MOVING AHEAD IN EVER-WIDENING CIRCLES

NIST/NCSL MANAGERS MEETING

On March 5, Del Caldwell, Immediate Past President, Graham Cameron, Executive Vice President, Laurel Auxier, Past President of 1977 and I met with Dr. John Lyons the new Director of the National Institute of Standards and Technology (NIST). We also met with other key members of Dr. Lyons' staff.

I feel the meetings were very beneficial from NCSL's point of view in that we continue to establish communication between the new NIST staff members and strengthen old ties. We discussed the renewed NIST interest in Laboratory Accreditation, concerns over thread fasteners, International Standardization, and the need for improved compatibility of the standards throughout the world.

The other Directors and Managers we met with at NIST were: Dr. Don Johnson, Director of Technology Services; Stanley Rasberry, Director of Measurement Services; and Dave Edgerly, Deputy Director of Technology Services. We discussed the NVLAP Program with Bob Gladhill, Jeff Horlick, and Wayne Stiefel & talked with Skip Kingston on the Consortium on Inorganic Analytical Systems. Ron Powell talked to us on emerging technologies in electronics and their measurement needs.

INTERNATIONAL STANDARDS

While in Washington, D.C., I gave a statement at the Department of Commerce Hearing on Improving U.S. Participation in International Standards Activities. Some of you might still be unaware of the impending changes with the European Community by 1992 (EC92). The role of standardization laboratories in minimizing the potential for non-tariff trade barriers will take on added significance particularly for the U.S. and for our relationship with the European Economic Community. We still welcome any further thoughts, issues, or concerns from our membership on this subject. If you do have any thoughts on improving U.S. participation in International Standards Activities, I would suggest you write to George Rice, NCSL Government Affairs Chairman.

USE OF NCSL'S NAME IN ADVERTISING

It was brought to my attention that advertising literature from a company contained NCSL's name. The use of the words were misleading and indicated that NCSL endorses their services. I discussed my concerns with the particular company and I also want to share with all of you NCSL's policy on this subject. NCSL does not approve, recommend, or endorse any proprietary product. Also that no reference shall be made to NCSL or to NCSL documents, in any advertising or sales promotion which states or implies that NCSL approves, recommends, or endorses any product/service or which has as its purpose an intent to cause directly or indirectly the advertised product to be used or purchased because of NCSL recommendation. I guess I do not need to go into this any further, enough said.

RETired COORDINATORS – Many years of dedication to NCSL

Harry Haymes has resigned from Region 1 Coordinator duties. Harry has put in many, many, many years of dedication to Region 1 either as a Director or Coordinator. He has been our cornerstone for NCSL in New England for a long time. Harry we'll miss you.

(Continued on page 62)
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EDITOR'S MESSAGE:

IT'S "LET'S HELP WILBUR" MONTH

Every two years, NCSL publishes the definitive directory of Metrology Capabilities. But
that can't take place without inputs from all the members and other laboratories who wish
to be listed. This takes the form of the Capabilities Questionnaire, mailed from the
business office.

After that, Wilbur and Joan get the mixed duty of nagging everyone to get them filled out
and turned in. So this is an appeal for each of you to get right at filling out the
questionnaire as soon as you get it, which may already happened by press time of this
Newsletter.

So let's all help out Wilbur, who we all know is a really fine fellow, & who doesn't deserve
to have to become a nag.

UNCERTAINTIES REVISITED

The internationalizing of things is always a good news/bad news sort of activity. But there
is no stopping the dramatic economic and political changes coming about in Europe and
elsewhere in the world. Our own NCSL membership shows the same sort of growth.

The good news is that trade and economic activity will bring us all closer together. The
"bad" news is that much more effort is needed to be sure that trade standards and
agreements have the technical underpinnings that will support this expanding activity. But
that's our business, so we have to be involved.

A case in point is the long-negotiated "Guide to the Expression of Uncertainty in
Measurement" by the ISO/TC4/WG3. I've tried to cover some of the material from time
to time, and Rolf Schumacher has presented updates occasionally. I now have in hand a
40+ page THIRD DRAFT from Mr. E. Richard Cohen, of Rockwell, Int'l, who is the
Convener of WG3, along with several commentaries from Del Caldwell and Howard
Castrap of NCSL. (See page 14)

(Cont'd on page 62)
JOIN US IN PRESENTING A PAPER OR WORKSHOP AT THE 1990 EQUIPMENT MANAGEMENT FORUM

This year’s Forum will be held in Kansas City, Missouri on November 14, 15, & 16 at the Hyatt Regency Crown Center.

The theme of the Forum will be Total Quality, with a focus on how Equipment Management support the implementation of these practices throughout the organization.

Some of the planned topics for papers and workshops are:

**Topics for Papers and Workshops**

- Total Quality Management (TQM) Overview
- TQM Aspects of Equipment Management
- Integration with Property Management
- Integration with Plant Equipment Maintenance
- Individual Company Case Studies in EM
- Application of Modern Information Technology
- Equipment Cataloging Systems
- Application of Bar Code Technology
- Organizing for Optimal EM Effectiveness
- Equipment Life Cycle Management
- Equipment Planning Procedures
- Defense Downsizing Opportunity for EM
- Equipment Leasing and Rental
- Economics of Equipment Utilization
- Changing Equipment Technology

**Paper Requirements**

Papers should be non-commercial and objective.

If you are interested in presenting a paper or workshop on one of these or related topics, send an abstract to:

Phil Chase, PMS Systems Corp, 2800 Twenty Eight St.,
Santa Monica, CA 90405 or Phone (213) 450-1452.

Deadline for abstracts is August 1st.

Call for Papers brochures are available through the NCSL Secretariat.

**Forum Theme**

**Total Quality: The Foundation of Equipment Management**

Whether you call it TQC or TQM the focus on improving the quality of our products, services, and internal processes is becoming increasingly clear. Over the past decade there has been much talk about the need to take a Total Quality approach in order to remain competitive in the world marketplace. Today many of our customers are demanding Total Quality throughout our organizations in order to remain on their approved supplier lists. In addition, many of our organizations will be looking to Europe for growth in the near future. As 1992 approaches, the requirements of the various ISO standards will be applied to us if we are to continue to participate in the many of the European market opportunities. These standards clearly encourage if not require a Total Quality approach.

Today’s Equipment Management professionals have many opportunities to apply total quality to their own organizations to meet these requirements and the competitive challenge. Beyond that they can be a catalyst, if not a leader in the entire organization to propagate the discipline and process control that is at the heart of the Equipment Management Forum’s mission.

**Exhibits**

The EMF will host exhibits of products of interest to the Equipment Management community. If you are interested in exhibiting a product or would like more information, please contact:

Charles Motzko, Electro-Rent Corporation, 6060 Sepulveda Blvd., Van Nuys, CA 91411-2501, Phone: (818) 786-2525.
When: August 19-23, 1990

Where: Grand Hyatt Hotel, Washington D.C.

Why you should attend:

NETWORKING
Perhaps the unsung highlight of the NCSL Conference is meeting so many new people who have similar interests to you. You will meet people who provide a different opinion on an issue, another way to solve a problem, or a new perspective on a situation. Many of these new professional contacts will prove to be of valuable benefit to NCSL conference attendees for years to come.

TECHNICAL PAPERS
This year's conference promises a host of excellent papers covering topics such as:

- Strategic Planning
- Data Networking
- New Trends in Instrumentation
- Documentary Standards
- Metrology Education & Testing
- Advances in Measurement Disciplines: *Electro-Optics*, *DC/Low Frequency Electrical*, *Microwave/Millimeterwave*, *Time & Frequency*, *Optical & Ionizing Radiation*, *Physical & Dimensional*

- Laboratory Automation
- Intrinsic Standards
- Equipment Management
- Laboratory Accreditation
- Industry -- Specific Metrology for Utilities & Pharmaceuticals
CONFERENCE
Symposium for Metrologists

EXHIBITS
The conference will host exhibits presented by 60 of the leading manufacturers supplying the calibration community. These firms will be represented by key company executives, technical experts, and personnel trained in both demonstrating and providing useful information about their equipment.

A few booths are still available. For more information, please contact:

Dean A. Brungart
Telephone: (818) 717-6872 Facsimile: (818) 717-6862

NCSL COMMITTEE OPPORTUNITIES
Like any other organization, you get out what you put in. Be a contributor! Come meet the people who are doing the inside work for NCSL and ask them how you can get involved. Committees meeting at the Conference include:

- Utilities Committee
- Calibration Intervals Committee
- Laboratory Facilities Committee
- Automatic Test & Calibration Committee
- Intrinsic and Derived Standards Committee
- National Measurement Requirements Committee
- Calibration Systems Committee
- Calibration Procedures Committee
- Medical Instrumentation Committee
- Laboratory Evaluation Committee
- International Region Member Delegates

TIME IS RUNNING OUT!!! CALL NCSL HEADQUARTERS AND REGISTER NOW: (303) 440-3339

REGISTRATION - 1990 NCSL -- AUGUST 19-23, 1990

Name ___________________________ Title or Position ___________________________

Dept., Div. or Lab ___________________________ No. in lab ______________

Organization ___________________________

Street Address ___________________________

City ___________________________ State _______ Zip __________

Telephone Number (_____) ___________ Ext. ________

☐ Registration fee enclosed (Make checks payable to NCSL 1990 Workshop)

☐ NCSL Member $300 ☐ Non-Member $335 ☐ Late Reg. (after 8/1/90) $350

☐ Interested in Guest’s Program -- Guest’s Name ___________________________

☐ $______ for Guest’s Conference Banquet Ticket ($30 each)

☐ $______ for International Dinner Tickets ($30 each)
HIGHLIGHTS OF THE NCSL BOARD MEETING

Pontchartrain Hotel
New Orleans, LA, May 14-16, 1990

PRESIDENT’S REPORT – Bill Simmons

Traveled to Chicago to attend the first joint NCSL Sectional Video Teleconference Meeting between the Chicago and St. Louis sections. Was unable to attend the conference due to illness. Delivered a statement from the NCSL and attended several presentations at the Department of Commerce hearings.

Wrote a letter to Dr. John Lyons congratulating him on his appointment as Director of NIST. Met with Dr. Lyons on issues concerning NIST and on matters where the NCSL might be able to contribute.

Received a letter of resignation from Val Gersbach and appointed Chet Crane as the Vice President of Conference Management, appointed Bob Willett as Vice President of Education & Training and appointed Tony Anderson as Vice President of Operations & Marketing.

Bill Simmons commented on the potential impacts on the NCSL with the recent Board changes and travel restrictions incurred by Board members.

EXECUTIVE VICE-PRESIDENT’S REPORT – Graham Cameron

Graham Cameron briefed the Board on Metrologia ’90 and the necessary preparations that the NCSL made for that conference. A general discussion arose over Metrologia ’90 and the activities that took place. Interest was shown in all areas of the conference.

Attended the NIST Hearing on Improving U.S. Participation in International Standards Activities.

SECRETARY’S REPORT – Bill Doyle

Bill Doyle announced that he will be presenting papers at both the MIDCON and NORTHCON events.

TREASURER’S REPORT – Tom McGowney

Mr. Brauchli, the NCSL lawyer, reviewed the indemnification insurance for officers and directors along with the pertinent NCSL articles of incorporation and Colorado statutes. Mr. Brauchli will prepare the necessary amendment for the next Board meeting if appropriate. He also suggested that the insurance company remove the endorsement that excludes coverage if a governmental or regulatory agency brings action against the NCSL.

A motion was made by Chet Crane to have Mr. Brauchli propose the amendments to the articles of incorporation to conform to Colorado law. Seconded by Bob Smith. Discussion: A discussion arose over which articles of incorporation must be changed and approved by the Board. Further questions arose over the effect, if any, that the proposed changes would have on the NCSL non-profit status. The motion was amended by Chet Crane to state “To have Tom McGowney have Mr. Brauchli propose the amendments to the articles of incorporation to conform to Colorado law. Seconded by Bob Smith. Further discussion: None. Motion carries.

An action item was given to Tony Anderson to pursue the matter of advertising quality NCSL items in the Newsletter.

NIST REPRESENTATIVE’S REPORT – Joe Simmons

NIST hosted the NCSL/NIST Managers Meeting on April 2, 1990. Presentations on “NIST/Industry Consortium on Automated Analytical Systems” and “Emerging Techno-logics in Electronics and Their Measurement Needs” were made.

NIST hosted a Total Quality Management meeting which was chaired by Gary Davidson and attended by representatives from NCSL, the Department of Defense and NIST. The participants agreed on a general strategy and schedule for exploring the application of TQM approaches to industrial calibration laboratories.

GOVERNMENT AFFAIRS COMMITTEE – George Rice

Bill Simmons summarized the Government Affairs Committee activities during the last quarter. George Rice did complete the Congressional Testimony, however this was not presented due to the NCSL not being able to determine the dates for the presentation in advance. A discussion arose over methods which could be employed to allow the NCSL to gain advance meeting dates scheduling information.

OLD BUSINESS – Bill Simmons

Bill Simmons reviewed the 1990 - 1994 Long Range Plan and requested any further inputs for the plan. A motion was made by Klaus Jaeger to accept the 1990 - 1994 Long Range Plan as submitted. Seconded by Bob Smith. Motion carries.

Bill Simmons briefed on the progress of the Service Contracting Guideline to date. It was agreed upon that Gary Davidson will complete the Service Contracting Guideline and send it to the Board for review.
Bill Simmons introduced the use of trade names issue and the progress made to date. A general discussion arose over the use of trade names and the proper methods that should be employed by the NCSL.

Bill Simmons introduced the Regional Management Structure issue and a general discussion arose. It was decided that this issue should be tabled until next year.

CALIBRATION LABORATORY ACCREDITATION – Joe Simmons

Joe Simmons presented a detailed outline of the requirements for the Calibration Laboratory Accreditation Program. The presentation included the accreditation triggers, current status, the essential participants and the essential ingredients for the program to be successful.

A discussion arose over NIST involvement in the accreditation program and ways that the NCSL can become involved.

AD HOC COMMITTEE REPORTS

A discussion arose over the information which is available for the change to the temperature scale. It was decided that more guidance is required from this committee.

INTERNATIONAL MEASUREMENT COORDINATION – Graham Cameron

Graham Cameron summarized his written report. A discussion followed over the need for making this a standing committee and renaming it the International Measurement Coordination Committee.

An action item was given to Bill Simmons to find a committee chair for the newly formed International Measurement Coordination Committee to include the study of which vice president that this committee should be responsible to.

METRICATION – Jim Ryan

Made two presentations during the past quarter. One at the Measurement Science Conference and the other at the Region 11 Teleconference. Completed the Metric Questionnaire and requested inputs from the Board.

