITS OF VOLTAGE AND RESISTANCE

The Director of the National Bureau of Standards, Dr. Ernest Ambler, is seeking comments of NCSL members, concerning the effect on industry of possible changes in the U.S. legal units of voltage and resistance. Such comments will be helpful in formulating a U.S. position concerning this issue in preparing for the forthcoming meetings of the Consultative Committee on Electricity (CEE) of the International Bureau of Weights and Measures. Dr. Ambler outlines the current status of these quantities and the proposed changes in a letter to NCSL President, Pete England, which is reproduced below. It should be emphasized that if in fact the CEE does decide to adopt a new value for the Josephson frequency-voltage ratio and a value for the quantized Hall resistance, the values chosen will be based on a critical assessment of all of the measurements available which bear on the subject; values will not be adopted if the data are inconsistent.

Fete England has asked NCSL Vice President for Laboratory Management, Del Caldwell, to collect comments from NCSL members concerning the effect of the proposed changes. NCSL members or other interested parties are requested to send their comments to Del at the address listed below before May 15, 1985.

Mr. Delbert H. Caldwell
Navy Metrology Engineering Center
P.O. Box 2436
Pomona, CA 91769
(714) 620-0525

Readers of this newsletter will be kept informed of future developments.

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NBS FY 1986 BUDGET REQUEST TOTALS $120 MILLION

A total of $120.0 million is included for the Commerce Department's National Bureau of Standards (NBS) in the fiscal year 1986 budget proposal sent to Congress today by President Reagan.

The budget request is $4.0 million less than the bureau's fiscal year 1985 appropriation of $124.0 million. Included are program increases totaling $16.4 million and cost-of-living and other built-in changes of $4.9 million. The request also includes proposed program reductions of $16.5 million and decreases of $8.8 million, attributable to the President's Deficit Reduction Program.

According to NBS Director Ernest Ambler, "This proposed budget is the result of the administration's careful evaluation of the Bureau's programs and priorities. It reflects the minimum resources we need to continue serving industry, government, and academia.

"The U.S. economy is increasingly dependent on industry's ability to advance and exploit science and technology, and it is NBS' responsibility to lay the measurement foundation that is needed to get this job done.

Therefore, we have proposed increases for the most critical areas of research while also proposing decreases in view of overall fiscal constraints. We need to move ahead."

Proposed program increases are:

- Process and quality control measurements ($1.9 million). This increase would fund the development of advanced primary standards and measurement methods to improve industrial productivity and competitiveness through improved process and quality control.

- Biotechnology ($3.0 million). This increase would fund NBS' development of a scientific base to advance the commercialization of biotechnology in chemical production and related industries.

- Advanced ceramics ($3.5 million). This increase would address the need for technical information and measurement services to support the production of reliable, high-performance ceramics.

- Cold neutron source ($8.0 million). This increase would permit NBS to establish a cold neutron source that will provide a unique capability for measuring the properties, performance, and processing of high-technology materials, and will be available to other government agencies, universities, and private sector scientists.

The proposed program reductions are:

- Building research ($3.1 million). The center for Building Technology would be eliminated. This research is more properly the role of the private sector and state and local governments.

- Computer sciences and technology ($5.0 million). The federal automated data processing (ADP) standards development and testing program would be reduced to $5.0 million. Resources would be focused in the area of international networking of computers where American trade interests must be protected. The voluntary standards process would be relied upon for other computer-related standards.
Fire research ($5.1 million). The center for Fire Research would be eliminated. This research is more properly the role of the private sector and state and local governments.

Equipment replacement program ($3.3 million). This program, established to provide NBS with an equipment level equivalent to comparable research laboratories, will reach its goal in fiscal year 1985, permitting the fiscal year 1986 budget to be reduced with minimal program impact.

Other proposed decreases represent absorptions and reductions for a fiscal year 1986 federal pay cut of 5 percent ($2.4 million), administrative reductions and productivity reviews ($3.0 million), reductions to carry out the Deficit Reduction Act of 1984 ($1.2 million), and absorptions of base adjustments ($2.2 million).

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USING THE SUN FOR ANTENNA MEASUREMENTS

NBS has been successful in using the radio star Cassiopeia A and the moon for precision gain-to-system-noise temperature ratio (G/T) measurements for communications antennas. Now, NBS has begun to investigate the sun for use as a standard noise source for measuring antennas 4 to 6 meters in diameter. The sun is potentially a more useful standard than the moon because of its greater radio-wave and microwave emissions. "A Preliminary Investigation Into Using the Sun as a Source for G/T Measurements" (NBSIR 84-3015) discusses solar flux density, atmospheric correction factor, and star shape correction factor for use in G/T measurements above 5 GHz. It is available for $7 prepaid from the National Technical Information Service, Springfield, VA 22161. Order by PB #85-128148.

CONTACT: Fred McGehan, 303/497-3246.

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SHIELDING EFFECTIVENESS OF BUILDINGS

Electrical engineers and others concerned with the effectiveness of buildings in shielding their interiors from electromagnetic (EM) radiation will be interested in a new publication from NBS. Building Penetration Project (NBSIR 84-3009) documents a computer program which calculates building attenuation of EM radiation over the frequency range 10 kHz to 10 GHz. Attenuation is computed from building shape, dimensions, room layout, and the electrical properties of the construction materials; no electromagnetic measurements are required. Although performed for the U.S. Army, the work is applicable to almost any situation where it is desirable to estimate the extent of penetration of EM radiation into a multi-room, one-story building. The 310-page publication, which includes listings of computer programs, is available for $25 prepaid from the National Technical Information Service, Springfield, VA 22161. Order by PB #85-126001.

CONTACT: Fred McGehan, 303/497-3246.

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PROCEEDINGS OF PRECISION MEASUREMENT CONFERENCE

NBS has published the proceedings of the Second International Conference on Precision Measurement and Fundamental Constants (June 8-12, 1981). These proceedings include 20 invited review papers, 15 contributed papers, and 92 papers from poster sessions. The topics covered include precision measurement of frequency and wavelength; trapping and storing ions; precision spectroscopy; quantum electrodynamics and elementary particles; measurement of the gas constant; x-ray interferometry; assignment of uncertainties; measurement of nuclidic masses; gravitational acceleration, mass and electrical quantities; and measurements relating to gravity and relativity. Copies of "Precision Measurement and Fundamental Constants II" (SP 617) are available for $23 prepaid from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Order by stock no. 003-003-02620-4.

CONTACT: Michael Baum, 301/921-3181.

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GTE RESEARCHERS TO STUDY ADVANCED CERAMICS AT NBS

Guest workers from GTE Laboratories, Waltham, Mass., will work at NBS with bureau scientists to use a variety of nondestructive evaluation (NDE) techniques to study the properties of advanced ceramics. The NDE techniques, which include neutron diffraction, neutron depth profiling small angle neutron scattering, and trace analysis methods, will be used to study the atomic scale structure, microstructure and trace impurities in ceramics, semiconductors, and alloys. The projects of mutual interest to GTE and NBS will include fundamental research on the structure of both ionic conductor and insulating materials, the porosity of high-strength ceramics, and the role of implanted materials on the surface properties of steels and other alloys. A data base will be developed for determining the performance of advanced ceramics for electronic products and for high-temperature engines and turbines.

CONTACT: Roger Rensberger, 301/921-3181.
The HCS Emulator is written largely in VMS operating system. Copies of the HCS Emulator are available from the National Technical Information Service, Springfield, VA 22161 for $240 prepaid. Request PB 485-152759. Price includes the program on 9-track tape, ASCII format, 1600 BPI, and three HCS emulating manuals.


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AMRF ACQUIRING FINAL PIECES OF EQUIPMENT

With the arrival of a Unimate 4000 robot from Westinghouse Unimation in December, the NBS Automated Manufacturing Research Facility (AMRF) is now set up in its final shop-floor configuration. The facility includes automated manufacturing systems, a turning workstation, an automated inspection workstation, and the robotic equipment for cleaning and deburring workstations. Equipment for the last workstation, materials-handling, is expected to be in place by this fall. Over $2.75 million worth of the equipment in the AMRF was loaned or donated to NBS by companies sponsoring research at the facility. Remaining tasks include integrating several of the workstations into the advanced experimental control system used by the AMRF, further refinements to that system, and development and testing of the data administration system and data structures. The facility is scheduled to be functionally complete in 1986.

CONTACT: Michael Baum, 301/921-3181.

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NBS, CINCINNATI MILACRON TEST ROBOT TOOL CHANGER

NBS and Cincinnati Milacron, Inc., have set up a joint Research Associate Program to test under industrial conditions a new, automatic "quick-change" system for robot and effectors being used in the NBS Automated Manufacturing Research Facility (AMRF). It allows an industrial robot to
swap specialized end effectors ("hands") to meet various tasks. The system provides for up to 6 hydraulic (1000 psi) or pneumatic (100 psi) connections and up to 38 electrical or fiber-optic connections. It has mating repeatability of better than 0.001 inch per inch in tilt and has several reliability and safety features. The new tool change system adds about 15 lbs. to the robot's load and about 2 inches to the length of the end effector. Cincinnati Milacron engineers will optimize the quick-change system for industrial use and test the system at their facility in Lebanon, Ohio.

CONTACT: Michael Baum, 301/921-3181.

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OPTICAL FIBER MEASUREMENTS


CONTACT: Collier Smith, 303/497-3198.

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EM FIELD STRENGTHS IN AND AROUND POLICE CARS

Public-safety agencies and other organizations that use mobile radio equipment will be interested in a new publication that provides indications of the levels of field strength that may exist in and around automobiles that use mobile radio transmitters. The report was prepared by NBS for the National Institute of Justice in response to a request from the Technology Assessment Program Advisory council of the International Association of Chiefs of Police. Using the NBS-designed, calibrated probe, NBS engineers made field strength measurements at 10 locations within the test vehicle, with and without the driver's door open, and with and without front seat occupants. The measurements were made at a frequency representing common frequency bands in use by public-safety agencies. In addition, specialized field strength measurements were made. The study notes that the measurement results are indicative of what may be expected, and are not definitive. Copies of "Field Strength Levels in Vehicles Resulting from Communications Transmitters" are available from the Law Enforcement Standards Laboratory, B157 Physics Building, National Bureau of Standards, Gaithersburg, MD 20899.

CONTACT: Fred McGehan, 303/497-3246.

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EVALUATING VOLTS, JOLTS, AND LIGHTNING BOLTS ALL IN A DAY'S WORK AT FEDERAL LABORATORY

We are all familiar with the annoyance of electrical power blackouts. Lights flicker and die. The TV quits. And the family makes a mad dash for candles and flashlights. More importantly, vital services such as traffic control and residential heating are disrupted. Often, lightning is the culprit.

For most of us, lightning is a dangerous and frightening phenomenon, as well as the reason for occasional inconveniences. But researchers at one federal laboratory are using lightning-like pulses as a high-tech tool to help utilities and manufacturers define how well their equipment will hold up if struck by lightning.

Such predictions require an extremely accurate and reliable system of measurement, something that is a specialty at the Commerce Department's National Bureau of Standards (NBS). There, researchers are working for and with industry, universities, and other government agencies in a recently expanded high-voltage measurement facility. They tackle problems ranging from lightning bolts to fluctuating currents in machines used for welding metal shipping containers. In each case, NBS performs a special measurement service unlike that of other electrical measurement laboratories around the country.

Take lightning for example. To evaluate power equipment's response when hit by lightning, private laboratories routinely create simulated versions of lightning bolts—pulses that last only a few millionths of a second (microseconds). But since instruments needed to measure these "bolts" would be destroyed by such high voltages, the laboratories use a "voltage divider" to reduce the simulated lightning to a few hundred volts. NBS gets into the act because utility test operators need to know how the dividers themselves will respond to high voltages before the devices can be used.