An action item was given to the Board to critique the Metric Questionnaire and provide Jim Ryan with feedback or to sign the questionnaire if no feedback is indicated not later than May 31, 1990. An action item was given to Bill Simmons to contact all absent Board members to solicit inputs for Jim Ryan’s Metric Survey.

TQM INITIATIVE ON CAL. SYS. REQUIRE. – Gary Davidson

A discussion arose over the need to change the name of this committee to TQM Initiative on Calibration Systems Requirements due to additional tasks assigned to the committee. It was decided that the name change was appropriate. The committee’s core team membership consists of 3 representatives from the DoD, one from the DLA, one from NIST and 5 from the NCSL.

There are plans to finalize, distribute and tabulate the draft surveys for the government and commercial activities. A discussion arose over the need to establish a budget account for this committee in light of the increase in activities. A motion was made by Chet Crane to assign a $1,500.00 budget to the Calibration Systems Requirement Ad Hoc Committee. Seconded by Joe Simmons. Discussion: None. Motion carries. It was noted that the Air Force and the Navy are not participating in the TQM Initiative. No general consensus was reached.

MULTIPLE AUDIT AD HOC COMMITTEE REPORT – John Lee

No report received. A general discussion arose over the need to have this committee continue.

THREAD FASTENERS – Klaus Jaeger

Summarized activities to find a committee chair for this committee.

V.P. OPERATIONS & MARKETING REPORT – Tony Anderson

500 additional sheets of the SI-90 stickers were printed and are available from the Business Office. The International Temperature Scale (1990), ITS-90, are available from the Business Office.

SECRETARIAT’S REPORT – Wilbur Anson

Wilbur Anson summarized the current membership which stood at 1586 as of May 1, 1990. An action item was given to all Directors to have their respective Regional Coordinators poll their regions for those member delegates who have 5, 10, 15, 20 or 25 or more years of service.

PUBLICITY – Al Herman, Cooper Cameron

The table top display has been purchased and was used at Metrologia ‘90. Signs for the new exhibit have been produced and it is intended to add photographs in the future for both of the exhibits.

ADMIN. GUIDELINES & BY-LAWS COMM. – Gary Davidson

Continued to convert Administrative Guidelines Manual from Dean Brungart’s word processor to Gary Davidson’s processor. 14 guidelines are currently in the process of being revised.
V.P. CALIBRATION SYSTEMS MANAGEMENT REPORT
- Bob Smith

The latest version of the Calibration Laboratory Manager's Handbook was provided to the Board for review and comments. An action item was given to all Board members to respond to Bob Smith's latest version of the Calibration Laboratory Manager's Handbook not later than June 22, 1990 to include both positive and negative inputs.

LABORATORY EVALUATION COMMITTEE - Leroy Britain

Leroy Britain was appointed as chairman of this committee. There was no additional activity to report this quarter.

LABORATORY FACILITIES COMMITTEE - Walter Fitzgerald

This committee's next product will be the Recommended Practice #7.

CALIBRATION PROCEDURES COMMITTEE - Mack Van Wyk

Mack Van Wyk/Boeing Aerospace and Electronics was appointed as the chair for this committee. Reported the current status of the recommended practice for Application and Maintenance Manuals for Test Equipment.

CALIBRATION SYSTEMS COMMITTEE - Dennis Pinnecker

Completed the coordination draft of the Salary Survey and submitted it for Board review. The Calibration Reports Subcommittee met in February and has agreed on the ground rules and agenda. A framework of the RP has been designed, action items assigned and the next meeting established. The first draft of the RP is scheduled for the October Board meeting.

CALIBRATION INTERVAL COMMITTEE - Frank Butz

Frank Butz summarized his committee activities to date.

V.P. MEAS. SCIENCE & TECHNOLOGY REPORT - Klaus Jaeger

Klaus Jaeger and Jim Ingram submitted a proposal on the issue of trade names to Gary Davidson for inclusion in the guidelines.

AUTOMATIC TEST & CALIBRATION COMMITTEE - Dave Nebel

Dave Nebel/Tektronix was appointed as this committee chair. Many thanks to Ken Landis for his contributions to this committee.

MEASUREMENT ASSURANCE COMMITTEE - Mike Cruz

The Twin Cities area is conducting a thread gage round robin. Currently there are nine participants. There has been interest in doing a 10 volt round robin using the Datron 4911. The participants would be laboratories with the 10 volt Josephson Junction array. Steve Stahley/Datron and Jim McKinnon/Navy Primary Standards Laboratory will coordinate this effort.

NATIONAL MEAS. REQUIREMENTS COMM. - Laurie Baker

This committee will hold their next meeting at the annual conference. This meeting will include finalizing the direction of the 1991 NMRC Report. Joe Simmons, Klaus Jaeger and the NMRC Committee will meet with the NIST personnel to discuss the focus of the next NMRC Report. A leak Calibration Workshop will be held at NIST Gaithersburg following the NCSL Conference. The April issue of the NCSL Newsletter contains a bulletin to publicize this workshop.

INTRINSIC & DERIVED STANDARDS COMM. - Richard Pettit

This committee met at the Measurement Science Conference and reviewed the progress of the two current working groups. No inputs were received from the committee's questionnaire which appeared in the January 1990 issue of the Newsletter.

V.P. INDUSTRIAL PROGRAMS REPORT - Jim Ingram

Jim Ingram visited the University of California State at San Bernardino as a result of conversations with the college. They are interested in setting up a pre-laboratory course for pre-engineering and laboratory science students. Jim Ingram will coordinate with the university in putting the course together.

BIOMED. & PHARM. METROLOGY COMM. - Ralph Bertermann

This committee continues to plan for their meeting in the Fall as well as a workshop and papers at the NCSL Conference.

MEDICAL INSTRUMENTATION COMMITTEE - Marc Nachman

Marc Nachman has completed the committee charter and administrative guideline. He held a formation meeting at the American Association for Medical Instrumentation Conference. Contact has been made with two organizations that seem interested in working on joint projects. This committee looks like it may be getting off to a booming start.
EQUIPMENT MANAGEMENT FORUM
Dale Kemper

The 1989 Forum proceedings were printed and distributed to all attendees. Preparations continue for the 1990 EMF to be held in Kansas City. The committee will issue a brochure for their 1990 Forum and will have a flyer available at the NCSL Conference. Jim Ingram stated his concerns over the EMF relying heavily on exhibitors and the Kansas City location.

UTILITIES COMMITTEE – Gary Shuler

The 1990 NCSL Utilities Form was held May 2 and 3, 1990 at the Consumers Power in Michigan. There were 15 pre-registered for this forum.

PETROLEUM INDUSTRY METROLOGY COMMITTEE –
Sue Grislon

A formation meeting is planned for May 1990 and a mailing is being made to 180 interested parties to get the committee rolling. The questionnaire regarding the industry needs has been completed.

V.P. CONFERENCE MANAGEMENT REPORT – Chet Crane

Dennis Pinnecker/Rockwell was appointed as Program Chairman of the 1991 Conference in Albuquerque. Hank Daneman/HDL Associates was appointed as Guest Program Chairman for the 1991 Conference. Don Dalton/Fluke was asked to accept the Conference Evaluator position. Appointed Dave Braudaway/Sandia as the Local Coordinator for the 1991 Conference in Albuquerque.

SITE SELECTION COMMITTEE REPORT – Chet Crane

Appointed Randy Seefeldt as the 1993 Site Selection Chairman.

TREASURER’S REPORT (Continued) – Tom McGovney

A motion was made by Chet Crane to approve the corporate resolution as submitted by the NCSL Treasurer. Seconded by Bob Smith.

A lengthy discussion arose over the need to increase the membership dues and/or exhibitor fees. The general consensus was not to increase the exhibitor fees and to increase the membership dues.

A motion was made by Jim Ingram to increase the 1991 dues by $50.00. Seconded by Tony Anderson. Motion carries. Jim Ingram requested that the Board be polled. The results were: Yeas - 10, Nay - 0, Abstentions -0.

A discussion arose over the need for an initiation fee and/or a re-instatement fee. It was determined that Tony Anderson will develop a strawman policy on the membership dues issue.

An action item was given to Tom McGovney to develop policies for the administration of the NCSL budget. This is to include provisions for the membership dues to cover all yearly operating costs minus the conference and a method for the conference to make a pre-determined surplus. (To cover any short falls in other areas.) Tom McGovney is to present a motion at the August 1990 Board meeting to include these policies in the appropriate guideline, as applicable.

REGIONS 1 & 11 DIRECTOR’S REPORT – Ralph Bertermann

Appointed Brian Gurney/Tekserv as Region 1 Coordinator. Ralph Bertermann thanked Harry Haymes for his many years of service. The first NCSL video teleconferencing was held between the Chicago and St. Louis Sections on April 16, 1990. There was 56 attendees at teleconference. Appointed Dave Walters/Commonwealth Edison as the new Chicago Section Coordinator.

REGIONS 2 & 5 DIRECTOR’S REPORT – Dave Duff

Steve Stahley summarized activities for the region.

A discussion arose over the NCSL Membership Directory and if the data is current. Steve Stahley stated that section coordinators are more in touch with the current membership than any other group and that the Membership Directory is severely outdated since it is published every two years. An action item was given to Tony Anderson to review the process of updating the Membership Directory.

REGIONS 3 & 4 DIRECTOR’S REPORT – Woody Tramel

Summarized regional activities during the last quarter. Ernie Sharp was appointed as the Atlanta Section Coordinator.

REGIONS 6 & 9 DIRECTOR’S REPORT – John Buck

John Buck is coordinating a Thread Gage Round Robin between the Twin Cities, St. Louis and Richard Hyman of Region 1.

REGION 8 COORDINATOR – Ronnie Eubanks

The MIDCON 90 Electronics Conference will be held in Dallas, Texas on September 11 through the 13, 1990 and they will make space available for the NCSL to display information. A steering committee was formed to develop an Associates Degree in the Metrology Program at Texas State Technical Institute. The committee partly consists of Ronnie Eubanks, Clyde Orison, Judy Smith and Donald Drum.
REGIONS 7 & 8 DIRECTOR'S REPORT - Howard Castrup

Region's activities was summarized.

INTERNATIONAL REGION DIRECTOR'S REPORT - (TBA)

Graham Cameron summarized the United Kingdom report. They were interested in the video tape library converted to the PAL format. An action item was given to Graham Cameron to contact Mike Hutchins to determine which tapes are of particular interest to the UK group.

LIAISON DELEGATE'S REPORTS - Graham Cameron

PRECISION MEASUREMENTS ASSOC. - Glenn Rasmussen

The PMA have established a pilot program for the accreditation of metrologists. An Ad Hoc committee has developed the examinations. An action item was given to Chet Crane to contact the PMA in regard to their current activities in the technician accreditation program. The PMA is working to produce and publish the 2nd International Directory of Metrologist

MEASUREMENT SCIENCE CONFERENCE (MSC) - Chet Crane

The MSC expressed their appreciation and accepted the complimentary table at the 1990 Conference. The 1991 MSC Workshop and Symposium will be held January 31 and February 1, 1991. The theme for the conference is "Continuous Improvement in Measurement Science".

Officer for the 1991 Conference are:
Dennis Pinnecker - Board Chairman/Past President
Kevin Ruhl - President/Conference Chairman
Bob Tobias - Executive Vice President
John Schulz - Secretary
Bob Weber - Treasurer

AMER. ASSOC. FOR LAB. ACCREDITATION (A2LA) - Peter Unger

Two laboratories have been accredited under the A2LA Metrology field of testing for dimensional measurements of length, angle and flatness. The Association signed a memorandum of understanding with the Hong Kong Laboratory Accreditation Scheme. This provides mutual recognition to laboratories accredited by each agency.

The ISO Guide 25 is expected to be harmonized with the ISO 9000 series of directives. The ILAC plenary session will be held in Turin, Italy in October 1990.

AMERICAN NATIONAL STANDARDS INSTITUTE - Rolf Schumacher

Rolf Schumacher summarized all the ANSI activities in regard to the ISO 9000 series of directives.

CONF. ON PREC. ELECTROMAGNETIC MEAS. - Art McCoubrey

The CPEM '90 Technical Program Committee met and completed the selection of papers to be presented during the technical sessions. Dr. Jacques Vanier expressed the appreciation of the CPEM for the NCSL contribution to the conference.

WESTERN EUROPEAN CALIBRATION CONFERENCE - Graham Cameron

Graham Cameron provided Dr. Perissi/WECC with a set of the NCSL Recommended Practices for his review and comments.

COUNCIL FOR RADIOMETRIC MEAS. (CORM) - Bill Simmons

Bill Simmons briefed the Board on the activities of the CORM Standing Committee on Optical Properties of Materials and the three subcommittees under this committee.

Klaus Jaeger proposed that he should be the Liaison Delegate to the American Physical Society. Graham Cameron appointed Klaus Jaeger to fill this liaison position and numbered it 90.19.

NEW BUSINESS - Bill Simmons

Dennis Pinnecker announced that he requires a copy of all standards that are currently in use. This includes commercial, government and nuclear. Bill Simmons led a discussion over renaming the NCSL. The consensus was that an Ad Hoc committee needs to be established to study the changing of the name. An action item was given to Bill Simmons to establish an Ad Hoc Committee, within two weeks, to study the changing of the NCSL name.

Bill Simmons conducted a straw man vote on the changing of the name. The results were: Yeas - 11, Nays - 0.

ATTENDEES

Bill Simmons
Graham Cameron
Gary Davidson
Chet Crane
Jim Ingram
Klaus Jaeger
Robert Smith
Tom McGovney
Sverdrup Technology
Dept. of Nat. Def.
TRW
Teledyne Microelect.
Inwil Metrology
Lockheed MSC
Ford Aerospace
TRW
Board Meeting

Randy Seefeldt (I) and Tom McGovney talk over some items during coffee break.

If this is asking for volunteers, Wilbur Anson looks pretty hesitant, Bill Doyle (center), downright against it, and Bob Smith eager as always.

Executive VP Graham Cameron (I) and President Bill Simmons preside over a somewhat attenuated Board gathering this time, possibly caused by spring fever, or whatever?

Bill Doyle
Joe Simmons
John Buck
Tony Anderson
Randy Seefeldt
Steven Stahley
Mark Thornton
Frank Butz
Dennis Pinnecker
Jim Ryan
Hal Stitt
Wilbur Anson
Roland Vavken

U.S. Inst. Rentals
NIST
UNISYS
Guideline Instruments
Navy Pri. Std. Lab.
Datron/Wavetek
Mensor Corp.
G.E.A.E
Rockwell Intl.
McDonnell Douglas
Wavetek
A.S.B.S.
For this Newsletter I have selected issues relative to environmental controls, recalibration of M&TE, and the term "or equivalent" as used in paragraph 5.10, Calibration Status.

With regard to environmental controls, there has been a proposal that the MIL-STD be revised to include specific limits for environment controls, (e.g., temperature 23°C ± 1°C and humidity 20%-50% RH) that this information is required in order to adequately determine the limits of a "standard condition." RESPONSE. As there exists a wide range of makes and models of MT&E and measurement standards of varying degrees of accuracy, application, and environmental susceptibility, it is impractical for the MIL-STD to specifically state or determine what would constitute acceptable limits, standard conditions, or proper ranges of temperature and humidity for instrument use or calibration procedures. These assessments must be made by the contractor (on all M&TE and measurement standards applicable to the contract) and documented in the contractor's written calibration system description.

I recently received a letter concerning the need to recalibrate M&TE when the calibration status of these instruments are being changed from active to some other determination, e.g., calibrate before use, support equipment, storage, etc. The requirement to recalibrate these instruments came as a result of an auditor's interpretation that failure to recalibrate M&TE prior to any change in calibration status was "viewed as bypassing the MIL-STD requirement for feedback of out-of-tolerance conditions." RESPONSE. It is important to note that MIL-STD does not require or make it mandatory that all M&TE be recalibrated prior to a change in the calibration status. Whether or not M&TE should be recalibrated is a quality and management decision left entirely up to the contractor. How the contractor elects to implement such a program should be documented in the written calibration system description. Additionally, the contractor should be prepared to demonstrate to the Government how these decisions do not adversely impact the DOD or expose the DOD to additional risks.

With regard to the term "or equivalent," the contractor may use a variety of methods for expressing calibration dates, as long as the dates are explicit (not just month and year). It is important to point out that the term "or equivalent," used in the MIL-STD, simply means that the contractor may elect to either transpose the calendar date, e.g., month, day, year, visa-vis day, month, year, etc., or develop an alternative system for identifying calibration status, as long as the system can target to a specific day. The specific date requirement became necessary when paragraph 5.4, Intervals for Calibration, was revised to include provisions for the temporary extension of the calibration due date, for limited periods of time, such as a test in progress. Although the calibration label reflects a specific day, calibrations may be performed anytime on or before that date. This then allows for a reasonable method for queuing M&TE and measurement standards for calibration.

David J. Mednick
Army Agent for MIL-STD-45662A
Office for TMDE Management
INDUSTRY MEETINGS

Contact NCSL Business Office, (303) 440-3339.


Sept. 11-12, 1990 - Symposium on Optical Fiber Measurements, Boulder, CO.
Contact Douglas Franzen, (303) 497-3346.

Contact Ralph Bertermann, (708) 982-7611.

Oct., 1990 - Biomedical & Pharmaceutical Metrology, Chicago, IL.

Nov. 6-7, 1990 - 10th Annual Canadian Workshop/Symposium. NRC, Ottawa.
Contact: Duane Brown, (613) 925-5934.

Contact Leon Barnes, Allied Signal Aerospace, (816) 997-5480.

Contact Chet Crane, (213) 822-8229.

May 9, 1990 - ISA International Instrumentation Symposium, San Diego, CA.

May 21-22, 1991 - CORM at NIST in Gaithersburg.

REGIONAL MEETINGS SCHEDULE

REGION 1. October 1990.
Contact Brian Gurney, (508) 459-9480.

Contact John Wehrmeyer, (716) 477-8891.

Contact Gary Foster, (215) 822-2929 X2548.

Contact Donald Drum, (412) 287-8711.

REGION 3. NA
REGION 4. NA
REGION 5.
October 4, 1990 - Indiana, TBA
October 11, 1990 - Dayton, TBA
October 18, 1990 - Cleveland, TBA
October 25, 1990 - Michigan, TBA
REGION 6.
Central Section, Nov. 7, 1990 Fluke - Dallas.
Contact Clyde Orrison, (214) 995-5031.

South Section, July 11, 1990, Ausron - Austin, TX.
Contact Mark Thornton, (512) 396-4200.

West Section, Sept. 12, 1990, Ball Aerospace Systems - Boulder, CO.
Contact Deirdre Lavalie, (303) 449-6841.

REGION 7.
Contact Bard Dunkelberger, (408) 738-2888 X5207.

REGION 8.
LA/Orange County Section, Sept. 1990, Anaheim-Costa Mesa-Irvine area.
Contact Claude Fourroux, (213) 605-1264.

LA/Valley Section, Oct. 18, 1990, San Fernando Valley.
Contact Brian Conroy, (818) 886-2211 X2523.

Arizona Section, Nov. 1, 1990, Tucson, AZ.
Contact Wayne Benda, (602) 794-5900.

Contact Randy Seefeldt, (619) 545-8849.

REGION 9.
EG&G, Idaho Falls, ID.
Contact Del Knapp, (503) 642-8600.

REGION 10. (INTERNATIONAL)
Canadian Annual Workshop & Symposium, Nov. 6-7, 1990,
NRC, Ottawa Ontario, Canada.
Contact Marilyn Ross, (819) 997-3411.

REGION 11. NA
Mr. Samuel E. Chappell  
Chief, Office of Standards Management  
Office of Standards Services  
National Institute of Standards and Technology  
Gaithersburg, MD 20899

Subject: GUIDE TO THE EXPRESSION OF 
UNCERTAINTY IN MEASUREMENT.

Dear Mr. Chappell:

I have reviewed the third draft of the subject document forwarded by your letter of 28 February 1990. My comments and questions regarding the work are included in enclosure.  
(Ed Note; not printed)

In general, I believe that the final document will make a significant contribution to the field of metrology by providing a consistent system for incorporating “Type B” uncertainties into the overall expression of measurement uncertainty and by using careful and thorough narrative to discuss a specific topic and relate it to other topics in the document.

I look forward to seeing the next draft.

Sincerely, D.H. Caldwell, NCSL Immediate Past President

Ed. Note: The following comments were supplied by Howard Castrup of Integrated Sciences Corp., & NCSL Director.

GENERAL REMARKS

First, I would like to congratulate the authors of ISO/TAG4/WG3 Guide to the Expression of Uncertainty in Measurement [1], hereinafter referred to as “the guide,” on developing an excellent document. I believe that it provides a much needed baseline for further research on understanding, computing and using measurement uncertainty estimates. It offers one of the best treatments I’ve seen so far on the subject. Anyone who has participated in creating a guidance document can appreciate the extensive thought and effort that went into its development.

With this in mind, the following comments should be taken as an attempt to provide constructive input to the authors for their consideration. In instances where my comments may reflect a misunderstanding some of the material presented, I hope they will be taken merely to highlight a possible need for further clarification.

First, a note of encouragement and moral support. It has been my experience in attempting to document analytical methodologies for the metrology community that many in the intended audience believe that highly technical subject matter should be communicated without recourse to the use of mathematics or statistics. A few readers have taken a more reasonable position, advising that mathematical material, if absolutely necessary, should be confined to appendices. Unfortunately, neither point of view is tenable in presenting ideas which are essentially mathematical in such a way as to lead to any practical application. Abstaining from math completely can yield a document void of content. Confining the math to an appendix can lead to a three page document with a forty page appendix. Assuming that the intent of the guide is to provide a thorough and concise treatment on the subject of measurement uncertainty analysis intended for practical application, the mathematical level seems to me to be just about right.

Another criticism we often hear aimed at such documents is that they are developed by “statisticians” who have little comprehension of the mechanics of making real world measurements. From Annex A.3 of the guide, however, it is evident that the authors invested considerable effort in developing such comprehension.1

So much for preliminaries. The following specific comments, although numbered, are not necessarily presented in any particular order of importance.

SPECIFIC COMMENTS

1. Fundamental Concepts

Much of the material presented in the guide is rooted to a particular view of the measurement process. Although many of the fundamental elements of this view are elucidated at various points in the body of the guide, I think it would be a good idea to also state them up front in the introduction. Some of the more essential elements can be treated in answering the following questions:

   a. What is a measurement?
   b. Why make measurements?
   c. What is a “true value?”

Before going any further, I should probably take my own advice and offer some response to these questions, so that subsequent comments can be better evaluated. I started out thinking that I should only recommend stating important

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1 I occasionally take pleasure in imagining that there exists some happy far-off world, where metrologists (i.e., measurement scientists) invest a similar effort in learning the basic statistics needed to understand and interpret measurements.
ideas early and not get into a discussion on the content of these ideas. However, I couldn't help pontificating my own views. If the authors of the guide feel that these views are flawed, I hope that will not preclude consideration of the notion that emphasizing fundamental points in the introductory material is a good idea.

a. What is a measurement?

To me, a measurement is any process in which the magnitude of the quantity is estimated. The word "estimated" is in italics to draw attention to the fact that the result of a measurement is not to be taken as a representation of truth, but merely as a reflection of it. This may seem like such a fundamentally obvious concept that to dwell on it is like explaining music to Mozart, but many experienced metrologists have trouble accepting it. In fact, some react to it as outright heresy. The concept is stated very clearly in paragraphs 4.1.3 and 4.7.1 of the guide, but should probably also be emphasized earlier.

Making measurements may or may not involve the use of reference artifacts. Making measurements (estimates) without artifacts is somewhat more basic than making measurements with them and, therefore, may serve to better illustrate the approximate nature of the measurement process. For example, suppose that I perform an "eyeball" estimate of the pressure in my car's tires. Assume that, from experience, I know that a certain degree of lateral bulge (factoring in whether the day is hot or cold; the car is loaded or unloaded; the tires are new, seasonized or venerable; etc.) can be associated with more or less satisfactory performance. For this discussion, imagine that obtaining an eyeball estimate is completely sufficient for my purposes, which are, for instance, to reach San Francisco from San Dimas on one tank of gas while simultaneously holding the probability of a tire blow-out to a low level. Assume further that experience has shown that too much bulge is associated with increased road friction and reduced fuel economy (allowing me to reach Carmel, at best) and too little bulge is associated with an increased risk of tire rupture.²

Assume now that my neighbor, who owns a car similar to mine, wishes to determine whether to pressure in his tires is optimal. Assume also that he has heard of my incredible prowess in this area and asks me to come over and evaluate his car's tire pressure. I, of course, do this for no charge.

It takes little imagination to extrapolate to a situation in which I am forever traveling from house to house offering tire pressure advice to owners of cars similar to mine, becoming the local area's recognized standard. (Obviously, this example ignores the fact that someone has already had the good sense to invent an artifact which can be used to estimate tire pressure and which can be replicated.)

This example, although ridiculously simple, contains the basics of the measurement process:

Even though no transportable artifact was involved, a reference (my experience) was used to estimate a physical quantity. As stated above, this is a key concept in understanding measurements, namely, that no matter how confident a user may be of his or her reference, the result of a measurement is only an estimate.

Despite the apparent absence of quantifying units, they are present in the example. Distance is measured, for instance, in San Dimas-to-San Francisco and San Dimas-to-Carmel units. One San Dimas-to-San Francisco unit is associated with acceptable tire pressure, and one San Dimas-to-Carmel unit is associated with unacceptable tire pressure.³ The point here is that, not matter how structured or unstructured they may be, measurements involve expressing physical quantities in terms of numbers.

Given the nature of the "standard," the reader can readily appreciate that considerable variation may accompany my tire pressure measurements and the extent of this variation can be only crudely estimated at best. This concept of measurement variation can easily be extended to the use of any artifact, no matter how finely its precision is stated or who owns it. In other words, all measurements are variables which are characterized by some degree of uncertainty.

b. Why make measurements?

This question has been answered succinctly in several references (see, for example, the foreword in Reference [2]). Measurements are made to obtain information needed to make decisions. To quantify the efficacy of measurements in this context, it is useful to estimate the risks which accompany such decisions [3]. These risks are referred to as measurement decision risks. Measurement decision risk is defined as the probability that a negative outcome will result from a decision based on a measurement or set of measurements. Estimating measurement decision risks allows us to evaluate alternative decisions in concrete terms. For example, suppose "too much tire bulge" leads to a tire failure probability estimate of 0.2 and an incomplete trip probability estimate of 0.3. With these levels of risk, the decision "add air to the tires" would seem better advised than the decision "forget about tire pressure, go in the house and have a snack."

Measurement decision risks are calculated using statistical distributions. This is not surprising, since statistical distributions describe the measured values, the measurement.

²At this point, you will no doubt perceive that this is a highly fanciful example.

³Actually, come to think of it, I wouldn't mind spending a few weeks in Carmel after all.
"Uncertainties"

process and the quantities being measured. In order to be able to compute measurement decision risks, therefore, we need to develop estimates of various parameters which characterize the distributions of interest. For each distribution, these parameters include such things as mean, variance, skewness, kurtosis, etc. Distribution variances, for example, are obtained through estimates of uncertainties. This leads to an interesting observation which follows from a logical sequence:

1) We make measurements to help make decisions.
2) To help make decisions, we quantify measurement decision risk.
3) To quantify measurement decision risk, we use statistical distributions.
4) To develop statistical distributions, we estimate uncertainties.

The interesting observation which follows is this. If we make measurements in order to make informed decisions, then the purpose of estimating uncertainties is obtaining parameters for use in statistical distributions. The reason I'm going on about this to such an extent is that there are places in the guide where it is asserted that knowing the relevant statistical distributions is not necessary. However, the foregoing considerations argue to the contrary. This is why I think the guide should carefully address the question "why make measurements?".

Relating uncertainties to measurement decision risks requires developing a few technical concepts. If the reader has had enough of "why make measurements." he or she can skip this part and go on to the next penetrating question, "what is a true value."

As stated above, measurement decision risk is the probability that a negative outcome will result from a decision based on a measurement or set of measurements. To quantify measurement decision risk, relationships are developed between measured values (e.g., degree of tire bulge) and associated probabilities of occurrence of negative outcomes (e.g., an abbreviated trip and a tire blow out). This involves the use of "utility curves" for the parameter being measured and various statistical distribution, as indicated above. The utility curves are mathematical functions which relate the performance of a device of the values of its various measurable parameters or attributes. The statistical distributions are used to infer information about the device's attribute values based on measurements of these values.

Ordinarily, we think of a measurement process as one which maps a true value $x$ onto a set of measured values $y = \{y_1, y_2, \ldots, y_k\}$. The mapping is described by a conditional probability density function $f(y|x)$. To infer information about $x$ from $y$, we compute pdf:

$$f(x|y) = \frac{f(y|x)f(x)}{f(y)} \quad (1)$$

The pdf $f(x|y)$ is used with a utility curve $Q(x)$ to obtain risk estimates. The utility curve provides a number between 1 and 0 which quantifies the utility of the parameter of interest as a function of the parameter's value. For example, if my car tires rupture at 63 psi, then the parameter value "63" is assigned a utility of "0" by the utility function, i.e., $Q(x \geq 63) = 0$. Conversely, if 32 psi is the optimal tire pressure, then $Q(32) = 1$.