Because NBS is one of the few places in the world where the voltage dividers can be specially calibrated, utilities, manufacturers, and other laboratories turn to the bureau for these acute measurements. With an accurate measurement base traced to NBS,
At NBS, amid a bank of controls, monitors, and test devices, the highly specialized measurement standards are worked out that permit utilities and other laboratories to test with confidence insulators, as well as electrical outlets, lightning arresters, and even citizen band antennas. Since NBS is not a regulatory agency, bureau researchers develop the test methods, then turn the results over to others, who often adopt these test methods as voluntary, private sector standards.

Insulating materials, which may be solids (paper, for example), liquids (oil), gasses (air), or combinations of these (the oil and paper used in many transformers), are studied at NBS by being connected to a huge machine with rows of softball-sized electrodes. Called a standard lightning generator, this machine can energize an insulating material with as much as a half-million volts. The idea is to create a "transient voltage," which simulates what might happen to the insulator if the substation were subjected to rapid voltage rises or struck by a bolt of lightning. With specialized instruments, NBS researchers measure the effectiveness of the insulator as well as evaluate the accuracy of test equipment used by the utility companies.

Utilities have become especially interested in the performance of gas insulators in recent years because of the many gas-insulated substations that have been built nationwide. These facilities use a gas, such as sulfur hexafluoride, to insulate transformers, high-voltage cables, and switches. Though the substations are compact and fairly inexpensive to build, breakdown is of particular concern because ideal conditions are present for the transient voltages that prompt failure.

To study these gas insulators, NBS uses a "nanosecond (billionth of a second) transmission line"—a long, tubular device that allows transient voltage signals and actual effects to be observed in a controlled situation. NBS researchers and utility representatives expect this research to lead to more effective insulators as well as to a better understanding of the conditions under which existing insulators will perform more reliably.

Though utilities and other industries often use the NBS facility, the bureau has many of its own projects which aim to improve the science of voltage and current measurement. In one such study, NBS researchers are comparing voltage and current measurements made with conventional equipment to those produced with newer electro-optical and magneto-optical devices. They also are investigating how well standard voltage and current measurements can be simulated on a computer. Such computer modeling could save both time and money.

A laboratory like the bureau's, with its variety of equipment and experienced staff, is a boon to many industries, universities, and other federal agencies. "We have a lot of demand from industry to accept guest workers because they need a facility of this kind to do their work," says Dr. Robert E. Hebner, who manages the facility in the NBS Center for Electronics and Electrical Engineering.

One such client, the Exxon Research and Engineering Company (ER&E), is studying electrical breakdown in the oils used as insulators in transformers. With an elaborate high-speed photography system that runs at a speed equivalent to 20 million frames per second, researchers are making accurate measurements of precisely when breakdown occurs after a voltage is applied to the oil. Under study, "NBS has the specialized equipment we need for our work," says Eric Forster, a scientific adviser for ER&E who has collaborated with NBS for five years. Forster adds that by joining forces, NBS and ER&E have produced research results that have put both organizations in the forefront of technology in solving complex problems encountered in the electrical industry. In what he terms "an ideal marriage," Forster says the NBS/ER&E program helps both parties because it pairs the bureau's interest in measurement science with ER&E's interests in understanding the properties of hydrocarbon liquids.

While much of the bureau's work at the facility is in determining voltage, there is also a need for reliable measurements of current. For example, Sandia National Laboratories in Albuquerque, NM, has turned to NBS for help in improving quality control for large industrial welding machines, which
typically draw 100,000 amperes of high-pulsed current. (At its peak, this current level is equivalent to that drawn by 1,000 homes.) But in order for welds to be consistent, current must also be constant. Sandia needs to know if its test equipment is giving accurate current measurements so the welding machines can produce the repeatable welds needed for sealing metal container plates. The New Mexico laboratory has asked the bureau to evaluate measurements made by its test equipment under simulated conditions in the NBS lab, as well as to suggest how to make the current more consistent.

The accuracy of test equipment also has been a problem for electric utilities that make measurements of various aspects of direct current power lines. There has been interest in such measurements in recent years because of concern about the possible health effects of dc transmission lines. But, as Hebner says, utilities "have bought test equipment that sometimes gives inaccurate measurement readings." To evaluate the accuracy of such equipment, NBS has set up a scaled-down version of a typical dc power line. Instruments under study are electric field meters, Wilson plates (for measuring current), and ion counters. The latter instruments, which measure the ion density in air, have become important for their role in studying the biological effects of ions, as well as for industries, such as semiconductor manufacturers, which are interested in manipulating ion density in "clean rooms" to control static electricity.

Recently, the NBS facility also has been used to help the Consumer Product Safety Commission determine what might happen if a home-based citizen's band antenna were to fall on a power line. And the Rural Electrification Administration has used the facility to measure the electrical effects of ions, as well as for industries, such as semiconductor manufacturers, which are interested in manipulating ion density in "clean rooms" to control static electricity.

More companies, universities, and federal agencies have lined up to use the NBS facility in between the bureau's own projects. That's because while there are other electrical testing facilities in the United States, the NBS laboratory is the only one exploring the fundamentals of electrical measurements--fundamentals that other labs ultimately use as standards. As Hebner says: "We're the ones who are in the business of worrying about how well the measurements can be made."

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INDUSTRIAL GUIDE TO ACCURATE MASS MEASUREMENT

Researchers from NBS and the Lockheed Missiles and Space Company, Inc., have collaborated on A Primer for Mass Metrology (SP 700-1), which outlines fundamental concepts and equations and good metrology practice for the measurement of mass. The text also serves as a Bibliography of more detailed NBS publications on mass measurement. It is the first of the new Industrial Measurement Series of NBS publications, which will feature treatises on topics of special interest to industrial metrologists, prepared jointly by NBS and industrial specialists. $3.25 prepaid from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Order by stock no. 003-003-0261-2.

CONTACT: Michael Baum, 301/921-3181

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PRIVATE RESEARCHERS MAY USE CERTAIN NBS FACILITIES

As the nation's foremost science and engineering laboratory, the National Bureau of Standards has some of the premier research and testing facilities in the United States, and several of our laboratories are unequaled anywhere in the world. Bureau scientists and engineers use these special facilities to pursue the measurement-related work that U.S. science and industry need to grow and prosper.

Many of the facilities are available for use by the scientific and engineering communities either on a cooperative or independent basis. NBS has a long history of cooperative work in these laboratories with researchers from industry, government, and academia. For example, our Research Associate Program, established in the 1920's, has provided the opportunity for numerous collaborative projects over the years. Through this program, research associates have their salaries paid by the sponsoring organizations while NBS contributes its expertise and permits researchers to use the Bureau's facilities and equipment.

Now, recognizing the strong challenges from abroad and the need for U.S. researchers to pool their resources, we have decided to make selected NBS facilities available to U.S. researchers for proprietary work on a cost-recovery basis, when equal or superior facilities are not otherwise readily available. We hope that this will increase the transfer of technology to industry and encourage commercially important research that otherwise might not be done.
This brochure highlights only a small number of the special facilities available at NBS and provides information about their availability for collaborative or independent research and testing. Individuals or organizations wishing to use a facility should contact the facility manager listed in each write-up. NBS has designed its system for reviewing such requests to be as efficient and responsive as possible, to encourage maximum use and minimal paperwork on the part of both NBS and the prospective user.

We encourage you to take advantage of the nation's investment in NBS.

Ernest Ambler
Director
than the survey data. Combining data from these two sources required adjustments to compensate for interim economic trends.

Nevertheless, this study represents the first comprehensive estimate of the economic role of measurement and can legitimately be used for comparative purposes. The analyses reported herein will be updated and expanded in the near future.

SUMMARY

This study was conducted for the National Bureau of Standards to assess the relative importance of measurement among U.S. industries. The research consisted of developing initial estimates of the measurement costs being incurred in all sectors of the U.S. economy, and then developing more detailed estimates for twenty measurement-intensive sectors and their subsectors. For each sector and subsector the total dollar value added and costs of measurement are presented. Presented also as components of the total are the costs of measurement-type activities. Observations are included with regard to industry trends in measurement requirements over time and the effect that automation is having on measurement.

Based on the data collected, measurement-related activity is estimated to comprise approximately 3.5 percent of the gross national product (GNP). The contribution of measurement to GNP varies substantially across sectors of the economy. For example, a sample of 20 industrial sectors, which collectively contributed approximately 15 percent of GNP, were selected for more detailed study because initial analyses indicated they were relatively measurement-intensive. These sectors were estimated to have 13.5 percent of their combined contribution to GNP attributable to measurement-related activity, compared with 3.5 percent for the economy as a whole.

The total costs of measurement to industry (capital plus labor expenditures) are estimated to be $163 billion in 1984 (value added was used as an inflator). This figure represents approximately two percent of total sales. Approximately 3/4 of the cost of measurement is attributable to labor expenditures. Note that although the 20 sectors initially identified as measurement-intensive account for approximately 15 percent of GNP, they account for approximately 50 percent of the economy's expenditures on measurement-related activity.

ESTIMATES OF MACROECONOMIC IMPACTS AND COST

OF MEASUREMENTS

Table 2

<table>
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<tr>
<th>BEA Economic Sectors</th>
<th>Total Cost of Measurement ($ Billion)</th>
<th>Value Added by Measurement as % of Total Value Added by Sectors, 1979</th>
<th>1979</th>
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<td>20 measurement-intensive sectors</td>
<td>13.5%</td>
<td>$49</td>
<td>$80</td>
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<tr>
<td>81 sectors (total economy)</td>
<td>3.5%</td>
<td>$120</td>
<td>$163</td>
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<td>27</td>
<td>Chemicals and Chemical Products</td>
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<td>Plastics and Synthetic Materials</td>
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<td>52</td>
<td>Service Industry Machinery</td>
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<td>Household Appliances</td>
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<td>Radio, TV and Communications Equipment</td>
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<td>Electronic Components</td>
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<td>9,781</td>
<td>617</td>
<td>10,398</td>
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<tr>
<td>75</td>
<td>Auto Repairing and Service</td>
<td>15.4</td>
<td>25,666</td>
<td>3,953</td>
<td>13</td>
<td>3,966</td>
</tr>
</tbody>
</table>
Mr. George O. Rice  
President, NCSL  
Rockwell International Corporation  
Department 120, HC02  
3370 Miraloma Avenue  
Anaheim, CA 92803

Dear George:

The National Bureau of Standards is currently evaluating the need for the establishment of a national calibration service, which would have as part of its responsibilities the accreditation of private sector calibration laboratories. Before any policy decisions can be made concerning whether to establish or not to establish such a service, we must ascertain opinions from industry and, if positive, document the industrial need for the service. We would very much appreciate any help that the National Conference of Standards Laboratories could provide to NBS in gathering information that responds to the questions listed below.

1. Is there a need for a calibration laboratory accreditation service in the United States in the view of your member companies?

2. What would be the benefits (or disadvantages) of a national calibration laboratory accreditation service to individual companies in terms of productivity, domestic and international trade, and product quality assurance? We are particularly interested in obtaining evidence of the assistance that an accreditation system would have on international trade of products produced by your member companies.

3. Would a calibration laboratory accreditation service be more acceptable if it could be used as the basis for satisfying audit requirements in cooperation with DOD and prime contractors and thereby reducing the number of redundant audits?

4. If NBS were to propose the establishment of a national calibration laboratory accreditation service, what role might NCSL or other organizations play in the planning and implementation of the service?

We recognize that the quantitative information we need may not be readily available. However, without a convincing economic justification for such an accreditation service, strongly supported by the industrial community, it would be unwise to proceed further. We would also be pleased to provide you with assistance in collating and analysing information that you would obtain from your members.

Sincerely,

Ernest Ambler  
Director
Graham Cameron

Graham is member delegate for the Department of National Defense. He's the one with the Canadian accent, who has been actively involved in developing our growing International Region.

Following his attendance at a 1964 conference in New York City, sponsored by NCSL and two other organizations, he realized the potential benefits and recommended membership to his management. After that entry, his commitment has never faltered.

Born in the village of Fallbrook in Eastern Ontario, Canada in 1930, he attended public school, then high school in nearby Perth. He graduated in Mechanical and Industrial Technology from the Ryerson Polytechnical Institute in Toronto, Ontario and joined the Department of National Defence in 1952.

His early years were spent evaluating inspection and measurement systems throughout the Canadian Defence sector. He travelled annually to some 70 industrial sites and established many communication ties with this constituency.

He is currently responsible for the Defence Standards Laboratories operation within the department with electrical and mechanical standards facilities in Hull, Quebec (just across the river from Ottawa, the National Capital) and a dimensional standards laboratory in Quebec City, Quebec.

These facilities act as reference laboratories for the Departmental Facility Recognition Program. Carefully characterized artifacts are provided to the facilities seeking recognition and metrologists conduct on-site assessments to establish the level of achievement.

The Defence Standards Laboratories also underpin the more remote calibration facilities engaged in the calibration of Canadian Forces test equipment across Canada and in Europe.

The tribology operation undertaken by Graham's unit, the Quality Engineering Test Establishment, concentrates on rolling contact technology/bearing projects.

Utilizing his experience in laboratory management, Graham has contributed to the development of various metrological and quality based activities. He is a member of the Standards Council of Canada's Testing Accreditation Sub-Committee, contributing to the process of facility assessment.

He is a member of the National Committee on Metrology preparing a recommended practice. Graham and Dr. Bob Kamper, NBS Boulder, are members of the National Research Council of Canada Associate Committee on Standards of Physical Measurement, assessing Canadian requirements for basic and derived standards.

Graham has been a member of our Board of Directors for several years. He served two 2-year terms as Vice-President Measurement Requirements and more recently as Director International Region which now has a membership of sixty-six with twenty-seven of these in the Canadian section.

A good indication of how Graham's persistence has paid off shows in the growth of the Canadian section. The Canadian section's annual meeting now brings 60 to 70 metrologists together in late November to cover topics of special interest to our neighbour to the north.

Graham suggested to the Board in 1982, that 1984 be highlighted as the year to focus attention on international metrology at our annual conference. He was particularly pleased with the excellent contributions and new perspectives our foreign experts brought to the Gaithersburg audience.

Those of you who attended the 1994 International dinner meeting saw Graham in action as a professional musical entertainer. He and the "NCSL Players?" took us around the world in song with a hat and an accent to suit each country. His wife June joins him at many NCSL functions, as did daughter Janet and youngest son Brett last summer in Victoria, British Columbia. This summer wedding bells will be ringing for their eldest son Grant.
May 5-9, 1985
ISA, Aerospace Industries Test & Measurement Symposium, San Diego, CA.

May 14-16, 1985
1985 Test & Measurement World Expo at the San Jose Convention Center, San Jose, CA. For information call 617-254-1445.

May, 1985
PMA is planning a Joint Conference with National Scale Men's Association at Anaheim, CA.

May 6-9, 1985
The 39th Annual Quality Congress of the ASQC in Baltimore, MD.

May 29-30, 1985
Council for Optical Radiation Measurements Annual Conference, NBS, Gaithersburg, MD. Contact Norbert Johnson, 612-733-5939.

June 10-14, 1985
Antenna Parameter (Near-Field) Course, NBS Boulder, CO. Contact Richard L. Lewis 303-497-3787.

July 15-18, 1985
The 1985 NCSL Annual Workshop and Symposium will be held at the Hilton Harvest House Hotel in Boulder, CO. The conference theme: "The Metrologist's Mission in the Quest for Quality."

July 19-20, 1985
Board of Directors meeting at the Hilton House Hotel, Boulder, CO.

October 20-25, 1985
NBS/NCSL Workshop on Electrical Measurement Assurance Programs, Chicago, IL (hotel site to be announced). For information contact A.O. McCoubrey at NBS 301-921-3301.

October 21-24, 1985
ISA/85 International Conference & Exhibit, Philadelphia Civic Center, Philadelphia, PA.

January 23-24, 1986
Measurement Science Conference will be held at the Marriott Hotel in Irvine, CA.

March 23-28, 1986
NBS/NCSL Workshop on Electrical Measurement Assurance Programs is being planned for San Jose, CA area. For information contact A.O. McCoubrey at NBS 301-921-3301.

June 22-26, 1986
CEPM Conference will be held at NBS, Gaithersburg, MD. For information contact O. Petersons at the Bureau.

October 6-9, 1986
NCSL 1986 Annual Conference will be held at NBS Gaithersburg, MD. It is the 25th anniversary of its founding. Reserve the date, it will be a memorable event.

October 26-31, 1986
NBS/NCSL Workshop on Electrical Measurements Assurance Programs is being planned for the Southeast (NCSL Region 4). For information contact A.O. McCoubrey at NBS 301-921-3301.

1988
IMEKO Congress will be held in Houston, TX. For information contact the ISA.

TO HAVE YOUR ORGANIZATION'S MEETINGS AND CONFERENCES ANNOUNCED, PLEASE SEND A NOTICE TO M.J. CORRIGAN, JR., CHAIRMAN, MEETINGS AND PROGRAMS COMMITTEE.

* * * * * * * * * *

REGIONAL MEETINGS SCHEDULE

REGION 1
Typically holds two (2) meetings per year: a regional business meeting and a technical session. The next meeting is scheduled for March 12th, 1985, in the Boston Area. The Fall meeting is scheduled for September 12th in the same area.

REGION 2
Three (3) meetings are held each year: March 21, 1985 at Lockheed Electronics Co., Inc., Plainfield, NJ; June 19 in the Philadelphia, PA area; October 23 in the New York City area.

REGION 3
Plans to hold two (2) meetings each year: The first meeting is scheduled for April 18, 1985, and the second is planned for October 17; the locations will be announced later.

REGION 4
Plans are to hold two (2) meetings each year. This year's regional workshop schedule is as follows: The first meeting is scheduled for April, 1985, and is to be held in south Florida. The second meeting is scheduled for October 21 in Clearwater, Florida.

REGION 5
Holds two (2) meetings each year. The next meeting is scheduled for the May, 1985, with the date and place to be announced. A Fall meeting is scheduled for October.

REGION 6
The next meeting is tentatively scheduled for April, 1985, in the Dallas/Fort Worth area. A section/regional meeting is planned for September in the Denver/Boulder area.

REGION 7
Plans to hold three meetings each year. The next two meetings are scheduled for February 20th and May 22, 1985 in the San Francisco Bay Area. A Fall meeting is planned for October 30 in the same area.
REGION 8
Plans to hold six sectional meetings this year. Each section will hold two meetings. The Los Angeles section will hold a meeting on March 13th and September 18th, 1985, at the Proud Bird Restaurant in Los Angeles. The Phoenix section will meet on April 3rd in Scottsdale and October 23rd in Phoenix. The San Diego section will meet on February 20 and October 9 in San Diego.

REGION 9
Plans to hold two meetings each year. The next meeting is scheduled for the second week of June. The final meeting of the year is planned for the second week of December.

REGION 10
Plans to hold their next dinner meeting on July 16, 1985, at Boulder, CO. They also plan to hold the 5th Annual Canadian Section Meeting in the last week of November or the first week of December, 1985.

* * * * * * * * *

TOPICS FOR DISCUSSION

TOPICS FOR DISCUSSION, INCLUDING SUGGESTIONS BY THE BOARD OF DIRECTORS, ARE AS FOLLOWS:

1. There is much activity in the lab accreditation area and persons wanting to stay on top of it should contact John W. Locke, Manager, Laboratory Accreditation, National Bureau of Standards, NVLAP, Tech B141, Washington, DC 20234.

2. Support and service problems experienced by member companies in their dealings with NBS. Continue to inform Del Caldwell concerning the latest survey taken by the National Measurement Requirement Committee. Each Region should include this topic on their agenda and submit a separate report to both Del Caldwell and Art McCoubrey (NBS). Speakers are available on related subjects; arrangement can be made through Art McCoubrey’s office.


4. Training, including local efforts and that of Butler County Community College and Hutchinson Area Vocational Technical Institute. Adjunct training, NCSL Video Training Library, etc.

5. MAP. What is it, and how can you participate?

6. Productivity in Metrology — explore various approaches that stimulate an increase in productivity in the Metrology Lab by round-table discussion or other methods.

7. Electrostatic discharge: what are the problems and solutions?

8. Bar Codes, how can it help the metrologist?

9. What is significant? How do you define it for use in your Metrology Program?

10. Discussion of how to get NCSL and delegate member visibility up the chain of command in his or her organization.

* * * * * * * * *
WELCOME TO OUR NEW MEMBERS

John Fluke MFG.
P.O. Box 7366
Burbank, CA 91510
Delegate:
Jeffery W. Crooks
(213) 849-7181, X14

ATT Technologies Inc.
So. Lawrence Road
Springfield, NJ 07081
Delegate:
Raphael A. Paulino
(201) 467-7336

Tru-Stone Corporation
1101 Sundial West
Waite Park, MN 56387
Delegate:
Ed Ray
(612) 251-7171

Ever Ready Thermometer Co. Inc.
401 Park Avenue, South
New York, NY 10016
Delegate:
Sidney Ween
(213) 684-2155

Veda Incorporated
1555 S. Jefferson Davis Hwy.
Arlington, VA 22202
Delegate:
Mr. Michael F. Charters
(703) 553-9770, X339

J.M. Test Systems, Inc.
P.O. Box 45489
Baton Rouge, LA 70895
Delegate:
Ed. C. Morrison
(504) 925-2029

Intratech Corporation
757-109th Street
Arlington, TX 76011
Delegate:
Johnnie L. Winters
(817) 265-4943

John Fluke MFG Co., Inc.
1011 19th Avenue
Coralville, IA 52241
Delegate:
Larry D. Warner
(319) 354-2811

AirResearch Electronic Systems
2701 E. Elvira Road
Tucson, AZ 85706-7124
Delegate:
Ralph Blanchard
(602) 573-6342

Industry Department
Hong Kong Government 14/F Ocean Centre, Tsimshatsui Kowloon, Hong Kong Delegate:
B. Tyler
5-8937302

McDonnell Douglas Astronautics Corporation Titusville Division 701 Columbia Blvd. Titusville, FL 32780 Delegate:
J.R. George
(305) 268-7371

Martin Marietta Measurement Systems, Inc.
Maitland Center, Suite 408 851 Trafalgar Court Maitland, FL 32751 Delegate:
Richard E. Drews
(305) 660-9260

Organon, Inc.
375 Mt. Pleasant Avenue
West Orange, NJ 07052 Delegate:
Raymond Pocrorba
(201) 325-4860

FMC Corporation, NOD DIV 4800 E. River Road Minneapolis, MN 55421 Delegate:
Michael E. Czech
(612) 572-6783

The Ever Company
111 Pitkin Street
East Hartford, CT 06103 Delegate:
Walter Baribault
(203) 289-5713

Hughes Optical Products Inc.
2000 S. Wolf Road
Des Plaines, IL 60018 Delegate:
Peter Britt
(312) 699-7700, X2156

John Fluke MFG Co., Inc.
33031 Schoolcraft Road
Livonia, MI 48150 Delegate:
George J. Newton
(313) 522-9140

General Dynamics
P.O. Box 3356
Camden, AR 71701 Delegate:
G. David Webb
(501) 574-1000, X257

Best Tool & Gage
821 E. Enon
Everman, TX 76140 Delegate:
Steve Malons
(817) 478-8293