To get an idea of overall risk, I evaluate the utility function at all values of $x$. To add a flavor of realism to these evaluations, I need to take into account the probability that each value of $x$ is the value which was responsible for the observed set of measurements $y$ (see below). With these considerations in mind, the estimated utility of a given device is expressed as

$$\text{device utility} = \int Q(x)f(x|y)dx.$$  

Hence, the appropriate relation for measurement decision risk is

$$\text{measurement decision risk} = 1 - \int Q(x)f(x|y)dx. \quad (2)$$

Note that in Eqs. (1) and (2), the true value $x$ is treated as a variable, in contrast with the usual notion that true values are fixed, immutable quantities which are invariant in the course of a measurement process. Treating $x$ as a variable runs contrary to ideas which are hammered into our heads by statistics professors and statisticians. (I was uneasy with the concept at first, but am now able to accept it without...
Actually, forming the conditional pdf \( f(x|y) \) is entirely supportable when you consider that the function is just a table (with an infinite number of entries) which associates relative frequencies of occurrence between true values \( x \) and corresponding measurements \( y \). It might help to think of \( x \) as a "generator" for \( y \). The pdf \( f(x|y) \), then, gives us the probability that \( y \) could have been generated by \( x \) rather than, say \( x' \) or \( x'' \) or whatever. Incidentally, paragraphs 5.2.5 and 5.2.6 of the guide offer a provocative glimpse of some of these ideas. More will be said later on thinking of true values as variables.

As Eq. (2) shows, determining measurements decision risk requires a knowledge of statistical distributions, which are embodied in probability density functions. Such knowledge may be difficult to obtain in practice. Fortunately, in many cases, we encounter symmetric distributions, such as the normal distribution. To describe these we need only category A and B uncertainty estimates and some knowledge of their mean values.

It might be argued that decisions can be based on knowing only measured values and uncertainty estimates — without knowing the distributions. Such decisions would presumably be made from a history of experience which has led to an ability to associate uncertainty estimates with likelihoods of alternative outcomes. It can readily be seen that what is being done is such cases is the cognitive equivalent to developing a mapping between uncertainty estimates and outcome likelihoods, i.e., developing statistical distributions and employing them to relate outcomes to uncertainties. Again, the uncertainty estimates themselves are of value only because they can be related to outcomes resulting from measurement decisions through the use of some kind of statistical distribution.

c. What is a true value?

In the guide, the parameter true value is used to develop an unambiguous notion of what an error is. This is relevant to the uncertainty analysis process, which strives to provide ranges of values which bound errors. Errors are presented as the difference between true values and measured values. Hence, the question "what is a true value?" This may seem like a specious query, but not nailing down what is meant by "true value" may lead some readers into bewilderment. This is partly because of the way in which true values are treated mathematically. In customary treatments, and in several places in the guide, true values are portrayed as immutable quantities, which could be ascertained without error if only our measuring devices were accurate enough. The connection between this concept and the use to which many people put their measurements may not be obvious to some. This is because the true value in a measurement situation is often a fluctuating quantity. For such situations, estimating an instantaneous true value appears to provide little or no benefit. So, why try?

It should perhaps be emphasized early in the guide that, in such situations, measurements are not made to estimate instantaneous true values per se. Instead, measurements are made to estimate some statistic, such as a population mean, that is worthwhile to obtain. This is done by taking a measurement or set of measurements of instantaneous true values. The value of the statistic is inferred from these measurements. There are sections in the guide where this view is suggested. It may be worthwhile to give its own section or, at least, devote some time to it in the introduction.

Treatting true values as variable rather than fixed quantities provides some additional benefit. This is discussed in item 8 below.

2. "Inaccuracy."

The term inaccuracy is defined in paragraph 3.10 as "A measure of the lack of knowledge of the true value of a quantity. Specifically, any one of several possible parameters characterizing the quality of a measurement result. See uncertainty. Uncertainty is defined in paragraph 3.09 as "A parameter aimed at characterizing the range within which the true value of a measurand is estimated to be (generally with a specified likelihood)." In the main, I found paragraph 3 (Terminology) to be extremely well thought out and very comprehensive. Many of the definitions presented are concise, informative and without blemish. I intend to flagrantly plagiarize them in future reports and papers.

However, the definitions of inaccuracy and uncertainty, and the subsequent use of these terms, leave me somewhat cold. This is because many researchers, myself included, have been using the term "uncertainty" to label the variable referred to in the guide as "inaccuracy" and have been using the terms "uncertainty limits," "control limits" or "uncertainty bounds" to label the variable referred to in the guide as "uncertainty." I have seen several instances where attempting to force definitions which run counter to established or common usage has led to failed systems. If creating objectionable hiccups in the lexicon is needed to clarify a given specialty or field of study, then, by all means, feel free. However, in this instance

6 Didn't somebody (I forget who) once say that plagiarism is the sincerest form of flattery? I thought about leaving off all reference to the author of this quote, but that would be plagiarism.

7 I heard that, in the early seventies, air pollution researchers, desiring to reduce the ambiguity of their terminology, defined smog as “nitrous oxides resulting from combustion of fuels.” Subsequent to this, tables were published indicating 'smog' levels attributable to principal sources of combustion. State and local officials were relieved to find that public buses and the like, which burned Diesel fuel, were not big smog producers, thereby obviating the need to control emissions from these vehicles. This was little comfort to the rest of us, however, who have been gagging, coughing, retching, etc. from the foul (but relatively nitrous oxide free) emissions of these vehicles. I don't know if this account is strictly true, but it made a good story anyway.
"Uncertainties"

I am unable to perceive the benefit of doing this. Perhaps others can enlighten me.

There is another reason why using the term "inaccuracy" to label "uncertainty" will result in semantic confusion. In paragraph 3.08, the guide defines accuracy as "The closeness of the agreement between the result of a measurement and the conventional or true value of the measurement." If this is "accuracy," then surely "inaccuracy" is the complement of it. But the complement of accuracy is, presumably, error, as defined in paragraph 3.06: "The difference between a measured value and the true value of the measurement (measured value minus true value)." I'm getting confused even looking at what I just wrote. Imagine the poor reader trying to understand measurement uncertainty analysis under this sort of semantic persecution. In view of this, I strongly recommend scrapping the term "inaccuracy" and all variations therefrom, e.g., combined (standard) inaccuracy, and reverting to a more universally palatable and internally consistent terminology.

3. Definition 3.22 — (overall) uncertainty

Overall uncertainty is defined as "combined standard inaccuracy" multiplied by the range factor." Two notes follow this definition:

"Note: 1. Due to our lack of knowledge of the probability density functions of the uncertainty components, overall uncertainty cannot be associated precisely with a given level of coverage.

Note: 2. Since the multiplication of the combined standard inaccuracy (which should itself always be stated) by the range factor does not change the information content, the use of a range factor is not recommended unless needed for legal or contractual purposes."

In my previous comments, I argue that estimates of uncertainties (or inaccuracies, to use the guide's term) are useful only in assessing consequences (risks) associated with making decisions based on measurements. This requires knowledge of at least the identity of the appropriate statistical distributions, as used earlier in Equation (2). I also stated that uncertainty estimates have no independent value in themselves. The point of view taken in the foregoing definition, and in many other places in the guide, is evidently precisely the opposite.

It seems to me, that the guide ventures onto shaky ground when it attempts to advise on what is or is not important to the reader (particularly in regard to calculating confidence limits). Perhaps the guide should confine itself strictly to the problem of estimating uncertainties, which it addresses admirably, without getting into what to do with these estimates once you've got them. The latter issue requires a great deal more thought by all interested parties — not just the guide's authors — regarding what people make measurements for. I also think this approach would help remove some of the guide's inconsistencies which will be discussed presently.

One final note on paragraph 3.22. Note 2 advises not worrying about using range factors unless motivated by legal or contractual purposes. Let me assure you that many of the guide's readers are going to say "what else is there?" For those of us engaged in using measurements to design, produce and test products, these purposes are often preeminent. Both are inextricably connected to staying in business, whether we're satisfying written contract clauses or attempting to avoid warranty problems of loss of future sales.

4. Paragraph 4.1.1 — Systematic Inaccuracy

This paragraph is one which I think adds considerable value to the guide in that it attempts to clarify the distinction between error and uncertainty. Implied in the language of the paragraph is the notion that we should not occupy ourselves with attempting to estimate errors. Errors, which are present in all measurement processes, cannot be known. We should, instead concern ourselves with estimating the uncertainty which characterizes our lack of knowledge of these errors. This is good advice. However, the paragraph 4.1.1 goes on to get itself in trouble by stating that there is "no such thing as a systematic inaccuracy [uncertainty]." Statements like this merely trigger the imagination of the reader, many of whom can probably come up with a veritable flood of examples of systematic uncertainty. Moreover, it is not clear what value the statement in question adds to the guide. I recommended it be deleted.

5. Paragraph 4.3.1 — Use of the Central Limit Theorem

The guide correctly states that "In order to be able to describe the uncertainty of [confidence in] the result of a measurement, one must be able to characterize the portability distribution of an estimate." The guide then goes on to say that all we need are the elements of the variance-covariance

\[^{10}\text{One only need think of a parameter which drifts linearly with time. If we're lucky, this linear drift can be estimated by a maximum likelihood straight line fit to data. Such a fit can be used to predict parameter bias, which drifts systematically with time. However, errors in the estimated coefficients which characterize the straight line can lead to}\
\text{systematic errors in the bias corrections. These errors also may drift, or even grow, with time (systematically, of course). In addition, the uncertainty associated with the coefficient estimates grows with time in a likewise systematic manner. Hence, "systematic uncertainty."}

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*There's that term again.*

*The range factor is a parameter which is just like a statistical multiplier used to compute confidence limits, only different.*
matrix for the measurement. Armed with these elements we can proceed "without the need to introduce additional details of the underlying probability distribution of the measurement errors." Then, in a seeming about-face on the matter of whether we need to use distributions, the guide asserts that, if we don't know what the distribution is, "it is often possible to assume a normal distribution because of its simple form and because it is the limiting distribution for a sum of random variables possessing distributions fr0 a wide class of distribution functions."

I'm certainly not going to take issue with assertion. There are indeed many instances where the central limit theorem can be invoked and the normal distribution can be assumed. However, I think that if guide recommends this practice, it should caution the reader to carefully evaluate his or her specific measurement process to see whether the practice is justified. In its defense, the guide does give the conditions under which the use of the central limit theorem is valid.

It is not difficult to conjure up measurement processes in which the central limit theorem is not very useful, such as when the measurement model is not expressed as a sum of statistically independent variables. Consider an example taken from the oil industry. In the process of recovering oil from wells noted for unspectacular production, steam is injected into oil deposits to soften up highly viscous zones to enable oil to flow more freely. The expense involved is justified if the process yields an increase in oil production whose value more than covers the costs associated with steam injection.

In the process, steam enters an "injection well" at ground level and is forced into a deposit through spaced perforations in the casing of the well. Maximizing oil production requires optimizing the distribution of steam injected over the vertical interface between the well casing and the oil deposit. To monitor this vertical distribution, samples are taken of measurements of flow rates of team exiting each perforation. The process of describing the steam injection distribution in terms of steam flow rates along the vertical interface is referred to as steam profiling [4].

The quantity which is most useful in steam profiling is the ratio of steam flow rate at a given perforation to the flow rate of the total steam injected into the well (i.e., what percentage of the 'investment' is being applied at a given point on the vertical interface). Accordingly, the variable of interest is called the "fractional steam flow rate" or "fractional flow rate." Fractional flow rates are obtained from measurements of steam flow rates as follows.

\[ x_n = \frac{m_{n-1} - m_n}{m_0} \]  (3)

For simplicity, assume that \(m_{n-1}\) and \(m_0\) are normally distributed quantities (they aren't exactly, but this is only an illustrative example, so I can get away with making outrageous assumptions). Assume further that, even though the quantities themselves are functionally related, measurements of their values are statistically independent. This is actually a pretty good assumption. Now, from Eq. (3) it is obvious that, even with the convenience of statistical independence, the uncertainties in \(m_{n-1}\) and \(m_0\) cannot be added linearly to obtain an overall uncertainty estimate. It might be asserted that recourse to the Taylor series expansion method [2] would allow a linear sum of uncertainties. This is justified if the uncertainty components are small. However, in the kind of application modeled by Eq. (3), the uncertainty components may range as high as twenty-five percent of the associated measured quantity. So, if we wish to estimate confidence limits for \(x_n\), we are forced to develop its statistical distribution. Fortunately, since the model is simple and \(m_0\) and \(m_{n-1}\) are assumed to be normally distributed, determining the pdf for \(x_n\) involves a straightforward (although tedious) convolution process. A good description of the convolution method is given in Reference [5].

You might think that I scoured around for an off-the-wall example just to prove a point. Nothing could be farther from the truth. The sorts of uncertainty analysis problems I seem to be encountering lately permit using any kind of simple additive uncertainty models.

6. Paragraph 4.5—"Random" and 'Systematic' Errors

Paragraphs 4.5.1 and 4.5.2 point out (I think) that the traditional labels "random error" and "systematic error" are sometimes not very useful. I would like to throw my hat into the ring and offer support to this view. First of all, the terms, "random error" and "systematic error" are often used to label not errors but rather uncertainties which arise from random or systematic sources. Actually, any given "error," i.e., departure from the truth, can be either random (fluctuating unpredictably) or systematic (fixed), depending on the time scale over which it is considered. This fact is stated in the guide.

Given all this, the terms "random" and "systematic" can still be pretty useful (provided they're not misused 14), and I would not like to see them completely excluded from the vocabulary.

11I picked the oil industry for an example because it is one business where measurement decision errors can have very expensive consequences.

12I apologize to petroleum engineers who will possibly wince at the simplifications used in this somewhat crude (no pun intended) description.

13It appears that the easy problems have already been solved.

14How's that for a tautology!
of measurement uncertainty analysis. I realize that early international efforts to develop a sensible approach to uncertainty computation encountered a neurosemantic mindset brought about by the terms "error analysis," "random error," and "systematic error." Not to anyone's surprise, the word "error" in these terms tended to mislead people into thinking that "error analysis" had something to do with estimating measurement errors. It has taken the ISO/BIPM years to overcome this misconception. This has evidently been accomplished, in part, by attempting to eradicate from use the terms in question. The effort was an heroic one and much needed, but do we still have to be sensitive to the words "random" and systematic? Has anyone checked lately to see if we still need to worry about individuals who persist in the idea that they can estimate errors? If so, then I withdraw my comment. If not, perhaps we can start using the forbidden terms again and begin examining how they can be put to good use.

7. Paragraph 5.1.2

For clarity, $s^2$ should be subscripted in Eq. (3) of paragraph 5.1.2:

$$s^2 = \frac{1}{n-1} \sum_{j=1}^{n} (x_{i,j} - \bar{x}_j)^2.$$  

A similar recommendation applies to Eqs. (4) and (5) of the same paragraph.

8. Paragraph 5.2.2 ff

The treatment in the guide for obtaining estimates of true values is perfectly applicable in cases where the true value can be taken to be a fixed quantity. As stated earlier, however, this may not always be appropriate. This is because, in certain kinds of measurement processes, true values can take on a distribution of their own. The bias parameter $b$ defined in paragraph 5.2.2 is still a useful quantity in such cases. For example, consider a situation in which the quantity $z$ and the mean $z_{true}$ are both variable which are distributed according to

$$f_z(dz_{true}) \rightarrow N(z_{true} + b, \sigma_z) \text{ and } f(z_{true}) \rightarrow N(\mu, \sigma_{z_{true}}).$$

In the measurement process, we want to get some feel for the magnitude of the quantity $w = z - \mu$. This involves determining the distribution for $w$. Since $z$ and $z_{true}$ each follow normal distributions, this is easy.\footnote{If you don't mind doing a convolution integral.} The pdf for $w$ turns out to be

$$f(w) = \frac{1}{\sqrt{2\pi(\sigma_z^2 + \sigma_{z_{true}}^2)}} e^{-\frac{(w-b)^2}{2(\sigma_z^2 + \sigma_{z_{true}}^2)}}.$$  

i.e., $w$ also follows a normal distribution. The mean of $w$ is $b$, as in the case where the true value is fixed, but the variance of $w$ is the sum of the variances of the measured quantity and the true value. It might be argued that, in this example, the real true value of interest is not $z_{true}$ but is, rather, the mean $\mu$, and that the quantity $\sigma_z^2 + \sigma_{\mu}^2$ is equivalent to the quantity $\sigma_z^2 + E(b^2)$ given in paragraph 5.2.2 of the guide. I won't quibble with this. But I would argue for presenting the measurement uncertainty analysis problem in terms which acknowledge the possibility that the quantity being measured is itself often a random variable. This helps us to better isolate and focus on all sources of uncertainty, not just those surrounding the $c$ system.

9. Paragraph 5.2.9 – Estimated Limits of Error

This paragraph cautions against assuming a normal distribution for uncertainty estimates in all cases and advises that sometimes it is better to work from a realistic estimate of 'limit of error' than to attempt to guess a variance as a component of uncertainty. The guide's recommendation for cases where all that is stated is that the parameter of interest is confined within a given range $[B_-, B_+]$ is to assume a uniform distribution:

$$f(x) = \begin{cases} \frac{1}{B_+ - B_-} & B_- < x < B_+ \\ 0 & \text{otherwise} \end{cases}$$  

The simplest case is when the range is symmetric, i.e., $B_+ = -B_-$. Then Eq. (4) becomes

$$f(x) = \begin{cases} \frac{1}{2B} & -B < x < B \\ 0 & \text{otherwise} \end{cases}$$  

It is important to bear in mind that the limits of error $\pm B$, if not obtained through statistical analysis, are usually a guess estimate provided by a human being.\footnote{Or the supervisor of a human being, which is sometimes almost the same thing.} Given this, it is of some interest to calculate the variance in $x$:

$$\sigma_x^2 = \int_{-B}^{B} f(x)(x - \mu_x)^2 dx$$

$$= \frac{1}{2B} \int_{-B}^{B} x^2 dx$$

$$= \frac{B^2}{3}.$$  

This is the same result that would be obtained by assuming that the specified limits are equivalent to $\pm \sqrt{3} \sigma_x$ confidence limits for a normally distributed variable $x$. This corresponds
to a confidence level of about 90% (actually, closer to 92%). It may be that the person (possibly a design engineer) supplying the ±B limits believes or, better yet, knows that x is normally distributed and likes 90% for a confidence level. This may seem strange, but in talking to some of the people who dream up equipment specs, you soon realize that they have an interesting attitude toward what these specs should mean. They are capable of invoking some of the most inventive (and puzzling) tricks for building "confidence" in their estimates.17

This brings me to the reason why I'm singling out paragraph 5.2.9 for comment. Namely, that I think we need to do some research into what thought processes are percolated through in offering a limit of error estimate.18 Are such limits "those which are expected to bound all values experienced in practice" or are they something else? If they are the former, then, then, if ±B will do the job, so will ±2B, or ±4B, etc. Since these are all correct, which do we choose? Perhaps limits of error should be thought of as "minimum limits which are expected to bound all values experienced in practice." If so, what is the meaning of "minimum" in the mind of the geoscientist? Hopefully, trying to answer such questions may reduce some of the hilariously extravagant uncertainties frequently encountered in trying to develop or use Category B estimates. At least, such a noble endeavor may help define some groundrules for making guesstimates and thereby might lead to some degree of standardization.

11. Paragraph 6.2.4 – Final Advice

Paragraph 6.2.4 refers back to the result of paragraph 6.2.3, which gives expressions for uncertainty estimates and their associated degrees of freedom:

$$u^2(y) = \sum_k A_k u_k^2,$$

(7)

and

$$v = \sum_k \frac{A_k^2 u_k^4}{v_k}$$

(8)

In Eq. (7), the variables $u_k$ are the uncertainties in the variables $x_k$. In Eq. (8), the variables $v_k$ are degrees of freedom for the uncertainties $u_k$. Paragraph 6.2.3 states that the results of an instrument calibration, for example, can be passed on in terms of just $u^2$ and $v$. Paragraph 6.2.4 comments on this:

"The primary advantage of this is that the quantity $u^2$ is essentially distribution-free, no assumptions need be made about the specific underlying 'law' of the 'distribution of errors' other than the existence of finite moments."

Actually, the quantity $u^2$ is distribution free only if a certain set of conditions is satisfied. These conditions may be extracted from a careful reading of the guide, but they should be reiterated prior to extolling the virtues of $u^2$.

12. Paragraph 7.3.3

Paragraph 7.3.3 basically restates Note 2 in paragraph 3.22 and adds that the range factor should be between 2 and 3. For comment on this, see footnote 5.

LONG-AWAITED CONCLUSION

At this point, you might think that I harbor mostly negative thoughts about the guide. This is not true. Actually, I liked it. You can convince yourself of this, if you're interested, when you consider that the guide has over a hundred paragraphs, and I only explicitly remarked on twenty-one of them (I counted). If you're still not convinced, please refer back to some of my opening remarks, which were dripping with praise. I would encourage anyone interested in computing measurement uncertainties to read the guide, but I would caution prospective readers to be careful with some of its assumptions.

At any rate, I would like to conclude by encouraging the authors to continue their laudable effort. If any of them would like to discuss any or all of my comments, I would be happy to oblige.

Howard Castrup

REFERENCES

MEMORANDUM FOR: Members of the U.S. TAG for ISO/TC4/WG3

From: Samuel E. Chappell, Chief
Office of Standards Management
Office of Standards Services

Subject: Third Draft Guide to the "Expression of Uncertainty"

I am sending you enclosed a copy of the third draft "Guide to the Expression of Uncertainty in Measurement." This draft results from consideration of the last meeting of ISO/TC4/WG3 were taken into account. That meeting was held in West Berlin in November 1989 and chaired by Dr. E. Richard Cohen of Rockwell International. Dr. Barry N. Taylor of NIST also attended the meeting as an observer. A brief summary of the meeting is enclosed.

A meeting of ISO/TC4/WG3 has been scheduled for March 27-29, 1990 at ISO Headquarters in Geneva, Switzerland to discuss this new draft.

We would appreciate your reviewing this material and providing any comments that you might have. Comments received prior to March 23 will be brought to the attention of those who participate in the March meeting of ISO/TC4/WG3. Please let us hear from you, however, by no later than April 30, 1990, so as to ensure that your views will be considered in the next stage of development of this work.

If others who are not identified as members of the U.S. TAG are interested in this work, please inform them of this effort and encourage them to contact us and provide comments. Our intention is to inform as many interested parties and technical experts as practicable in order to reflect a U.S. consensus about this work.

Thank you in advance for your attention and contributions to this effort.
THIRD DRAFT

GUIDE TO THE EXPRESSION OF UNCERTAINTY IN MEASUREMENT
16 FEBRUARY 1990

ISO/TAG4/WG3

This third draft has incorporated the changes and comments from the Berlin meeting in November; I hope that I have included all of the significant changes. I have had only a partial response from those who were to submit alternative examples for Annex 3. I will assemble those contributions and all others that I receive in time as an addendum for the Geneva meeting March 27-28.

I have experimented with the introduction of the word 'inaccuracy' into the vocabulary to describe the estimated variances or equivalent variances of the observed quantities and influence coefficients. This allows a strict distinction between the observed variance of a set of repeated observations and the estimated variance of the observed mean. It also provides a distinction between the 'uncertainty' as defined in VIM and the equivalent variances. The total inaccuracy of the measurand is then simply the sum of the component inaccuracies; this avoids the clumsy 'square root of the sum of the squares' that is necessary only if the square roots are extracted prematurely. The term 'inaccuracy' is a place holder; if there is a better term available it can be substituted. The uncertainty is then given by the relation

\[ U = k \sqrt{u^2} \]

where the determination of the factor k is to be left to the individual Standards that will follow this Guide.

E. Richard Cohen

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1 INTRODUCTION

1.1 Background.

1.1.1 The concept of uncertainty as a quantifiable attribute of measurement is relatively new in the history of scientific measurement, although error and error analysis has long been a part of the practice of metrology. It is now widely recognized that, when all the known or suspected components of error have been evaluated, and the appropriate corrections have been applied, there still remains an uncertainty about the correctness of the stated result, i.e., about how well that value represents the quantity that the metrologist has defined as his measurand. It is therefore necessary, when reporting the result of measurement, to put a value on that uncertainty and to give an indication of the amount by which the reported result might deviate from the ideal (or "true") value. The stated uncertainty is itself uncertain; one deals with estimates, some derived from a statistical analysis of repeated measurements, some based on experience and on insight concerning the nature of the measurement and of the influence quantities.

1.1.2 In the past many authorities have thought it useful to express uncertainty in terms of "credible bounds", i.e., a pair of values of possible error that represent the maximum credible interval for the ideal. There are at least two objections, one of principle and the other of practice, to such a concept. First, credibility cannot have a sharp cut-off; there is no range of values outside of which the value is incredible and within which all values are credible. (While the "cosine effect" in length measurement produces an uncertainty in only one direction with a sharp cut-off is itself uncertain.) Second, if there is more than one "systematic" source of uncertainty and one assumes the worst case for all of them, so that the "credible bounds" are combined by arithmetic addition, experience generally shows the result to be unduly pessimistic. (If the bounds do add, the influence quantities are not independent but correlated, in which case the uncertainty analysis might be better formulated in terms of different variables.) Finally, the resulting expression of uncertainty of the measurement is of limited use: it may represent a range within which the "error" is believed to lie with high probability, ( > 95%, perhaps), but such a statement is useful only for legal or commercial purposes, it gives little help to the metrologist who wishes to make use of the result in his own measurements.

1.1.3 Where a result reported by one metrologist is used by another, the uncertainty of the first result must be incorporated into the reported uncertainty of the second result. Because there are, at the moment, no generally accepted international standards by which uncertainty should be reported, it is often far from clear how that should be done. This confusion led the Comite International des Poids et Mesures (CIPM), the world's highest authority in metrology, in 1978 to request its Bureau (BIPM), in conjunction with the national standards laboratories, to address the problem and make a recommendation. BIPM prepared a detailed questionnaire covering the issues involved, and distributed it to 32 national metrology laboratories (and, for information, to five international organizations) known to have an interest in the subject.

1.1.4 By early 1980 responses to the questionnaire were received from 21 laboratories. Almost all of the laboratories felt that it was important to arrive at an internationally accepted procedure for stating uncertainties and for combining them into a single "overall" uncertainty, but there was no consensus on how this was to be accomplished. BIPM then convened a meeting attended by experts from eleven national laboratories for the purpose of arriving at a uniform and generally acceptable procedure for the specification of uncertainty. This BIPM Working Group on the Statement of Uncertainties agreed on a Recommendation (Annex 1.1) that is a briefly outlined approach rather than an explicit algorithm or the specification of a method. This recommendation was subsequently adopted by the CIPM in October 1981 (Annex 1.2) and amplified in 1986 (Annex 1.3).

1.1.5 CIPM then referred the matter of developing a detailed document to the International Standards Organization (ISO) as the appropriate body for achieving international agreement and uniformity. Responsibility was assumed by ISO Technical Advisory Group 4 (TAG4) since it is the coordinating channel for measurement issues of common interest to ISO and the International Electromechanical Commission (IEC), the two world-wide standardization bodies, and to BIPM and the International Organization of Legal Metrology (OIML), the two world-wide metrology organizations.

1.2 Terms of Reference.
The present working group (ISO TAG 4/WG 3) consists of experts nominated by the represented organizations and was constituted under the following terms of reference:

"To develop a guidance document based upon the recommendation of BIPM Working Group on Uncertainty which provides rules on the expression of measurement uncertainty for use with standardization, calibration, laboratory accreditation and metrology services;

"The purpose of such guidance is

• to promote full information on how uncertainty statements are arrived at,
and
• to provide a basis for the international comparison measurement results."

2 SCOPE

2.1 This Guide gives a procedure for expressing the uncertainty of a measurement that is:

1. general in the sense of being applicable to a variety of measurement fields, purposes, and user groups;

2. specific in the sense of being practical, relatively simple, and providing explicit directions for application; and

3. self-consistent in the sense that the expression of uncertainty is based on a single set of principles such that the overall expression of uncertainty will be indifferent to the manner in which the uncertainty is decomposed into component or in which subcomponents are combined into components. In particular, the information required in the specification of uncertainty is such that "imported" uncertainties are consistent with uncertainty components derived or evaluated within the measurement procedure.

2.2 This Guide is intended to be applicable to the broadest possible range of fields of metrology (e.g., mass, electricity, fluid flow, analytic chemistry, radiation) as well as for various purposes at different metrology levels. Although the full detail developed here may not be applicable to all cases, the principles of the Guide should be generally useful. It is expected that the standards to be developed will take from it as much detail as is appropriate, consistent with the objectives of the measurement and the level of accuracy required. It is hoped that these principles will be applicable to the full range of metrology, from high accuracy measurements in basic research and metrological standards to international standards comparisons, national laboratory standardizations, secondary standards laboratories, testing and calibration services, legal metrology, production-line quality control and "shop-floor" measurements.