John Fluke MFG Co., Inc.
3740 Industrial Avenue
Rolling Meadows, IL 60008 Delegate:
Henry V. Fisher
(713) 240-5995

Sencore, Inc.
3200 Sencore Drive
Sioux Falls, SD 57107 Delegate:
Dave Drewnes
(605) 339-0100, X188

Navy Metrology Engineering Ctr.
P.O. Box 2436
Pomona, CA 91769 Delegate:
Maurice M. Carter
(714) 620-0500

John Fluke MFG Co., Inc.
3740 Industrial Avenue
Rolling Meadows, IL 60008 Delegate:
John Heitman
(312) 398-0850

Micro-Rel
2343 W. Tenth Place
Tempe, AZ 85281 Delegate:
Richard M. Hanley
(602) 968-6411, X6245

Coronet IND.
Coronet Drive
Dalton, GA 30720 Delegate:
David R. Kessel
(404) 259-4511

Cilco, Inc.
P.O. Box 218
Lesage, WV 25537 Delegate:
John D. Beam
(304) 660-9260

Brookhaven National Lab
Upton, NY 11973 Delegate:
David W. Potter
(516) 282-4234
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<th>Company</th>
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<tr>
<td>Gulf Coast Calibration</td>
<td>5920 N. Belt, Suite 102, Humble, TX 77396</td>
<td>Clinton M. Matheny Jr.</td>
<td>(713) 441-2709</td>
</tr>
<tr>
<td>IBM</td>
<td>5600 Cottle Road, San Jose, CA 95193</td>
<td>Al Hill</td>
<td>(408) 256-3305</td>
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<tr>
<td>C.S. Draper Lab (Mechanical)</td>
<td>555 Tech Square, Cambridge, MA 02139</td>
<td>Norman Theriault</td>
<td>(617) 258-2595</td>
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<tr>
<td>Intel Phils. Mfg. Inc.</td>
<td>5548 South Superhighway, Makati, Metro Manila, Philippines 3116</td>
<td>Willy L. Tabbada</td>
<td>(632) 817-5941, X274</td>
</tr>
<tr>
<td>Plantronics Inc.</td>
<td>345 Encinal Street, Santa Cruz, CA 95060</td>
<td>Joseph Garcia</td>
<td>(408) 426-5858, X370</td>
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<tr>
<td>Analog Devices</td>
<td>7910 Triad Center Drive, Greensboro, NC 27409</td>
<td>Kirk D. Hahn</td>
<td>(919) 668-9511, X617</td>
</tr>
<tr>
<td>Delfi. Cal. Labs. Inc.</td>
<td>100 West 35th St., Suite S, National City, CA 92050</td>
<td>John W. Stevenson</td>
<td>(619) 422-5349</td>
</tr>
<tr>
<td>Allian Crawford Associates, Ltd.</td>
<td>6503 Northam Drive, Mississauga, Ontario Canada L4V1J2</td>
<td>Herb Duval</td>
<td>(416) 678-1500, X204</td>
</tr>
<tr>
<td>Diconix, A Kodak Co.</td>
<td>3800 Space Drive, Dayton, OH 45414</td>
<td>Michael D. Patrick</td>
<td>(513) 890-3544, X287</td>
</tr>
<tr>
<td>Fluke Atlanta Sales Dist.</td>
<td>2600 Delk Rd., Suite 150, Marietta, GA 30067</td>
<td>F. Douglas Severance</td>
<td>(404) 953-4747</td>
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<td>Hg. U.S. Marine Corps</td>
<td>Code- LMA-3, Washington, DC 20380</td>
<td>Head Support &amp; Test Equipment</td>
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THE NCSL CALCULATOR PROGRAM
TAPE/DISK LISTING

Prepared by
Automatic Test & Calibration System Committee
Revised April 1983

TAPE EXCHANGE PROCEDURE

1.0 All participating organizations/laboratories must have a signed Release Form on file with the NCSL Automatic Test & Calibration Systems Committee. If you wish to participate in this project either as a SUBMITTOR or as a REQUESTOR and do not have a Release Form on record, reproduce from attached form, complete, sign and mail to the COORDINATOR at the following address:

P. O. Box A, MS EV-26
Newport Beach, CA 92663
ATTENTION: R. R. Smith
(714) 720-4820

2.0 If you have a Release Form on file and wish to contribute a new program(s) to the listing, submit the following directly to the COORDINATOR:
   a) Program title
   b) Calculator and peripherals required
   c) Brief description of the program’s purpose or use
   d) Name, address and telephone number of the contact for that laboratory.

3.0 If you have a Release Form on file and wish to obtain a tape program call or write to the COORDINATOR and request the tape(s)/disk(s) by number and title.

4.0 The COORDINATOR will supply you an Organization’s name and the contact information of a possible SOURCE.

5.0 The REQUESTOR then contacts the SOURCE and requests the desired program(s). If the SOURCE agrees the REQUESTOR sends the SOURCE the following:
   a) A blank cassette/cartridge tape/disk for each program desired.
   b) A return address label.
   c) Stamps to cover postage.

6.0 If the SOURCE declines for any reason, the REQUESTOR recontacts the COORDINATOR for another SOURCE.

7.0 The SOURCE laboratory duplicates the requested program on the REQUESTOR’s tape/disk and sends it back to them.

8.0 The REQUESTOR then becomes a SOURCE for the next request.

9.0 After receiving the program tape(s)/disk(s), the REQUESTOR must notify the COORDINATOR of receipt in order to maintain listing records.

10.0 All participating members are encouraged to update their listing as revisions to this document are mailed.

11.0 DEFINITIONS
   a) PARTICIPANT — Any organization/laboratory who has a signed Release Form on file with the NCSL Automatic Test & Calibration Systems Committee.
   b) SUBMITTOR — The original developer and contributor of the program tape/disk.
   c) SOURCE — Any organization or laboratory who may be in possession of a listed program tape/disk.
   d) REQUESTOR — Any organization/laboratory requesting a program tape/disk.
   e) COORDINATOR — The individual who compiles, develops, updates and distributes a listing of available programs and descriptions. He also provides the contact SOURCE and any other information that may be requested concerning this program.

NCSL CALCULATOR PROGRAM LISTING

001 HP9830 Error Ratio Check Program:
Prints out the ERROR RATIO by comparing the accuracy specifications of two instruments. Simplifies the calculation of accuracy ratio by reducing total accuracy to % input. User inputs accuracy values and nominal calibration points.

002 HP9830 Data Sheet Program:
Creates a standard data sheet for use in calibration. Calibration points, accuracy specifications, model no. I.D. no., etc. are inputted by user. Prints out heading, nominal calibration points, minimum and maximum test values.

003 HP9830 Electronic Counter Drift Rate Program:
User inputs drift data and program calculates a straight line drift rate using a least square solution. Data and slope values are printed out.

004 HP9830 Fractional Deviation Counter Drift Rate Program:
User inputs drift rate data from nominal and computer calculates the value based on the standard deviation of X, Y, data. Data and results are printed out.
005 HP9830 Data Reduction Program for North Atlantic 225 Phase Angle Voltmeter:
User inputs tested data values (Phase angle, In Phase and Quad Voltages). The program reduces data by computing the ARC TANGENT values for comparison of actual readings. Data values and results are printed out.

006 HP9830 Calibration Procedure Program:
A universal string oriented program for creating a one-of-a-kind printed calibration procedure with data sheet. Originally conceived as a Text Editor for writing procedure with expected expansion.

007 HP9830 Ratio Transformer Data Sheet Program:
Creates a printed data sheet which includes calculated accuracies of minimum, maximum values for calibration purposes.

008 HP9830 Basic Real Time Program for Flow Transducers:
A basic program to interface three instruments (temperature and pressure) for data reduction for the calibration of certain flow transducers (meters).

009 HP9830 Basic Real Time Program for Linear Accelerometers:
A basic program to interface DVM to LINEAR accelerometer output in order to perform a semi-automatic "real time" calibration of these transducers. Solutions to a least square of x, y data is printed out. It also includes hysteresis, repeatability and deviation, RCV printout in data sheet format.

010 HP9830 Basic Real Time Program for Servo Accelerometers:
Same as item 9.

011 HP9830 Basic Real Time Program for Load Cells:
A basic program to interface DVM to LOAD CELL output, etc. for the purpose of performing on-line semi-automatic calibration of various LOAD CELLS. Includes a 22 point least square solution of x, y points, hysteresis, repeatability and deviation values. Print out is a complete data sheet with flagging of O/T values. This program has been expanded to include various models of different ranges of transducer. Includes the calibration of four transducer on-line at the same time, producing four data sheets.

012 HP9830 Charge Amplifier Calibration Program:
Two separate programs to perform real time calibration of ENDEVCO 2713 and 2735 Charge Amplifiers using the JRL Locost AC-signals. Instructions step by step calibration of parameters and automatic step calibration for linearity test. Complete data sheet and test results are printed out.

013 HP9830 Data Reduction Program for Voltron Transducers:
A series of nine programs for the data reduction of input/output values. Least square solutions are provided and a complete data sheet is printed out. The programs are for various transducer measureands such as DC, WATTS, AC VOLTS of different models.

014 HP9825 NMTBA Statistics Plot — Machine tool calibration calculates accuracy, standard deviation of repeatability and last motion.

015 HP9825 Error Plot — Machine tool calibration, plots deviation from nominal value for linear accuracy.

016 HP9825 Gage Block Statistics — Gives mean value and standard deviation for repeated measurements on a small set (10) of gage blocks, when measurement is made directly using laser interferometer.

017 HP9825 Straightness and Squareness — Machine tool calibration, calculates straightness and squareness relationship between two axis of a machine tool; must be used with straightness adapter for H-P laser interferometer.

018 HP9825 Optical Polygon/Rotary Table Absolute Calibration
This program is used in the data reduction of the absolute calibration of an optical polygon having an even number of faces and the rotary table that is used to position the polygon. The data is recorded on mark sense cards. Equipment required:
  a) Test polygon (Davidson Model D633-12)
  b) Test rotary table (Ultradex Model B)
  c) Two autocollimators (Hilger Watts TA53-2)
  d) HP 9825A Calculator
  e) HP 9817A Impact Printer
  f) HP 9869A Card Reader

019 HP9825 Gage Block Calibration
Three programs are used. The first is used to establish a history of a gage block set on magnetic tape. The second is the controller for the laser gage block comparator operation and the third is used to produce a report of the calibration results. Equipment required:
  a) Laser Gage Block Comparator
  b) HP 5526A Laser Interferometer System
  c) HP 9825A Calculator
  d) HP 9871A Impact Printer

020 HP9825 Thermocouple Reference Tables (NBS 125)
This program is used to derive the temperature (°C or °F) versus EMF or the EMF versus temperature for seven thermocouple types. The Seebeck coefficient is also available. The equations listed in the National Bureau of Standards Monograph 125 "Thermocouple Reference Tables Based on the IPTS-68" are used. Equipment required:
  a) HP 9825A Calculator.

021 HP9825 Humidity
The following programs are available:
a) Enhancement Factor for Moist Air.
The temperature (°C IPTS 68) and pressure (pascals are used in the Enhancement Factor calculation in the range of -100° C to 100° C from 0.1 to 2 MPa.

b) Vapor Pressure of Water
The vapor pressure of water or the dew point is calculated.

c) Humidity Functions.
This program includes conversion functions between parts per million, dew point and percent relative humidity. Also included are functions for determining saturator or test chamber pressures and temperatures required for a given set of conditions in a two temperature two pressure humidity generator.

Equipment required: HP 9825 Calculator.

022 HP9825 Platinum Resistance Thermometer Equations:
This program contains nine functions that are used to handle the IPTS-68 Platinum Resistance Thermometer equations that are defined in "The International Practical Temperature Scale of 1968" (April 1969). The functions are intended to be used in other general purpose platinum resistance thermistor programs.