Ed. Note: There followed the rest of the draft.

LLOYD B. WILSON
1917-1990

We just received word from Mrs. Wilma Wilson at press time that Lloyd Wilson had passed away on April 12, 1990. She noted that he had succumbed after a long and valiant fight with cancer.

Older NCSL member delegates will remember that Lloyd was one of the three-founding-W's of NCSL. Wilson of Sperry, Woodington of General Dynamics, and Wildhack of NBS. Here are a few excerpts from the 25th Anniversary Issue.

"The first reference to the formation of a standards laboratory organization was made by Harvey Lance, NBS, Boulder, on 22 June 1960, at the Conference on Standards and Electronic Measurements, held in Boulder. In his paper, "The Nation's Electronic Standards Program: Where Do We Now Stand?", Harvey posed six problems concerning standards laboratories operations, and concluded by suggesting the need for some sort of association of standards laboratories to help solve these problems.

. . . . The General Arrangements Committee met at noon, on 24 June 1960, and appointed an Ad Hoc committee with Curt Biggs as Chairman, Harvey Lance as Executive Secretary, and Amey, Geist, Wildhack and Wilson as the other members.

. . . . After the resolution was adopted, the Executive Committee selected Lloyd Wilson and Charles Johnson as the first Chairman and Vice Chairman, respectively, of the NCSL General Committee."

And the Newsletter shows a 4 Dec. 1961 letter from Dr. A.V. Astin, Director of NBS, addressed to General Chairman Wilson, in which NBS accepted the sponsorship of NCSL, which shows that a lot of organizing took place in the intervening months. So although Curt Biggs chaired the Ad Hoc Committee, Lloyd was the organization's first formal Chairman. We owe him and all the other intrepid organizers of that time our thanks.

Editor
New Program and Directions at the National Institute of Standards and Technology

Reprinted from the NIST Journal of Research, Jan.-Feb., 1990

Volume 95  Number 1  January-February 1990

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The Trade Act of 1988 created the National Institute of Standards and Technology (NIST) from the National Bureau of Standards (NBS). In addition to explicitly defining and reconfirming the traditional measurement services, the law assigned new responsibilities to NIST to assist U.S. industry in capitalizing on new technologies developed in the U.S. scientific and technical community at a faster rate. This article describes the new programs being established at NIST to comply with this mandate and the new organizational unit at NIST that brings together the traditional services and these new programs.

Key words: Advanced Technology Program; Clearinghouse for State Technology Programs; Manufacturing Technology Centers; State Technology Extension Program; Technology Services.

Accepted: November 14, 1989

1. Introduction

The rapid loss of competitiveness of American industry in international markets is an extremely serious problem with wide-ranging consequences for the United States’ material well-being, security and political influence. Its causes are many, but among them certainly are the slow rate at which new technology is incorporated in commercial products and processes, and the lack of attention paid to manufacturing. There is a clear need to compete in world markets with high-value-added products, incorporating the latest innovations, manufactured in short runs with flexible manufacturing methods. Research, management, and manufacturing methods that support change and innovation are key ingredients needed to enhance our Nation’s competitive position.

Many ideas originating in the American scientific and technical community are being commercially exploited in other parts of the world. As a nation, we have been slow to capitalize on new technology developed from America’s own intellectual capability. In the past, small and mid-sized companies have led U.S. industry in innovation. Our government must now find ways to help such companies meet the demands of global competition, when the speed with which firms are able to translate innovations into quality commercial products and processes is of utmost importance.

The Omnibus Trade and Competitiveness Act signed into law on August 23, 1988 is the result of policymakers’ endeavors to create a new framework and environment that can enhance the rapid commercialization of technology. Among other things the Act created the National Institute of Standards and Technology (NIST) from the National Bureau of Standards (NBS) and assigned to it several new and expanded functions which build on the technical expertise of NBS. NIST will maintain the traditional functions of NBS in support of U.S. industry and will continue to offer the full
array of measurement and quality assurance services including calibration services, standard reference materials, standard reference data, and measurement assurance programs.

The NIST resources are still quite modest when compared to research and development expenditures by industry and the federal government, or with the more than $550 million expenditure by the various states for technology development and commercialization. However, the new programs being developed by NIST in response to the new legislative assignments are designed to be collaborative, highly leveraged, and serve as examples to be followed by others with greater resources.

2. New NIST Organizational Unit

A new major organizational unit, Technology Services (TS), was established in NIST to bring together the new assignments, which are mainly extramural, and the traditional NIST (NBS) services which have been, and are now more than ever, an important link in our Nation’s efforts to improve its industrial competitiveness. Figure 1 shows the organizational placement of the new unit within NIST. Figure 2 shows the organizational structure of Technology Services in more detail.

3. New Programs

The Act assigns to NIST four new major programs designed to assist private sector initiatives capitalize on technological innovations; advance R&D projects which can be optimized for commercial and industrial applications; and promote shared risks, accelerated development, and pooling of skills necessary to strengthen America’s manufacturing skills. The new programs are:

* the Regional Centers for the Transfer of Manufacturing Technology,
* the State Technology Extension Program,
* the Advanced Technology Program,
* the Clearinghouse for State Technology Programs.

3.1 Regional Centers for the Transfer of Manufacturing Technology

The objective of the regional centers is to bring modern automated manufacturing technology to small and mid-sized manufacturing firms. The program focuses on technologies appropriate to firms in a selected geographic region and emphasizes “hands on” experience and “off the shelf” technologies. Three organizations have been selected to become the first NIST Regional Manufacturing Technology Centers: The Great Lakes Manufacturing Technology Center at the Cleveland Advanced Manufacturing Program in Cleveland, Ohio; The Northeast Manufacturing Technology Center at Rensselaer Polytechnic Institute in Troy, New York; and The Southeast Manufacturing Technology Center at the University of South Carolina in Columbia, South Carolina. NIST has now established cooperative working agreements with each of these organizations.

3.2 State Technology Extension Program

The objective of the extension services program is to improve the use of technology, particularly federal technology, by small and mid-sized businesses. A number of federal, state, and local sponsored extension services already exist, but most of the services offered are focused on business assistance rather than technology. In addition, most of the organizations providing extension services do not have sufficient technically trained personnel nor the technical resources needed to help small companies with their technological needs. This NIST program will help to coordinate the state and local extension services with federal technology transfer programs by working with the existing delivery network; provide technology assistance to extension services as appropriate; develop and conduct workshops/seminars on technological issues; and expand the distribution and utilization of NIST services.

3.3 Advanced Technology Program (ATP)

The objective of this program is to accelerate the commercialization of scientific discoveries and manufacturing technologies, particularly by small entrepreneurial firms. This program will provide limited federal funding to encourage and leverage private sources of support for developing generic technology, developing new products from specific projects, and improving existing manufacturing processes.
Figure 1. Organizational placement of Technology Services within NIST.
NIST has developed a preliminary ATP program plan that calls for the initiation of eight operating program components (see table 1) that together would:

* encourage U.S. business to look to the future and to improve their competitive positions through technological innovation,
* capture greater civilian market potential from existing Federal investment on basic research,
* systematically vector different aspects of Federal research investments to follow-on funding from state and local governments.

3.4 Clearinghouse for State Technology Programs

The objective of this program is to develop a central base of information on programs already in place and document the results that can be measured as a resource for state and local governments to utilize when deciding on new technology investments. NIST will acquire information through the development of a network of technical contacts within the state and local policy level staff, and through the collection of information on current programs. The clearinghouse will provide the type of information needed at the state and local level by governors, county executives, mayors, and other decision makers as they plan new programs and make policy decisions. The total investment at the state level is large and the influence on the overall direction of U.S. high technology and, hence, the impact on the nation's balance of trade will be substantial. The availability of a quality data base on state technology programs is an essential resource for the decision makers.
Table 1. Advanced Technology Program (ATP) options

• Emerging Technologies Consortia
  Provide start-up support for joint R&D ventures to rapidly develop generic technologies having exceptional long-term commercial promise.

• Manufacturing Research Consortia
  Provide start-up support for joint R&D ventures to create generic improvements in manufacturing technology or improved productivity and quality control.

• Business-Federal Laboratory Partnership
  Provide funding matched with private sector funds to extract commercially promising technology from federal labs.

• Business-University Partnership
  Provide funding matched with private sector funds to extract commercially promising technologies from universities.

• SBIR Phase III Technology Development
  Provide follow-on support for commercially promising Small Business Innovation Research (SBIR) Phase II Projects.

• Invention Evaluation
  Provide seed support for highly ranked, commercially promising inventions from extension services program.

• Business-State Partnership
  Provide leverage funding with state programs to insure local follow-on support for commercially promising projects.

• Prototype Engineering Research
  Provide support for successfully completed ATP projects with exceptional commercial potential but low private sector funding appeal.

4. Conclusion

Our new name, National Institute of Standards and Technology, reflects the broadened role and the new responsibilities. NIST will continue to serve as the Nation's central laboratory for developing and disseminating measurement standards and scientific data for service, engineering, manufacturing, commerce, industry, and education. The combination of our new assignments and the traditional NBS measurement and quality assurance services under the new organizational unit (TS) will enable NIST to focus more effectively on its new purpose, "to assist industry in the development of technology and procedures needed to improve quality, to modernize manufacturing processes, to ensure product reliability, manufacturability, functionality, and cost-effectiveness, and to facilitate the more rapid commercialization... of products based on new scientific discoveries."

About the author: D. R. Johnson is Director of Technology Services at the National Institute of Standards and Technology in Gaithersburg, MD.

By Maureen Breitenberg
Office of Standards Code and Information
National Institute of Standards and Technology
U.S. Department of Commerce

The European Community’s plan for a Single Internal Market in 1992 will substantially alter the business environment in Europe, with new laws designed to facilitate the free movement of goods, people, capital, and services. Perhaps the most far-reaching changes affecting the product sector will occur in the standards, testing, and certification areas. The EC’s goal is to develop harmonized regional standards for key product areas and a Community system for product testing and certification.

To benefit from EC 1992, U.S. industry must have up-to-date information on the flow of decisions being made in preparation for the completion of the internal market. U.S. industry can then be in a position to support actions that reduce or eliminate barriers to trade and achieve the greatest advantages for U.S. enterprises. Companies must also have information on new and existing standards and product acceptance procedures in order to maintain market positions and to develop opportunities for increased export sales. The European commitment to adopt international standards as new regional standards, where these are available, makes it critical for U.S. firms to have access to information on standards activities at both the international and European levels.

The Office of Standards Code and Information (OSCI), within the Commerce Department’s National Institute of Standards and Technology, can provide information and technical assistance to facilitate timely and effective U.S. responses to standards-related activities. OSCI operates the U.S. “inquiry point” for the GATT Standards Code; maintains a national repository of standards and certification information; and provides a “technical office for non-agricultural products” to investigate problems relating to non-tariff trade barriers. These activities fulfill three major functions specified by the U.S. Trade Agreements Act of 1979, which implemented the Agreement on Technical Barriers to Trade (popularly known as the Standards Code) of the General Agreement on Tariffs and Trade (GATT). OSCI staff serve on the Interagency Task Force on EC 1992 and the Working Group on Standards, Testing, and Certification as part of broader activities related to standards and trade.

OSCI’s U.S. inquiry point staff receives from the GATT Secretariat in Geneva, notifications of proposed foreign regulations from other signatories to the Standards Code, including the EC itself and its member nations: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom. The staff then disseminates GATT notifications (and, on request, their texts) to U.S. industry and to other U.S. federal and state agencies. The inquiry point also publishes the IJTS--news, a newsletter that contains information related to proposed regulations, standards, and trade.

OSCI’s technical office assists U.S. manufacturers and exporters with respect to specific technically-based, standards-related trade issues; develops technical positions for U.S. negotiators in bilateral and multilateral discussions; monitors the adequacy of U.S. participation in international standardization efforts; handles complaints from representatives of U.S. industry concerning foreign standards and certification practices that might be considered technical barriers to trade; and reviews and transmits U.S. comments on proposed foreign regulations through our embassies to the appropriate foreign government organizations. Technical office staff have given many talks to industry and government groups on the EC 1992 program to encourage awareness of the changes taking place in the European market. They have counseled and provided information and related services to U.S. interests regarding standards-related aspects of the EC’s legislative program and new EC approaches to standards development and certification.

The National Center for Standards and Certification Information (NCSCI) in OSCI is the central repository of standards-related information in the United States. NCSCI maintains a reference collection of standards and related documents published by many foreign national and international organizations. NCSCI has recently obtained catalogues and memos from both the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC). CEN and CENELEC develop European Standards (ENs), Harmonized Documents (HDs), and European prestandards (ENVs), which are recognized throughout Europe. The Center also subscribes to the Official Journal of the European Commu-
ilities, which includes announcements of proposed and final EC regulations and directives and other information.

NCSCI responds annually to more than 6,000 domestic and foreign requests for information on the existence, availability, and sources of proposed and final standards and regulations. The Center does not provide copies of documents, but does refer requesters to appropriate sources for copies and/or additional technical information. Requests for information should always be as detailed as possible, identifying the specific product of interest, its function, and all terms necessary to identify and locate the appropriate information.

The EC has stated as a matter of policy that international standards from organizations such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) should be adopted or developed (if time permits) in lieu of the development of CEN or CENELEC standards, and that ISO and IEC technical committees should be apprised of CEN and CENELEC technical committee activities. Since this policy provides an opportunity for U.S. input to European standards, U.S. industry should be encouraged to participate in ISO and IEC standards activities.

NCSCI serves as the U.S. member of the ISO Information Network (ISONET), an agreement between national standardizing bodies to combine their efforts in order to make information on standards, technical regulations, and related matters readily available whenever and wherever it is required. As a member of ISONET, NCSCI is recognized as the principal national U.S. source for information on standards, technical regulations, certification systems, and related matters in the United States. Through ISONET, NCSCI is linked with the information centers of other ISONET members, including all EC countries except Luxembourg; the European Free Trade Association (EFTA) countries of Austria, Finland, Norway, Sweden, and Switzerland; and with the ISO Information Center in Geneva, Switzerland.

OSCII works closely with Foreign Commercial Service (FCS) Officers attached to U.S. embassies and missions in Europe and around the world, sending them copies of all OSCII publications and providing standards-related technical support on request. The FCS Officers, in turn, have proven helpful in obtaining information on foreign standards and regulations and in gathering U.S. comments on proposed regulations transmitted to the appropriate government officials.

OSCII has also published several directories and other publications which contain information useful to those involved in trade with Europe. These include A Summary of the New European Community Approach to Standards Development, A Review of U.S. Participation in International Standards Activities, and an update of that information, and a directory on international and regional organizations which conduct standards related activities. On request, OSCII will provide a list of publications and information on how they can be obtained. Organizations and individuals are also encouraged to visit the Information Center at NIST on the sixth floor of the Administration Building in Gaithersburg, Md., and to take advantage of the information and other materials in the collection.

Requests for additional information should be directed to: NCSCI, NIST, Bldg. 101/A-629, Gaithersburg, Md. 20899, tel. (301) 975-4040, fax (301) 975-2128, telex TRT, 197674 NIST UT.
‘A Commerce Department Analysis Of European Community Directives’

By the end of 1992, the European Community hopes to remove most barriers to the free movement of goods, services, people, and capital within the Community, resulting in a single, $4 trillion market of 320 million consumers. The 1992 program will fundamentally alter the regulatory and competitive environment of Europe. Based on analysis and discussions with U.S. industry, the Commerce Department believes that the completion of the internal market should benefit U.S. companies doing business in Europe. However, there is a danger if the 1992 program is implemented in a less than open fashion. Working with some 100 trade associations, Commerce has undertaken an extensive program to review the EC’s 1992 directives, and has begun publishing a series of volumes that analyze them. The first, published in June 1989, covers 66 directives on industrial products and services. A second volume has just been published; it analyzes 54 directives on company law, trademarks, and processed foods. Following is a summary of the general findings published in both volumes. Ordering information is printed below.

The European Community is collectively the most populous market in the industrialized world, with a combined gross domestic product (GDP) nearly the size of that of the United States. Yet, the EC’s economic performance over the last ten years has lagged behind that of Japan and the United States in terms of growth rate, productivity levels, and job creation.

One factor behind this lackluster performance is that the EC remains a fragmented market. Internal frontiers slow down and add costs to cross-border shipments. Public purchasing, which accounts for 15 percent of EC GDP, is awarded in 98 percent of all cases to national firms. Restrictions on cross-border banking and insurance prevent providers from offering services in a more efficient and economical way. A plethora of different standards can cause companies to produce to as many as 12 different sets of standards, or, worse, not export to other member states at all because of cost.

The 1957 Treaty of Rome committed EC member states to eliminating tariffs among themselves as well as to erecting a common external tariff, forming a common market. A customs union was completed ahead of schedule in 1968, but after that, the EC’s integration program languished. Numerous fiscal, physical, and technical barriers to trade within the Community remain. Since 1985, there has been renewed interest in completing the project laid out some 30 years ago. The 1992 program attempts to eliminate most of the remaining barriers to intra-EC trade, and thus complete the internal market.

The centerpiece of the program is the implementation of EC directives and regulations which eliminate the remaining barriers to trade:

- The elimination of physical barriers within the EC should save businesses millions of dollars in reduced transport costs and result in significant time savings. Stoppages at intra-EC customs posts will be reduced, if not altogether eliminated. The new EC Single Administrative Document has already been introduced, eliminating the need for scores of different customs forms.

- The elimination of technical barriers to trade within the EC should open previously closed national markets, such as insurance, telecommunications, and government procurement. The Community’s ‘‘New Approach’’ to industrial standards will facilitate the standardization of a company’s production, packaging, and marketing operations for its business in the Community. If a product can be sold in one EC member state, it can be sold in all.

- The elimination of fiscal barriers to trade, such as differing value-added and excise tax rates, is intended to reduce intra-EC border controls. As noted above, an internal market without frontiers will result in major cost and time savings.

The EC hopes that the creation of a single internal market will promote European commerce. Unification should lead to cost reductions, economies of scale, productivity improvements, and stronger European firms.

U.S. companies doing business in Europe should stand to gain from the completion of the internal market. U.S. firms can benefit just as the Europeans do from productivity and efficiency gains, and cost reductions on transportation and administrative items. In addition, article 58 of the Treaty of Rome entitles all firms organized under the law of an EC member state to be treated as European firms. Thus, U.S. companies so organized in Europe should be treated as European firms. Finally, higher real GNP for Europe means increased demand for goods and services. In many sectors, the United States is well positioned to take advantage of new demand.

Many U.S. companies will find the EC an attractive market for the first time, once they find they can sell a product made to one set of specifications throughout the $4 trillion market instead of modifying products for 12 smaller markets.

At the same time, EC 1992 will be a challenge to U.S. companies. The EC...

How to Get Copies of the Commerce Department’s EC Reports

The first two volumes of the Commerce Department’s series of reports analyzing the European Community’s 1992 directives are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. They are both titled EC 1992: A Commerce Department Analysis of European Community Directives. Volume 1 (GPO stock no. 003-009-00557-4) is 184 pages and costs $10.00; Volume 2 (stock no. 003-009-00564-7) is 180 pages and costs $9.50.
hopes that by having a single large market as a home base, and by fostering industrial cooperation among firms, larger and more efficient competitors will be produced. If this happens, European firms will be more effective rivals to American firms, not only in the EC but also in third-country markets.

Volume I of this series identified several EC directives and policies that could result in discrimination against non-EC firms. For example, new EC policies in road and air transport and broadcasting services reserve certain benefits of liberalization to EC-based firms. And, the reciprocity provisions in some of the proposed financial services directives could be used to deny many of the non-EC institutions access to newly liberalized financial markets within the EC.

Reciprocity has been a principal focus of U.S. discussions with the EC. The U.S. Government has argued for national treatment and has opposed any measures that could result in discrimination or protection. In May 1989, the EC revised the second banking directive’s reciprocity provisions towards national treatment. However, other financial services directives still contain the original language on reciprocity.

Volume I also discusses U.S. industry’s concerns about the lack of transparency and the potential for discrimination in the EC’s “New Approach” to standards, testing, and certification. Since that volume was written, Secretary of Commerce Robert Mosbacher traveled to Brussels to hold discussions with standards officials at the EC Commission, and the presidents of CEN and CENELEC (the European Committee for Standards and the European Committee for Electrotechnical Standardization, respectively), two important European regional standards bodies. One of the most important results of the discussions was an agreement between the EC Commission and the U.S. Government that pledges the EC to make efforts toward increasing transparency in the standards making process. Another result of the talks was CEN and CENELEC’s decision to allow non-EC experts, including U.S. exporters, to make representations to CEN and CENELEC about particular standards on an ad hoc basis.

Secretary Mosbacher’s discussions are part of what is expected to be a continuing dialogue among the European and the U.S. standards communities on standards, testing, and certification issues raised by EC 1992.

The second volume in the series examines EC directives and regulations on processed foods, company law, and trademarks. Reading the individual directives and regulations by themselves does not give a complete picture of the changes the Europeans are proposing in these areas. Thus, an overview of the changes along with a discussion of their consequences is presented.

The Department of Commerce will publish one additional volume of analyses in 1989. Volume 3 will cover product and service directives not analyzed in the first two volumes, as well as the EC’s new rules for government procurement.

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**U.S. Department of Commerce Resources on EC 1992**

For information on the 1992 Internal Market Program, copies of the Single Internal Market regulations, background information on the European Community, or assistance regarding specific opportunities or potential problems, contact:

**Single Internal Market: 1992 Information Service**
Office of European Community Affairs  
U.S. Department of Commerce  
Room 3036  
14th St. and Constitution Ave., NW  
Washington, D.C. 20230

Charles Ludolph, Mary Saunders, or Greg O’Connor.  
Office of European Community Affairs, tel. (202) 377-5276

The following Trade Development industry experts can provide sector-specific advice on the impact of EC 1992 on U.S. industry:

- Michael Hutchison, Textiles and Apparel, tel. (202) 377-2043
- Fred Elliott, Service Industries, tel. (202) 377-3734
- Myles Denny-Brown, Science and Electronics, tel. (202) 377-4466
- Mary Ann Smith, Chemicals, Construction, and Basic Industries, tel. (202) 377-0132
- Bruce Miller, Automotive Products and Consumer Goods, tel. (202) 377-2762
- Kay Thompson, Capital Goods and International Construction, tel. (202) 377-2474
- Marci Kenney, Aerospace, tel. (202) 377-8228

For information regarding Trade Development’s Outreach Program on EC 1992 to the sectoral trade associations, contact:

- Debra Miller, Office of Industrial Trade, tel. (202) 377-3703

For further information on European standards, contact:
- Patrick Cooke, National Institute of Standards and Technology, tel. (301) 975-4033
6TH BIENNIAL SYMPOSIUM ON OPTICAL SYMPOSIUM
FIBER MEASUREMENTS

The National Institute of Standards and Technology (NIST),
in cooperation with the Institute of Electrical and Electronics
Engineers (IEEE) Optical Communications Committee and
the optical Society of America, will sponsor the 6th biennial
Symposium of Optical Fiber Measurements on September 11-

The Symposium will include measurements on
telecommunications fibers (attenuation, cut-off wavelength,
mode-field diameter, polarization properties, geometry/index
profile, reflectometry), fiber lasers and amplifiers, fibers for
sensors, couplers, connectors, multiplexers, integrated optics,
sources, detectors, modulators, switches, long-haul systems,
LANs, subscriber loops, field and laboratory instrumentation,
and standards.

For more information, contact the General Chairman,
Douglas L. Franzen, or call (303) 497-3346.

Symposium on Optical Fiber Measurements
National Institute of Standards and Technology (724.02)
325 Broadway, Boulder, CO 80303-3328

SEVENTH SYMPOSIUM ON TEMPERATURE, ITS
MEASUREMENT AND CONTROL IN SCIENCE AND
INDUSTRY

April 28 to May 1, 1992, Toronto, Canada,

This symposium will be held in conjunction with the semi-
annual exposition of the Instrument Society of America
(ISA). It's cosponsored by ISA, the AIP, NIST, and the
National Research Council of Canada. The General
Chairman and Program Chairman will be Larry Rubin and
Jim Schooley. Please address future inquiries to:

Mr. Larry Rubin, Francis Bitter National Magnet Lab, MIT,
Building NW 14, 170 Albany Street, Cambridge, MA 02139,
Tel: (617)253-5517, FAX: (301) 253-5404.

or

Dr. James Schooley, Temperature & Pressure Division,
Room B-128, Phys. Bldg., National Institute of Standards &
Technology, Gaithersburg, MD 20899, Tel: (301) 975-4815,
FAX: (301) 975-3038.

THE NINTH NATIONAL CONFERENCE ON EDP
SYSTEM AND SOFTWARE QUALITY ASSURANCE
TECHNOLOGIES FOR THE '90S

October 22-24, 1990, Washington, D.C.

This conference will be the conference for professionals
responsible for EDP System and Software Quality Assurance.
Learn the latest in emerging QA technologies, tools, metrics
and management for the new decade.

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* Quality Metrics.

U.S. Professional Development Institute, EDP System and
Software Quality Assurance, 1734 Elton Road, Suite 221,
Silver Spring, MD 20903-1733, (301) 445-4400 – FTS (202)

UPDATE FOR COURSE SCHEDULE FOR COAST
QUALITY UNCERTAINTY COURSES

See April, 1990 issue, page 27 for course details.

Sept. 24-28, 1990   Toronto, Canada
Feb. 4-8, 1991   Anaheim, Calif.
Tuition Changes

$U.S. 825 per person, $U.S. 785 or 3-5 persons, $U.S. 750 for more than 5 persons if payment, purchase order, or equivalent if received at least four weeks prior to the class starting date;

In-House courses, North America: $U.S. 8,250 for up to 15 persons. Additional $250 for each person in excess of 15 up to a total of 30 persons.

CONTACT: Marlene Chandler, Coast Quality Systems, 35 Vista del Ponto, San Clemente, CA 92672-3122, (714) 492-6321

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LASER MEASUREMENTS SHORT COURSE

August 28-31, 1990
Doubletree Hotel
Vail Colorado

Course Description

The National Institute of Standards and Technology (formerly the National Bureau of Standards), in cooperation with the University of Colorado and industry, will offer a Short Course in Laser Measurements at Vail, Colorado, August 28-31, 1990. The three-and-one-half day course will emphasize the concepts, techniques, and apparatus used in measuring laser parameters and will include a visit to the NIST laser measurement laboratories. The faculty will consist of laser experts from NIST, industry, and other government agencies. A degree in physics or electrical engineering is assumed, and some experience in the use of lasers is desirable.

Course Outline

* Optics for Laser Measurements
  * Attenuation Techniques
  * Laser Operation
  * Basic Laser Power/Energy Standards
  * Laser Power/Energy Measurement Techniques
  * Optical Fiber Power Measurements
  * Pulse Measurements
  * Transfer Standards
  * Beam Profile Measurements
  * Diode Lasers
  * Laser Measurement for Optical Communications
  * Statistics and Error Analysis
  * Laser Safety
  * Detectors

Fee

The Fee of $695 includes registration, course materials, coffee breaks, and lunch. It does not include housing or other meals. Please complete the registration form and return it with your check, payable to the University of Colorado, prior to July 27, 1990. Foreign registrants should send registration form by July 27 and pay the fee in U.S. dollars at conference registration.

For additional Information, Contact: Office of Conference Services, Campus Box 454, University of Colorado at Boulder, Boulder, CO 80309-0454, (303) 497-3651.

For specific program content information only, contact: Thomas Scott, National Institute of Standards and Technology, Boulder, Colorado 80303, (303) 497-3651.

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LIQUID AND GAS FLOW MEASUREMENT TRAINING COURSES

Course Schedule

Liquid Flow Measurement

August 8, 9, and 10, 1990

Gas Flow Measurement

August 13, 14, and 15, 1990

Both classes will be held from 8:00 am to 4:00 pm at the:

Hilton Hotel, 50 Warren Street, Lowell, Massachusetts 01852, (508) 452-1200.

Tuition

The tuition for each three-day training course is $645 per person. For individuals attending both the Liquid and Gas Flow courses, the total tuition is $1045. The tuition includes all course materials, a comprehensive notebook and refreshments during class hours.

LIQUID FLOW MEASUREMENT

Course Number 9007

Course Objectives:
After completing this course, each student will understand the optimum selection and use of liquid flowmeters. In addition, each student will understand how density and viscosity affect liquid flowmeters. Each student will also know how to calibrate liquid flowmeters using primary and secondary flow standards.

GAS FLOW MEASUREMENT

Course Number 9008

Course Objectives:
After completing this course, each student will understand the optimum selection and use of gas flowmeters. In addition,
each student will understand Gas Law calculations and how they apply to gas flow measurements. Each student will also know how to calibrate gas flowmeters using primary and secondary flow standards.

CONTACT: Measurement Technology Company, 12620 Avenida De Espuela, Poway, California 92064-2535. A tentative registration can be made by telephone, (619) 451-2274.