Equipment required: HP 9825A Calculator.

023 HP9845 Basic Measurements Program for HP8507
A translated version for use with the HP9845, of programs supplied by Hewlett-Packard for operation of the HP8507 with the HP9830 Calculator.

024 HP9845 Accuracy Improved Measurement for HP8507
A translated version, for use with the HP9845, of programs supplied by Hewlett-Packard for operation of the HP8507 with the HP9830 Calculator.

025 HP9845 Linear and Log Sweep
A linear and log sweep program with printed or plotted (HP9862) output data for the HP 3042.

026 HP9830 Linear and Log Sweep
A linear and log sweep program with printed or plotted (HP9862) output data for the HP 3042.

027 HP9825 Instrument Calibration
The following instruments may be calibrated using an HP 9871A printer and a FLUKE 5100A Calibrator:

FILE 0 - Blank
1 - Index
2 - Hewlett-Packard 3470A
3 - Systrom Donner 7050
4 - Fairchild 7050
5 - Hewlett-Packard 34630
6 - Hewlett-Packard 3443A
7 - Fluke 8050A
8 - Hewlett-Packard 3435A
9 - Weston 1240
10 - Simpson 460
11 - Data Technology 30
12 - Keithley 179

028 HP9825 Instrument Calibration
The following instruments may be calibrated using an HP 9871A printer and a FLUKE 5100A Calibrator:

FILE 0 - Blank
1 - Index
2 - Tektronix DM43
3 - Fluke 8200A
4 - Fluke 8100A
5 - Weston 4449
6 - Fluke 8040A
7 - Tektronix DM501
8 - B & K 280
9 - Data Tech 45
10 - Fluke 8800A
12 - Hewlett-Packard 3480A

029 HP9825 Instrument Calibration
The following instruments may be calibrated using an HP 9871A printer and a FLUKE 5100A Calibrator:

FILE 0 - Blank
1 - Index
2 - Tektronix DM43
3 - Fluke 8200A
4 - Fluke 8100A
5 - Weston 4449
6 - Fluke 8040A
7 - Tektronix DM501
8 - B & K 280
9 - Data Tech 45
10 - Fluke 8800A
11 - Hewlett-Packard 3480A

030 HP9825A Surface Plate Data Reduction
This program uses the Moody system for calculating relative values from points on 8 lines of the surface plate, diagonals, perimeters and bisectors. A numeric data plot is then given.

031 HP9825A Surface Plate Analysis
This program analyzes the data from the Surface Plate data reduction program and gives average values and standard deviation for each line.

032 HP9825A Thread Wires
Given the readings over the wire and the pitch this program gives the average value and the C-value.

033 HP9825A Butress Threads
This program determines the effective pitch from the following inputs: nominal pitch, reading over the wire, wire diameter, trailing and pressure flank angles.
034 HP9825A Unified Thread
This program determines the pitch diameter from the following inputs: measurement over wires, half angle of threads, number of threads per inch, mean diameter of threads and the angle between wire axis and the plane perpendicular to the thread axis.

035 HP9825A Determination of Temperature from Resistance of Standard Platinum Resistance Thermometer
This program determines temperatures sensed by a platinum resistance thermometer given its resistance. The ice point resistance and calibration from the calibration of the thermometer must be known. Temperatures are given in Kelvin, Celsius, Rankine and Fahrenheit.

036 HP9825A Determination of Resistance for Muller Bridge from Temperature of Standard Platinum Resistance Thermometer
This program is the same as 035 except that resistance values are determined for given temperatures.

037 HP9825A Platinum Resistance Thermometer Fit and Interpolation
This program fits temperature and resistance ratio data to a two degree polynomial equation and then gives a table of values at a selected interval.

038 HP9825A Thermistor Fit and Interpolation
This program fits temperature and resistance data to a three degree polynomial equation and then gives a table of values at a selected interval. Ice point resistance must be known.

039 HP9825A Thermocouple Fit and Interpolation
This program gives a table of emf's, difference emf's, percent error and Seebeck coefficients when given at least four temperature, emf pairs. It is used for most types of thermocouples and the coefficients for the thermocouples come from NBS Monograph 125.

040 HP9825A Pyrometry Fit and Interpolation of Temperatures and Currents
This program determines coefficients of fit for an eight degree polynomial given temperature and current data. The data is fit with temperature as a function of current and also with current as a function of temperature. A table of values at a selected interval is given. Coefficients are stored in a data file for later use.

041 HP9825A Lamp Fit and Interpolation of Temperatures and Currents
This program is the same as 040 except that it is for lamps.

042 HP9825A Transmission Factor Determination
This program computes the transmission factor @ .65 microns for optical pyrometer calibrations using neutral density filters.

043 HP9825A A-Factor Determination
This program determines H-factors for optical pyrometers given the number of ranges and the temperatures on those ranges.

044 HP9825A Gold Point Lamp Interpolation
This program determines either temperature or current from inputted currents or temperatures, respectively for a gold point lamp.

045 HP9825A Working Lamp Interpolation
This program is the same as 044 except that 044 is for a standard lamp and this is for a working lamp.

046 HP9825A Standard Pyrometer Interpolation
This program is for an automatic optical pyrometer. Given the range and temperature or current data it will give the current or temperature values correspondingly.

047 HP9825A Standard Pyrometer Tables
This program gives a table of currents for preselected temperatures for each range of the automatic optical pyrometer.

048 HP9825A Pyrometry Coefficients for Pyro Interpolation or Tables
This program determines coefficients of fit for the four programs above (044, 045, 046, and 047) and stores them in data files used by the programs.

049 HP9825A Pressure Transducer
This program fits pressure and voltage output data from a pressure transducer and gives a table of interpolated data. Hysterisis, Linearity, repeatability and shunt test information are also given.

050 HP9825A Fused Quartz Pressure Gauge
This program is the same as 049 except that it is for fused quartz transducers.

051 HP9825A Harwood Model 200 Deadweight Tester
This program determines pressures given the nomenclature of weights for the Harwood 200 deadweight tester. Provision is made for changes in data from the deadweight tester calibration report.

052 HP9825A Pressure Determination for Ruska DWT's Models 2400HL and 2450HL
This program is the same as 051 except that it is for the above listed Ruska deadweight testers.

053 HP9825A Weight Determination for Ruska DWT's Model 2400HL and 2450HL
This program is the same as 052 except that it determines which weights will produce the desired pressure.
054 HP9825A Ruska Tilting Piston Gage
This program determines pressures given the nomenclature of weights for the Ruska tilting piston gage. Provision is made for changes in data from the piston gage calibration report.

055 HP9825A Ruska Tilting Piston Gage Tables
This program gives tables for 054 tape.

056 HP9825A Capsule Fit and Interpolation Tables
This program gives tables of counts for the Ruska 3850 bourdon tube system when given the corresponding pressures for each bourdon tube. Pressure units are selectable.

057 HP9825A Pressure Transducer Automatic Instruments: Fluke 8500 dvm, HP 59306 relay actuator and Fluke 3380. This program is for use with any pressure generation system. Used with the Ruska 3850 it will supply counts to be set and automatically take the reading from the transducer. With a dead-weight tester it will notify the user when he is within 20% of the desired pressure. The 3380B calibrator is used as a power supply and is automatically set to the desired excitation voltage. Both a HP 98034A HP-IB interface and a HP 98032A 16 bit interface are needed to interface the instruments. Shunt tests are done automatically via the relay actuator.

058 HP9825A My Load Cell
This program fits force and voltage output data from a load cell and gives a table of interpolated data. Hysteresis, linearity, repeatability, span and shunt information are also given.

059 HP9825A Load Cell Kit
This program is the same as 058 except that it is for load cell kits.

060 HP9825A Hydraulic Force Cell
This program is for a Ruska hydraulic force cell system and gives the needed weights for a given force that are loaded on the deadweight tester. This is only within the resolution of the weights, therefore the correct force is also given.

061 HP9825A Compressible Fluid Flow Nozzle Data Correlation
This program provides a means for determining fluid flow parameters for sonic nozzles by evaluating data given in the calibration done by Colorado Engineering Experiment Station, Inc. From these parameters, the parameters for subsonic flow nozzles can be found. Namely, the discharge coefficient as a function of the Reynolds number is determined for both types of nozzles, from which all other parameters can be evaluated. All functions are for air, since that is the medium which calibrations are performed. Coefficients for the critical flow factor were derived from fitting of tables in NASA TN D-2565, 'Real Gas Effects in Critical-Flow-Through Nozzles and Tabulated Thermodynamic Properties' by Robert C. C. Johnson. Compressibility and Viscosity coefficients were derived from fitting of tables in NBS Circular 564, "Tables of Thermal Properties of Gases", Formulae for fluid flow characteristics are from ASME's "Fluid Meters", 6th edition.

062 HP9825A Density of Fluids Using Mettler Paar DMA 50
This program calculates the density of fluids at a given temperature using periods read from the Mettler Paar DMA 50.

063 HP9825A Determination of Viscosity
This program determines viscosity in centipoise at any selected temperature given parameters from the viscosity standard used for the calibration.

064 HP9825A Vacuum
This program is for vacuum ion gauges and will cover ranges from 10⁻¹⁸ to 10⁻¹³. True values are stored in the program so that only the indicated values are entered. A table is given for each range and filament. The indicated values are incremented and the values given for each.

065 HP9825A Impactograph
This program is for impactographs and from the inputted true G's will give a best line regression of the data and provide a table of values.

066 HP9825A Polyfit
This program uses a Gaussian reduction method for a least squares analysis of entered data pairs. Resulting coefficients, the index of the determinant and the standard error are given along with the calculated values and differences.

067 HP9825A Polyformat
This program is the same as 066 except that provision is made for and table of interpolated data.

068 HP9830 Synerco-Resolver
This program converts output readings to degrees.

069 HP9830 Synchro-Resolver (0.001° - 10°)
This program converts output readings to degrees.

070 HP9830 Standard Cell
This program measures one standard cell directly.

071 HP9830 Standard Cell
This program measures three (3) standard cells in series-opposition.

072 HP9830 Standard Cell
This program measures four (4) standard cells in series-opposition.

073 HP9830 Standard Cell
This program measures six (6) standard cells in series-opposition.
074 HP9830 Surface Plates
This program calculates surface flatness from data taken from either levels or collimator.

075 HP9825A Fluke 8500A DMM
This program performs calibration on a FLUKE model 8500A digital multimeter. Requires peripheral equipment.

076 HP9825 HP 5328A Counter
This program performs calibration on an HP 5328A counter. Requires peripheral equipment.

077 HP9825A HP 3455A DMM
This program performs calibration on an HP 3455A digital multimeter. Requires peripheral equipment.

078 HP9825A HP 98032A
This program performs a performance verification routine on HP 98032A 16 Bit Interfaces. Requires peripheral equipment.

079 HP9825A HP 98033A
This program performs a performance verification routine on HP 98033A BCD interfaces. Requires peripheral equipment.

080 HP9825A HP 98034A
This program performs a performance verification routine on HP 98034A HP-1B interfaces. Requires peripheral equipment.

081 HP9825A HP 59306A
This program performs a performance verification routine on HP 59306A Relay Actuators. Requires peripheral equipment.

082 HP9825A HP 59308A
This program performs a calibration routine on HP 59308A Timing Generators. Requires peripheral equipment standards.

083 HP9825A HP 59309A
This program performs a performance verification routine on HP 59309A Digital Clocks. Requires peripheral equipment.

084 HP9825A HP 59313A
This program performs a performance verification routine on HP 59313A A-D Converters. Requires peripheral equipment.

085 HP9825A HP 3325A
This program performs a calibration routine on HP 3325A Synthesizers. Requires peripheral equipment/standards.

086 HP9825A HP 8672A
This program performs a performance verification routine on HP 8672A Signal Generators. Requires peripheral equipment.

087 HP9825A HP 9872A
This program performs a performance verification routine on HP 9872A Graphic Plotters. Requires peripheral equipment.

088 HP9825A HP 5363A
This program performs a calibration routine on HP 5363A Time Interval Probes. Requires peripheral equipment/standards.

089 HP9825A Wavetek 152
This program performs a calibration program on Wavetek 152 Waveform Generators. Requires peripheral equipment/standards.

090 HP9825A Wavetek 159
This program performs a calibration routine on Wavetek 159 Waveform Generators. Requires peripheral equipment/standards.

091 HP9825A System-Donner Power Supply
This program performs a calibration routine on Systron-Donner DPSD-50 Power Supplies. Requires peripheral equipment/standards.

092 HP9825A PRT
This program performs general data reduction/table generation routines. Requires printer.

093 HP9825A Resist
This program performs general data reduction/table generation routines on Standard Resistors. Requires Printer.

094 HP9825A STDCEL
This program performs general data reduction/table generation routines on Standard Cells. Requires printer.

095 HP9825A Weight
This program performs general data reduction/table generation routines for Balances. Requires printer.

096 HP9825A Flow
This program performs data reduction routines on flowmeter data. Requires printer.

097 HP9825A Accel
This program performs general data reduction routines on accelerometers. Requires printer.

098 HP 9825 Transducer, Bridge Type
Eleven or twenty-one data points; with R-Cal.

099 HP 9825 Strain Link Bridge Type
Eleven data points; with R-Cal and SR-4 data.
100 HP 9825 Load Cell, Bridge Type
Twenty-one data points; with R-Cal and SR-4 data.

101 HP 9825 Gas Flow
Volume Vs Time; 100 SCCM to 15 CFM, ranged via 5 G-K-P tubes of different sizes.

102 HP 9825 Gas Flow
Nozzle Standards Utilized; 0.5 SVFM to 730 CFM.

103 HP 9825 Liquid Flow
Mass Vs. Time; 0.1 gpm to 50 gpm

104 HP 9825 Liquid Flow
Turbine standard utilized; 5 gpm to 100 gpm.

105 HP 9825 Universal Ratio Set Data Reduction
Contains present correction factors of URS, resolves calculations of data sets obtained during resistance comparisons.

106 HP 9825 Accelerometer Calibration
Resolves calculations and produces certificate of accelerometers calibrated by ENDEVCO reciprocity calibration method, using a type 2270 primary accelerometer set-up.

107 HP 9825 Saturated Standard Cell Calibration Data Reduction
Resolves and reports data of NBS-type standard cell inter-comparisons such as 2 x 3, 2 x 4, 4 x 6, etc. matrices.

108 HP 9825 Unsaturated Standard Cell Data Reduction
Calculates and reports the mean value and related statistical data of calibration of unsaturated standard cells.

109 HP 9825 Decade Resistor Calibration
With the help of a Fluke 8500A GPIB equipped DVM, it calibrates, calculates the values of, and reports test results for a wide variety of decade resistors.

110 HP 9825 Surface Plate Calibration Data Reduction
Calculates and reports final results of surface plate calibration.

111 HP 9825 HP 5340A Microwave Counter Verification
Check HP-1B operation, inputs, self-check and resolution. Requires microwave signal generator.

112 HP 9825 HP 5328A Universal Counter Verification
Requires no peripheral equipment.

113 HP 9825 HP 436A Power Meter Verification
Requires no peripheral equipment.

114 HP 9825 AC Digital VM Calibration
This program will calibrate any AC Digital voltmeter. Utilizes Fluke 5200–5205 AC Calibrator.

115 HP 9825 AC Analog VM Calibration
Similar to AC Digital Voltmeter program of (114). Requires a Fluke 5200–5205 AC Calibrator. Programs include Ballantine 300G and 310A and Fluke 873A.

116 HP 9825 IC Cross Reference
This program cross references Generic IC numbers with HP, Fluke and Tek equivalent part numbers.

117 HP 9825 General Purpose Log/Linear Plot Program
Program is an auto scaling log/linear plot for plotting calibration data. The main program computes the appropriate scale from the entered values for X min, X max, Y min, and Y max. Requires HP 9862A Plotter.

118 HP 9825 Resistance to Temperature Conversion
This program was developed to aid the users of 25.5 ohm (nominal) platinum resistance thermometers such as the Leeds and Northrup 8163 series or the Rosemont 162C series.

119 HP 9825 Ruska Weight Selector Program
For Ruska 2451-606-8600 DWT. Program selects weights for any entered pressure value. Will also generate tables on a printer if desired.

120 HP 9825 Ruska Weight Selector Program
Weight selector program for Ruska 2465-701 DWT. Same as (119) but for a different DWT.

121 HP 9825 DWT Calibration
This program reduces data for the calibration of working level DWTs as calibrated against a Ruska 2451 DWT used as a standard.

122 HP 9845A HP 436A Calibration
This program using the 9845A computer prints output power in watts and dBm. The reading is compared with specifications and if the reading is out of limits an error is noted.

123 HP 9845 HP 8660C Calibration
This program using the 9845A computer prints output power, frequency and modulation readings. The reading is compared with specifications and if the reading is out of limits an error is noted. All RF plug-ins can be checked.

124 HP 9825 Number System Conversion
Converts a decimal number to hexadecimal, octal, binary or gray code or converts a number in any of these bases to a decimal number.

125 HP 9825 Arctangent (SIN/COS)
Calculates the angle in the correct quadrant from inputs of sine and cosine values.

126 HP 9825 RMS-MEAN-Standard Deviation
Calculates the rms, mean and standard deviation from any list of values.
127 HP9825 Gas Flow
Program permits operator to calibrate a rotometer with non-explosive medium. The program instructs the operator to simulate the conditions of the explosive working gas when using a non-explosive calibration gas. Also generates a calibration curve for the flowmeter under test.

128 HP9825 Thread Gage Dimensions
Program computes the minimum maximum major diameters and pitch diameters for unified thread gages. Also computes dimension for setting thread gages. Based upon Handbook H-28 and ANSI B1.2.

129 HP9825 "TRANWT"
Reduces the calibration data for class S, S-1, and P weights during the single transposition method and lists the results in tabular form.

130 HP9825 3320B
Automatic calibration program for the HP 3320B Frequency Synthesizer.

131 HP9825 3437A
Automatic calibration program for the HP 3437A High Speed System Voltmeter.

132 HP9825 CEC
Data reduction for the CEC Primary Pressure Standard. Prints out the combination of weights required to produce nominal pressure values.

133 HP9825 DEDWGT
Data reduction for the Ruska 5100-B Primary Pressure Standard. Prints out the combination of weights required to produce nominal pressure values.

134 HP9825 436A
Automatic calibration program for the HP 436A Thermocouple Power Meter.

135 HP9825 8375A
Automatic calibration program for the Fluke 8375A Digital Multimeter.

136 HP9825 8502A
Automatic calibration program for the Fluke 8502A Digital Multimeter.

137 HP9825 8400A
Automatic calibration for the Fluke 8400A Multimeter.

138 HP9825 8800A
Automatic calibration program for the Fluke 8800A Multimeter.

139 HP9825 8520A
Automatic calibration program for the Fluke 8520A Multimeter.

140 HP9825 619
Automatic calibration program for the Keithley 619 Electrometer/Multimeter.

141 HP 85A MTR. II
General program for Digital Meters with scale factors of 2. Check DCV, ACV, Res., DC Current, AC Current. Requires Fluke 5100B.

142 HP 85A 8120
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

143 HP 85A 8010A
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

144 HP 85A 8100A
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

145 HP 85A 3466
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

146 HP 85A 8050
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

147 HP 85A DM501
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

148 HP 85A 3435
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.
149 HP 85A 1240
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

150 HP 85A 8600
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

151 HP 85A 911
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

152 HP 85A 262
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

153 HP 85A 8000A
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

154 HP 85A 283
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

155 HP 85A 3438A
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator and an external printer.

156 HP 85A 3476
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator and an external printer.

157 HP 85A 5004
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator.

158 HP 85A 8200
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator and an external printer.

159 HP 85A 310
Calibrates all parameters. Prints out % error and asterisks any out of tolerance reading. Requires Fluke 5100B Calibrator and an external printer. (Beckman 310).

160 HP 85A 5100B
Daily calibration routine. Requires HP 3456 DMM with IEEE-488 interface. Takes the statistical average of 10 readings of 26 parameters. The data in the file is then evaluated for repeatability and accuracy, allowing the 5100B to be used directly to calibrate 5½ digit DMMs.

161 HP 85A Cal-Recall System
Allows the user to input instrument part number, serial number, description, date calibrated, date due calibration and another field that can be used for such things as location, asset number, etc. Can recall instruments due calibration between dates input by user. Requires external printer and Printer/Plotter ROM (085-15002).

162 HP 85A DIALM
This program is used to calibrate metric dial gages according to BS907:1965. Used in conjunction with SIP305M Gage Measuring Center.
RELEASE FORM

Desk Top Calculator Program Exchange

Company ___________________________ Delegate ___________________________

Please check the appropriate boxes below:

☐ We would like to participate, and have programs to share.

☐ A list of programs available are attached, with the appropriate program
descriptions and the calculator's manufacturer/model number for which
it is applicable.

☐ We will supply the listing and descriptions later.

☐ We would like to participate, but have no programs to share at this time. We
will cooperate in duplicating any we receive or generate in the future.

Person assigned as the CONTACT for your laboratory:

Name: ___________________________ Telephone ___________________________
          (print or type)

Address: ___________________________

The undersigned warrants that using or duplicating the programs will not constitute or
give rise to a cause of action for unauthorized use or infringement. Further, that NCSL
and/or the laboratory supplying the tape shall be held blameless from any and all claims,
demands, settlements, judgments, and damages as a result of such use.

Delegate's signature ___________________________ Date ___________________________

After completion please return to: Ford Aerospace & Communications Corp.
Aeronutronic Div.
P. O. Box A, MS-EV-26
Newport Beach, CA 92663
ATTENTION: Robert R. Smith
(714) 720-4820
REPORTS FROM THE REGIONS

REGION 6

November 14, 1984
Hurst, TX
Bob Willet
DFW Section Coordinator

GENERAL

Thirty people attended with approximately another ten who cancelled because of last minute conflicts. Attendance representation was divided as follows: seventeen test equipment users, nine manufacturers, and four service companies.

It was suggested and agreed to by the group present to change the regular meeting frequency from four times a year to two times a year. The Wednesday of the second full week of November and April were preferred. Tentatively then, the next meeting will be on April 17, 1985 from 9:00 a.m. to 3:00 p.m. at the Tektronix Las Colinas facility between Dallas and Ft. Worth (convenient to DFW airport).

Bill Simmons, the outgoing representative for Region 6 on the Board of Directors (BOD), led a summary discussion of recent events of the NCSL, including the BOD meeting and annual conference at NBS Gaithersburg. Hank Gonzales, our Region 6 coordinator, was unable to attend.

UNIQUE ACTIVITIES

One element of the NCSL section meeting that we want to promote and encourage is the informal basic communications. Even though the restaurant meeting room was crowded, we had the tables distributed so that we all could see each other. We also want to promote the "Unique Activities" and the "Test Equipment (TE) Representatives' Report" time of the meetings for "down-to-earth" open/informal and brief show-and-tell sessions.

At this meeting, Earl Murphy of General Dynamics described one of their successes with a bar-code system used to control the TE inventory as part of the "Unique Activities" time. It was not without a few tribulations but with persistence, it is now working well. More will be covered at our next meeting due to the apparent level of interest.

At our next meeting, please come prepared to share a success or achievement no matter how small it seems. Also, don't be bashful to describe problems or troubles which may not be unique to your operation. Help may be sitting next to you. Also, the TE reps should be prepared to announce any significant happenings with their principals regarding new products, services, seminars, publications, training, etc.

DISCUSSION TOPICS COVERED (Contact discussion leader if additional information is desired)

1. Validation and Documentation of an organization's Measurement Requirements and Optimum Measurement Capability in a parameter/table format. Conclusion: Absolute minimally practiced but should be. - Cliff Snelling of Texas Instruments 214/995-4898.

2. Test Equipment Classification Schemes; i.e., items which require initial verification of performance upon receipt, periodic reverification of performance at varying intervals, service only, or service only based on application or policy even though has quantifiable parameters. Conclusion: Multiple practices with unknown results. - Earl Murphy of General Dynamics 817/777-2990.


6. Test Equipment User Training for Operation and Application through TE manufacturer seminars, video tapes, etc. Conclusion: Very much needed as well as tutorial measurement, specification interpretation, etc. as well as formal training. - Joe Brown of Data Marketing Assoc. 214/661-0300.

7. DFW Section Measurement Assurance Program (MAP) or Measurement Capability Integrity Activity (MCIA)--Survey results and future actions. Conclusion: report by Weinschel and Efratom representative Harvey Evans 214/231-8106 on MCIA for VSWR/loss and frequency and Anritsu representative Joe Brown 214/661-0300 on possible MCIA for fiber optic power/loss. Evans is personally contacting organizations that have signed up for the VSWR/loss MCIA; deadline for sign-up February 1, 1985; pilot experiment description and timetable by March 1, 1985 and package on the road by June 1, 1985; approximately 10 MHz frequency MCIA sign-up deadline April 1.
1985. Anritsu/DMA fiber optic MCIA is in an interest survey mode with a questionnaire to be mailed to specific organizations by March 15, 1985.

FINALE

After the formal NCSL meeting adjourned at 3:00 p.m., shortly thereafter Ken Smith of Adams Russell gave an invited slide/handout presentation on their microwave cable assemblies (MCA's) with interchangeable connector heads. Also, discussed their new MCA's for use with the new HP 8510 automatic vector network Analyzer. Was very informative.

Our April meeting will consist of discussions on topics 3, 4, 5, 7A, 9, 24, and 27 from agenda attachment 1 (#0517B, Rev. 1/7/85). Also, please review the agenda attachment and come prepared at the April meeting to volunteer to lead a future discussion on a topic not covered yet, suggest a new topic that is of burning interest to you, or reopen an old topic.

Thank you for your interest and support.

Next meeting April 17, 1985 - Mark your calendars!

ATTENDERS:

Art Meakin
Earl Murphy
Dave Webb
Mack Covey
Andy Bradshaw
Howard R. Adams
Joe Tollelaon
Bob Roberts
Don Gasser
Luke Smith
Bob Wade
Harvey Evans
Clyde Orrison
Cliff Snellings
David B. Schneider
William H. Pedersen
Paul E. Trimbach
Robert L. Picker
Patrick E. Jacob
Ron Walters
Tommy Weaver
Jim Bailey
Don McKenzie
Kenneth Smith
Roy Newman
Mike Riley
Joe Brown
Russell Pepe
Ken Horne, Jr.
Bob Willet
Fluke
General Dynamics/Ft. Worth
General Dynamics/Camden Facility
Rockwell Int'l/CTSD/Richardson
Rockwell Int'l/CTSD/Richardson
Cal Labs, Inc.
Electro Rent/Dallas
Xerox/Lewisville
Motorola/Ft. Worth
S. Systems/Greenville
E. Systems/Greenville
Scientific Devices/Richardson
Texas Instruments/Dallas
Texas Instruments/Dallas
Lockheed Austin Div.
Lockheed Austin Multi-Amp Services
Fluke
Motorola/Ft. Worth
Motorola/Ft. Worth
Tacon Inc./Austin
Metrology Specialists, Inc.
Tektronix/Irving
Adams-Russell/Amesbury, Mass.
NEW/Arlington
Tektronix/Irving
Data Marketing/Dallas
Anritsu/Oakland, NJ
KS Specialties/Dallas
Rockwell Int'l/CTSD/Richardson

QUESTION/ANSWER "RAP SESSION" CANDIDATE DISCUSSION TOPICS (RANDOM ORDER)

(Add other topics you would like discussed before next meeting & provide to section coordinator)

2 [X] November 14, 1984 - Does your company distinguish between Test Equipment (TE) that needs periodic re-verification of performance/calibration and that which does not? If yes, how, results, motivation, etc.? (Earl Murphy, GD 817/777-2990)

3 [ ] Are you or company satisfied with the clarity and completeness of the TE manufacturer's performance specifications? What do you use for reference for performance requirements criteria? Is it the same for all TE manufacturers? (April 17, 1985 - Bob Willett, R/CTSD 214/996-7051)

4 [ ] What are your thoughts on TE manufacturers' test procedures written to restore a "known-bad-unit" versus that to verify an "assumed-good-unit"? Review NCSL RP-3 and proposed revision. (April 17, 1985 - Bob Willett, R/CTSD 214/996-7051)

5 [ ] What is your company's policy and practice in applying guard bands when accuracy ratio of measurement system capability to UUT performance specification is less than 10:1? Is it applied at all or uniformly in all departments assessing the quality of a supplier's component or instrument (receiving inspection, component test/evaluation, metrology, TE services, etc)? Who/How many know an accuracy ratio? (April 17, 1985 - Dave Howarth, Xerox 420-7414)

6 [X] TE user operation/application training.
- TE manufacturer seminars
- Video tapes, audio tapes, etc., (formal, informal) (Nov. 14, 1984 - Joe Brown, DMA 214/661-0300)

7 [X] Review of DFW Section MCIA's. (Will be status report at each meeting until completed)
- RF/MW Loss and VSWR - Harvey Evans, Scientific Devices 214/231-8106.

8 [ ] TE manufacturer documentation on microfiche:
- Present cost makes it inviting for retention, storage, and availability.

9 [ ] TE service organization Credibility; what does the TE user think? Major variation in practices, inconsistencies? (April 17, 1985 - Art Meakin/Fluke 214/233-9990)

10[ ] ESD (Electrostatic Discharge) What's happening?

11[ ] Non-USA (foreign) TE, problems, successes, etc.?

12[ ] TE acquisition practices, problems, successes, etc.?

13[ ] TE evaluation practices, when, who, how, documented, etc.?

14[ ] TE organization responsibilities, what, performance measures, etc. Are there better ways to contribute to the parent organization than routine calibration?

15[ ] TE unit performance measurement practices & criteria; TE user feedback to the manufacturer?

16[ ] Obsolete TE replacement activities?

17[ ] TE or measurement needs or requirements? How ID'd?

18[ ] Status of our NBS; what can we do about it? PNMS/IEEE activity?

19[ ] Communication between TE user, maintainer, & manufacturer?

20[ ] Parts, minimum parts order problems - solutions?

21[ ] TE manufacturer, model/option poor performers, top 10 per organization?

22[ ] Periodic verification interval setting and adjustment?
Regional Reports

February 28, 1985
Hewlett Packard
Palo Alto, CA
Ashley Harkness
Region 7 Coordinator

Sixteen representatives with guests attended the quarterly Region 7 meeting held at the Hewlett Packard Stanford Park Division in Palo Alto, California.

Ashley Harkness, Region Coordinator opened the meeting. John Minck of Hewlett Packard welcomed the attendees to the Stanford Park Division. Jim Ingram, Director of Regions 7 and 9, then presented Ashley Harkness a "Region Coordinator Appointment" plaque. Jim stated that the "Region Coordinator Appointment" plaque was instituted as a way to show appreciation for the efforts of the coordinators and the parent companies they represent.

Ashley Harkness then chaired the first session of the morning: a discussion on "Metrology Wastes and Toxic Concerns in the Laboratory." Beginning from the experiences of his parent company, Electro-Test, Inc., Ashley described some of the problems and solutions encountered in dealing with hazardous wastes found in the utility power industry.

One of the greatest concerns was to identify just what waste and disposal problems were in a measurement laboratory. From the outset, identification of problem areas was the most pressing need. Questions such as: "Do we have a hazardous waste problem at all?" and "If we have a problem in the laboratory, what steps are necessary to handle it?" were to be the focus of the discussion.

The discussion involved a wide range of materials which might be found in measurement laboratories such as mercury, lithium, and lead/acid batteries; paint solvents and overspray residues; cleaning solvents; asbestos products; PCB capacitors; and other controlled substances.

A representative from the Hewlett Packard Environmental Engineering unit was on hand to clarify just what kinds of materials were classified as controlled wastes requiring special handling. The basic definition, for openers, included flammable materials, toxic materials, corrosive materials (such as acids), and the heavy metals and their compounds. A quick "straw" list of things found in a laboratory showed that many routine materials are now under some form of control.

We learned that the laws governing the handling of such items are becoming more stringent and restrictive. A case in point was the requirements for transportation for disposal of spent mercury batteries. Depending upon the planned eventual disposition of the material, transportation might well require government licenses, manifests and the use of a licensed hauler to carry the material away. Also, because of the way the laws are written, the originating "generator" (the battery owner) could be held liable for the improper disposition of the material even after it had been sent off to other transporters or disposal facility. This means that if the last guy in the chain does something illegal or dangerous with the waste, EVERYONE back to the originator could be held liable!

One of the delegates mentioned that his company had embarked on a training program for its people. This program educated the workers about hazardous materials with which they might be working. One significant aspect of this program was to identify what materials were NOT hazardous. The idea was that the worker should know what is hazardous as well as what is not. Without such information, it is possible to breed a form of hysteria where workers suspect everything used is hazardous.

The discussion continued on to examine the question of where laboratory people could seek assistance in identifying and resolving waste problems. The consensus was that, while there is growing awareness and realization of the problem, there is little centralized help available for small companies.

Various governmental agencies exist to offer assistance. The County Occupational Health Department was listed as one source. But, as one delegate mentioned, sometimes the
best help comes from a seemingly unlikely place.

Many fire departments now have specialists in hazardous materials. These people are used to identify potential threats to their fire fighting teams. Also, many of the Bay Area counties require each business to identify (by size and location) concentrations of materials of a hazardous nature. These locations may be marked on the building or provided to the local Disaster Control Agencies in a formal report.

Another delegate speculated that we might be seeing the advent of a new industry, "Waste Management Consultants." Certainly with the ever growing public awareness to hazardous materials and the sure-to-increase government intervention, a breed of "Special Consultants" can not be far off. The complexity of the current law would seem to point this way.

The discussion closed on the need for follow-up. The consensus was that the problem of wastes in the laboratory is little understood and only now coming to the surface. This topic is in need of further study. A suggestion was made to consolidate the information from this meeting and make it available to the members at a later date. Also, Jim Ingram said that he would explore the possibility for a formal NCSL committee to look into laboratory waste questions.

After a short break, Bard Dunkelberger from Leasemetric, Inc. presented a talk on the topic of "Exploring Productivity in the Laboratory--the view from a leasing company."

Measuring a technician's productivity in the laboratory environment has always presented a unique challenge. The diversity of skills necessary; the wide range of instrumentation to be considered; production through-put and quality requirements of the organization—all are well known factors that affect the productivity of a laboratory.

Bard described how the high event activity of a leasing company affected the Leasemetric laboratory organization. Tasks were divided in such a way that simpler tasks like inventoring an instrument was done by junior technical people. Senior people were used on more sophisticated items or to assist the middle level technicians in repair actions. The responsibilities were set up so that the technician's time was focused directly on the instrument. Non-technical support was maximized wherever possible.

Each technician had access to a data base showing current stock of parts and accessories. This reduced the dead time associated with parts retrieval: There was no waiting to confirm a parts availability from stock.

Whenever possible, technicians would do work on several similar types of equipment. A technician might line up several Tek 475 scopes for instance in a row. This reduced the setup and tear down associated with doing different items in a row.

Bard also discussed how productivity was improved by the use of other techniques. Pay structure and management philosophy had been evaluated as to how it would improve productivity. Flex-time hours were instituted to afford greater flexibility for the technicians. The overall effect was to increase technical dedication to the company. Such methods resulted in a lower turnover rate and a consequent stable, high production/quality work force.

Bard opened the discussion for questions from the floor. One of the first questions was how the productivity levels of the laboratory were perceived by the corporation's controlling officers. Comments from the floor included the facts that the diversity of a metrology function makes simple measures very difficult. Whether the measurement parameter is items produced, items rejected, salary dollars paid, historical data or any other measure system, Bard mentioned that the key to the success of such a measure is educating those who must evaluate the data that results.

After a lunch break, Jim Ingram reviewed the recent Board of Directors meeting. Jim discussed the impending loss of NBS sponsorship and how it will impact the NCSL membership. Members were asked to consider such changes and how it would affect their companies participation. Jim also solicited articles on local laboratories for the newsletter.

John Minck hosted a tour of the Stanford Park Microwave facility. The group was broken into small units and escorted through the dimensional and microwave laboratories. Production areas for microwave products were visited where machining operations for attenuators parts were observed. The tour went through the production steps from start to final test and shipping.

The meeting was concluded at 3:00 PM with our thanks to Hewlett Packard and John Minck for providing our meeting place and refreshments.
ATTENDEES:

Harmon Jahi
John Lee
Jeff Morrell
Paul Chong
David Miller
Bill Waxed
John Minck
Dusanne Malonchi
R.R. Pack
Steve Dickford
Ken Wagner
Steven Dickey
Jim Ingram
Rusty Jarzombek
Tom Daniels
Tom Freeman
Bard Dunkelberger
Mark Natale
Ashley Harkness

Lockheed Missiles & Space
Telog, Inc.
Hewlett Packard
ESL, Inc.
Diximetric
Terex
Hewlett Packard
Solvant Systems
S.E. Labs
Intel
Intel
Intel
U.S. Instrument

Rentals
TRW Microwave
TRW Microwave
Watkins Johnson
Leasametric
Leasametric
Electro-Test, Inc.

December 14, 1984
Tektronix, Inc.
Beaverton, OR
David Goodhead
Region 9 Coordinator

Region 9 held a meeting at the Tektronix Factory Service Center in Beaverton, Oregon on December 14, 1984. Fifteen people attended the round table discussion on productivity and a presentation on "Artificial Intelligence." Feedback for Phil May on the salary survey was that it would be too time consuming. The member delegates voted to change meeting times. Instead of meeting the second week of June and the second week of December, the meetings will be held the second week of April and the second week of September.

The next meeting will be held in Richland, Washington. Subjects suggested for discussion included E.S.D. bar codes and Fluke's history with their 10 volt M.A.P.

November 28, 1984
Canadian Forces Base
Ottawa, Ontario
Graham Cameron
Region 10 Coordinator

The meeting got underway with an introductory word of welcome from Graham Cameron. Mr. Cameron introduced 3 executive members of the NCSL Board of Directors: Mr. George Rice, President; Mr. Hartwell Keith, Past-president, and Mr. Pete England, Executive Vice President and incoming President.

Mr. Anthony Anderson of Guideline Instruments Ltd. Smith Falls, Ontario NCSL Committee Membership Chairman was also introduced.

Dr. Andy Dunn was recognized for being the recipient of this year's Wildhack Award presented by NCSL at the October 1984 Workshop and Symposium. Dr. Dunn was awarded a cheque and a beautiful piece of art work.

The theme for the 4th. Canadian section meeting "Metrology in the Automated Workplace" was chosen at the planning meeting held in September in Toronto.

Mr. Cameron thanked Col. H.M. Sutherland and Mr. Sidney Thacker of 3 Canadian Forces Technical Services Agency, Toronto for hosting the 3rd. Canadian Section Meeting last year.

Mr. Wally Butts, Canoology Group Inc., Cambridge, Ontario presented Mr. Cameron with a cheque for $250.00 to be used to offset expenses incurred by the Canadian Section. Mr. Butts advised attendees that the Blanchette Tool & Gage Mfg. Corp. of Clifton, New Jersey had offered an award to the person locating the "oldest living" Sheffield Visual Gage. Mr. Butts was the search winner and designated this cheque to the Canadian Section of the NCSL International Region.

Note: In addition to verbal thanks, letters of appreciation have gone forward to Wally and Blanchette for this valuable contribution to our Canadian activity.

Technical Program

Mr. Butts, session developer, gave an overview of "Metrology in the Automated Workplace" plus illustrating typical system architecture and identifying certain problem areas.

Dr. Dennis Swyt, Deputy Director of the Center for Manufacturing Engineering at the National Bureau of Standards, Washington (Gaithersburg, Maryland) D.C. gave a very informative and interesting talk and slide presentation on automated manufacturing research which involves a flexible manufacturing system made up of robots, machine tools and/or computers. Dr. Swyt's slide presentation was divided into four sections: (a) Smart Machine Tools, (b) Interface Standards, (c) Hierarchical Control Concept, (d) Initial Graphic Exchange Specification System. Following the slide presentation Dr. Swyt showed the film entitled "The Automated Manufacturing Research Facility" which dynamically illustrated the NBS facility operation.
Note: Due to the expressed interest in this film, a request for a copy in videotape format has gone to the NBS. The tape will be placed in the NCSL training aids library in Boulder, Colorado. A copy has been requested by the Regional Director which may be borrowed. Contact Mrs. Marilyn Ross at the above address for availability end of January 1985.

Mr. Gavin McGregor was introduced from the Division of Mechanical Engineering, National Research Council Canada. Mr. McGregor brought with him an interesting series of photographs of some of the exceptional work that has been done by his specialized unit. Mr. McGregor gave a slide presentation outlining other approaches and experiences in adaptive manufacturing and showed some examples of closely toleranced components and the dynamic scaled model of the "Ocean Ranger" drill rig.

Dr. Omer Hageniers of Diffracto Limited, Windsor, Ontario, one of Canada's leading developers and manufacturers of computerized electro-optical sensors, gave a slide presentation covering a range of measurement applications with scanning photodiode arrays and spoke on High speed electro-optical measurement in quality control.

The afternoon session was opened with the presentation of a Certificate of Appreciation from President George Rice to Mrs. Marilyn Ross for services to the International Region and the Canadian section.

The next speaker was Mr. John Leckey of Hewlett-Packard, Mississauga and sectional liaison representative for electrical matters to the NRCC. John achieved one of the most significant pieces of work for the Canadian section by developing the exemption for Guildline Transvolt and Hewlett-Packard time standards as carry-on baggage on Air Canada flights. Mr. Leckey provided a slide presentation on HP's 'in house' automated calibration systems for electrical/electronic applications.

Mr. Wally Butts read a letter provided by Mr. Les Peer of the Canada Centre for Inland Waters describing his experience with various desk-top computers in measurement applications. Mr. Butts spoke about the calibration of instruments, i.e. single purpose instruments, limitations due to equipment interfacing: input/output differences.

Mr. Russ Winfield of Garrett Manufacturing Ltd., Rexdale, Ontario then spoke about constraints in going the automated route. He also spoke about computer aided inspection.

Following Mr. Winfield's talk there was a panel discussion with all previous speakers participating.

Mr. Butts advised attendees of the NCSL calculator program tape/disk listing available to members and asked that Mr. Cameron attach a listing to the minutes.* Mr. Butts also thought it would be useful if attendees provided input as to what type(s) of equipment is used and the nature of programs in order that attendees might learn from each other's experiences.

* Note 1: Copy of listing provided from:
NCSL Newsletter Dec 82 (PS2-58)
NCSL Newsletter June 83 (P90-92)

Note 2: Plans have been initiated by the International Director with the NCSL Automatic Test & Calibration System committee to obtain disk/cassettes for most of the programs listed. These items will be available for use by Canadian member organizations.

Dr. Andy Dunn, NRCC liaison contact at the NRCC, Physics Division reported on an International Agreement amongst National Laboratories and showed a slide indicating the text of protocols between NBS and NRC and Recognition of equivalence of national standards for the SI units in Canada and in United States.

In speaking about customs clearance practices Wally Butts pointed out the following items of interest:

1. When shipping equipment for calibration each individual box must be well marked indicating the individual items therein.
2. If you have a person crossing the border to do calibration you must call Canada Immigration Office and have a form completed "Confirmation of Offer of Employment."
3. Person must be prepared to show equipment upon entering and leaving Canada.
4. As far as software is concerned the only portion dutiable is value of disk (medium) i.e. $35.00.
5. If anyone encounters difficulties with customs, kindly advise Wally.

The next speaker was Gary Hysert of the Standards Council of Canada, Ottawa, Ontario. Mr. Hysert gave a brief presentation of the Standards Council of Canada Accreditation Program with particular emphasis on the measurement and calibration laboratory aspects.

Mr. Richard Knapp, Director of the Legal Metrology Branch, Consumer and Corporate Affairs, Ottawa gave an update on Canada's
activity with respect to the International Organization of Legal Metrology (OIML) and defined legal metrology in the Canadian context.

Certificates of merit were presented to:

Dr. A. Dunn, Dr. O Hageniers, Mr. Gary Hysert, Mr. R. Knapp, Dr. Wally Butts, Mr. John Leckey, Mr. Gavin McGregor, Dr. Dennis Swyt, and Mr. Russ Winfield.

Mr. George Rice, President of NCSL gave a brief summary of the highlights of NCSL in 1984. Mr. Rice advised the attendees that a tape of the movie shown by Dr. Dennis Swyt can be made available to NCSL members. Mr. Rice went on to advise the attendees that he, Mr. Hartwell Keith and Mr. Pete England are looking for feedback as to what members would like to see NCSL doing and what direction the NCSL should be taking.

Mr. Pete England, NCSL Incoming President, mentioned that they key thrust of NCSL is co-operative communication. He advised that one of his duties as Executive Vice-President was to prepare the five year long range plan. Listed below are some of the things Mr. England would like to see in the future and some of the planned activities for '85.

1. Growth - increase in membership.
2. Four Board of Directors meetings in 1985. The first in Santa Clara, CA in January, the second in West Palm Beach, FL in April, the third in Boulder, CO in July and the fourth in Ottawa, Ontario, Canada in October.
3. Anticipates that each region will hold two meetings per year.
4. Theme of July 15-18, 1985 Annual Workshop and Symposium, NBS, Boulder, Colorado - "Managing Measurements to Achieve Quality" - Call to Papers has gone out.
5. Identify current Secretariat cost (presently funded by NBS).
6. The continuation of NBS sponsorship of NCSL is being discussed.
7. A number of new committees are being staffed and Mr. England discussed the organization chart. (Organization charts were provided to attendees).

A range of door prizes, donated by various Canadian member organizations, were drawn by Mr. Cameron in the absence of Bill Macrovitch, who had to cancel attendance at the last moment.

Mr. Cameron asked attendees to provide suggested themes, subjects, speakers, locations for next year's meeting scheduled for mid-week last week of November (27th) or first week December (4th). He invited any attendees to join the half day planning group meeting schedule for last week August/early September in Toronto.

The "Attitude Adjustment Hour" and "A Touch of Europe" dinner followed adjournment.
NCSL BOARD OF DIRECTORS
1985

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**APPLICATION FOR MEMBERSHIP**

**NATIONAL CONFERENCE OF STANDARDS LABORATORIES**

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hereby applies for membership in the National Conference of Standards Laboratories and appoints as its member delegate

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who will serve until further notice. The sum of one hundred dollars ($100) is enclosed for membership dues for the current calendar year. Membership fee includes $25 for subscription to the NCSL quarterly newsletter. Please remit in U.S. currency.

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