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SYMPOSIUM FOR INNOVATION IN MEASUREMENT SCIENCE GENEVA, NEW YORK, AUGUST 5-10, 1990

The Symposium for Innovation in Measurement Science (SIMS) is sponsored annually by the Scientific Instrumentation and Research Division of the Instrument Society of America. Symposium topics are at the frontiers of measurement science and its applications to production technology, process control, and engineering advancement. SIMS enhances professional development by stimulating communication and encouraging innovative thought.

This symposium has descended from the famous meetings, organized in 1931 by John Hopkins' Professor Neil E. Gordon, at which Gordon stressed that a free and unhurried discussion among workers at the frontiers of a discipline would lead to innovation. To encourage such an uninhibited exchange, Gordon established the rule that no remark could later be cited without the express permission of its originator.

SIMS retains the basic traditions and format of the original Gordon Research Conferences. Two or three selected speakers/discussion leaders are scheduled during the morning and evening sessions. Opportunities are provided for free and open discussions, and participants are encouraged to bring up "quickie" topics for short presentation and debate. Afternoons are reserved for special activities (an excursion to a technical facility, for example), informal discussions, and leisure activities in the surrounding region.

ISA is pleased to sponsor these symposia, and will continue to offer topics which are at the frontiers of measurement science and its applications.

SIMS 90 Program

* Fiber Optic Sensor Technology
* Modern Sensor Materials
* Intelligent Sensors
* CIM and Factory Automation
* Surface Topology Sensors
* Imaging Technology
* Student Award Papers
* The 1991 San Agustin Expedition: "A Journey to Explore Deeper Inside Our Planet Than Man Has Ever Gone Before"

* Optical Sensors

For further information about SIMS 90 contact: Manager, Meetings, Instrument Society of America, POB 12277, RTP, NC 27709, (919) 549-8411, FAX (919) 549-8288.

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MEASUREMENT UNCERTAINTY TRAINING COURSES

Course Number 9005
September 4-7, 1990, Orlando, Florida – November 27-30, 1990, San Diego, California

Introduction

Evaluating the uncertainty of measurements is a vital part of Total Quality Management (TQM). Controlling the quality of measurements is an important first step in controlling product quality. As the quality of measuring instruments continues to improve, many organizations are unable to maintain the desired 4:1 accuracy ratio between calibration standards and measuring instruments. Deviations from this 4:1 accuracy ratio must be documented using uncertainty techniques to verify that accuracy has not been degraded. This course will provide instruction in evaluating measurement uncertainties.

The concepts learned in this course can also be used very effectively in other situations including: design of experiments; design of measurement systems; pre-test analysis to decide if a target uncertainty can be met; selection of measuring instruments; monitoring and control of measurement systems with control charts; and providing direction on how to improve measurement systems.

These and other uncertainty techniques will be discussed. Students will work practice problems that illustrate real world applications.

Tuition

The tuition for each four-day training course is $795 per person. The tuition includes all course materials, a comprehensive notebook and refreshments during class hours. It does not include transportation, meals or hotel accommodations.

Instructor

Mr. A.C. Catland, President of Measurement Technology Company, will be the instructor for this course, Mr. Catland was formerly the Director of Training at DALFI, Inc. He has been involved in design and marketing of instruments, systems and calibration equipment for over 35 years.

COMMITTEE NEWS

CALIBRATION REPORTS RECOMMENDED PRACTICE

Our team goal to publish a final NCSL RP, that will provide technical content and format guidelines for Calibration Report preparation, has taken a major step forward toward achievement. The completion of all our preliminary RP developmental action items has resulted in a Calibration Reports RP draft. While additional work efforts will be required to establish and publish the final Calibration Reports RP, we are now challenged to focus on the task of improving upon our past accomplishments. The final RP will be a value-added dynamic document. Hence, we must continually review, share and discuss with our colleagues, and solicit suggestions to enhance the draft RP.

If your Metrology Laboratory performs calibration which is documented by Calibration Reports, then your feedback would be appreciated. Copies of the 34-page Draft-1 Calibration Reports RP dated 5-24-90 may be obtained from any of the NCSL Calibration Reports Subcommittee team members:

Lewis A. Fong
Lockheed Missiles and Space Company
P.O. Box 3504
B/157-2E O/48-72
Sunnyvale, CA 94088-3504
(408) 756-3534 FAX (408) 742-4435

Robert M. Judish
National Institute of Standards and Technology, Division 723.01
325 Broadway, Boulder, CO 80303-3328
(303) 497-3380 FAX: (303) 497-3122

Kenneth J. Lund
Rockwell International
3370 Miraloma Avenue
D/120, 031-HC02
Anaheim, CA 92803-3105
714) 762-4234 FAX: (714) 726-1243

Bernie Rand
Naval Aviation Depot, North Island
Navy Primary Standards Laboratory
Bldg. 378 Code 062
San Diego, CA 92135-5112
(619) 545-6240 FAX: (619) 545-9861

Bud Scott
John Fluke Manufacturing Company
P.O. Box C9090
MS 169G
Everett, WA 98206-9901
(206) 356-5702 FAX: (206) 356-5116

Our NCSL membership is the source of demand and need for this RP, and is the best and most precious source of information. Please participate in our challenge to improve communications through basic standardization and clarification of information provided to requesters and users of Calibration Reports.

Contact an NCSL Calibration Reports Subcommittee team member today

Lewis A. Fong, Chairman
Calibration Reports Subcommittee

CALIBRATION SYSTEMS COMMITTEE REPORT

Since the last board meeting in Palm Springs, the committee has completed the coordination draft of the Salary Survey and is submitting it to the board for review and acceptance at the board meeting in New Orleans.

At the board meeting in January, action item 1 was assigned to Klaus Jaeger and myself to recommend an acceptable chairperson for the Threaded Fastener Ad Hoc Committee. Klaus will report on actions taken in his report.

The Calibration Reports Subcommittee met in February and agreed on ground rules and an agenda. A framework of the RP has been designed, action items assigned and the next meeting of the committee established. They intend to have their first draft of the RP available for the October Board meeting in Orlando.

The remaining goals for this committee for 1990 are:

a. Complete the Salary Survey
b. Proposed RP on Calibration Reports.
   c. Request capability documents per the RP from the membership for publication of the initial NCSL Calibration Laboratory Capability Guide.

Dennis Pinnecker, Chairman

TQM INITIATIVE ON MIL-STD-45862 AD-HOC COMMITTEE REPORT

Current committee staffing:

Darrell Johnson – Wavetek Corp.
Peter Lacy – Witon
   • Arlises Maldonado – Defense Logistics Agency
   • Dave Mednick – U.S. Army Material Command
   • Dennis Pinnecker – Rockwell International
   • Bill Quigley – Hughes Aircraft
   • George Rice – NCSL
Committee News

- Joe Simmons – NIST
- Bob Weber – Lockheed Missiles and Space
- Core committee members

A planning meeting was held on February 7, 1990 with Dave Mednick, U.S.A.M.C., George Rice, NCSL Government Affairs Chairman, Dennis Pinnecker, Rockwell International, and Colonel L. W. Murphy, Director Quality Assurance Policy and Programs, Canadian National Defence. The meeting resulted in the following mission statement:

To use TQM in the development of a dynamic calibration system that recognizes customer expectations in the delivery of products and services.

It was proposed that the core team membership be made up of 3 representatives from DOD, one from the Defense Logistics Agency (DLA), 1 from the National Institute of Standards and Technology NIST, and 5 from NCSL. These positions are now fully staffed except the Navy and Air Force have elected to not participate at this time.

A committee meeting was held on April 5-6, 1990, NIST, Gaithersburg, Maryland. The following action items resulted from the meeting.

**Action Items**

1. Dennis Pinnecker  Determine parallel activities (to ours) in developed, or developing international standards.
   - Identify each document
   - Characterize differences (matrix)
   
   Due: July 5, 1990

2. Joe Simmons  Develop strawman system structure proposal for accreditation.
   
   Due: July 5, 1990

   
   Due: May 15, 1990

4. Bill Quigley  Finalize draft NCSL and DLA surveys
   
   Draft Due: May 1, 1990

5. Davidson/Lacy  Develop plan to analyze what other countries (Europe/Far East) do related requirements that serves the intent of MIL-STD-45662A.

Before the next meeting of the Joint Working Group the following will be completed:

- Surveys (action item 4.) will be: finalized, distributed, and tabulated.
- Action items 1, 3, and 5 completed.

**General Plan**

- Survey NCSL membership and DLA Government representatives.
- Develop (package) and conduct one day separate NCSL and DLA regional Workshops for data gathering centered on elements of the surveys.

**Draft Vision Statement**
(From April 5-6 meeting)

Calibration system requirements for U.S. organizations will be defined in a way to allow continuous improvement in our calibration processes. Calibration system requirements will be keyed to measurement uncertainty and allow flexibility by minimizing structured approaches. Specifically, calibration system requirements will allow:

- Innovation.
- Control of processes in lieu of traditional calibration architecture.
- Utilization of Statistical Process Controls in lieu of traditional calibration control methods.
- Reduction of non value added paper.
- Techniques to improve measurement (quality) processes without increasing costs.
- Coupling calibration to product in a more effective way.
- Reduction of risk to customers.
- Definition and implementation of an ideal calibration system.
- Transition from current systems to new systems.
- Accommodation of new measurement technologies.
- Different levels of calibration system sophistication.
- Value added audits.
- Reduction of audit redundancy.
- Recognition of certification programs.
Committee News

* One U.S. standard recognized internationally.

* International measurement compatibility.

Gary M. Davidson, Chairman

The following Committee reports are from K.B. Jaeger, V.P.

AUTOMATIC TEST & CALIBRATION COMMITTEE

Welcome to Mr. David Nebel from Tektronix in Dayton, Ohio. David has agreed to take over from Ken Landis, ESI. Many thanks are extended to Ken for carrying this load as chairman. David needs the support from all of us and we wish him well.

MEASUREMENT ASSURANCE PROGRAM COMMITTEE

1. The twin city area is now conducting a thread gage round robin. The round robin leader is Mr. Rick Brion of Rosemont, Inc. Rick’s phone number is (612) 892-4271. There are nine participants. Half of the companies have completed the measurements. The artifacts are thread gage plugs of the following pitch size: 20, 32, 40. Rick wants to conduct the round robin in the Twin City area before expanding out.

2. There has been interest in doing 10 volt round robin using the Datron 4911. The participants would be laboratories with the 10 volt Josephson Junction array. Mr. Steve Stahley of Datron and Mr. Jim McKinnon of the Navy Primary Standards Laboratory (NPSL) will coordinate this effort. The NPSL will act as the pivot lab and will also perform the data analysis. Both Steve and Jim, can be contacted at the following phone numbers:

Jim McKinnon  NPSL  (619) 545-9723
Steve Stahley  Datron  (317) 782-4601

NATIONAL MEASUREMENT REQUIREMENTS COMMITTEE

NMRC activity for the past quarter has focused upon the upcoming annual NCSL conference. At this conference in August, there will be a meeting with the NMRC subcommittee chairs that will finalize the direction of the NMRC report for 1991. Also, at the annual conference there will be workshop on Pressure Measurement. This workshop is a continuation of two previous workshops jointly sponsored by NIST and NCSL/NMRC to establish a working group that will prepare or modify a Recommended Practice for the Use and/or Calibration of Piston Gages. This workshop has also been working to initiate a round robin for piston gage calibration.

Prior to the annual conference, NMRC, together with J. Simmons and K. Jaeger, have been planning to have a meeting with NIST personnel to discuss the focus of the next NMRC report. Our intent is to review prior reports to ascertain their value to NIST and to obtain NIST inputs for possible improvements to the report. The discussion should enable the NMRC subcommittees to direct their efforts more effectively.

Following the NCSL conference, there will be a Leak Calibration Workshop at NIST in Gaithersburg which will be jointly sponsored by NMRC and NIST.

INTRINSIC/DERIVED STANDARDS COMMITTEE

The Intrinsic/Derived Standards Committee met at the Measurement Science Conference (MSC) in Anaheim, CA on February 7, 1990. The committee reviewed the progress of the current two working groups: WG1, Josephson Voltage Standard: WG2, Triple Point of Water. WG1 has completed a second draft of a Recommended Practice and the next draft is being reviewed by its members. The next revision is expected to be completed by the end of April and a copy circulated to the Steering Committee shortly thereafter. WG2 has started to draft a Recommended Practice and its members held a meeting during the MSC. Several questions concerning the proper functioning of the triple point standard need to be answered. Members of WG2 are performing experiments aimed at answering these questions. Draft copies of the Recommended Practices from WG1 and WG2 will be mailed to the Steering Committee in July 1990 in time for discussions at the NCSL meeting in August 1990. No inputs have been received from the committee’s questionnaire which appeared in the NCSL Newsletter, Vol. 30, No. 1, January 1990.

On the issue of trade names used by NCSL members for RPs, etc. Jim Ingram and I have submitted our proposal to Gary Davidson for further discussion and inclusion into the Guidelines. Specifically one paragraph was added to Attachment II of the NCSL information Manual and paragraphs 3.6, 3.6.1, 3.6.2 were added to the Administrative guidelines number 3.4. Copies of the proposed changes will be available at the Board meeting.

The following reports, from James M. Ingram, V.P.

INDUSTRIAL PROGRAMS

Made a visit to California State University at San Bernardino. This was the result of several telephone conversations with
the Dean of the Department of Natural Sciences regarding metrology topics in the university courses. They are interested in setting up a pre-laboratory course for Pre-Engineering and laboratory science students. NCSL has been asked to assist in providing topic lists, syllabuses, texts or any other material that may be useful in the course development process. I have contacted various NCSL delegates to solicit suggestions and material. Anyone interested may send material to me for inclusion in the study. Once the material is together and consolidated into what would make an introductory course in metrology, I will coordinate with the university in putting the course together. They have also requested a review of the final syllabus. I will keep the board advised as things progress.

BIOMETRICAL & PHARMACEUTICAL METROLOGY COMMITTEE

Ralph Bertermann continues to fill in for Doug Smith. Hopefully Doug will be back with us by the Fall of this year. The committee continues to plan for their meeting in the Fall as well as a workshop and papers at the August conference in Washington, DC.

MEDICAL INSTRUMENTATION COMMITTEE

Marc Nachman has completed the committee charter and administrative guideline. By the time the board meets he will have held a formation meeting during the American Association for Medical Instrumentation (AAMI) conference being held the first week in May.

Marc has made contact with two existing organizations and they seem interested in working on some joint projects. This committee looks like it may get off to a booming start.

EQUIPMENT MANAGEMENT FORUM COMMITTEE

During this quarter the 1989 Forum proceedings were printed and distributed to all attendees.

Preparations continue for the 1990 EMF to be held in Kansas City. The EMF Committee will issue a brochure for their 1990 Equipment Management Forum by the end of April and will have a flyer ready for attendees at the 1990 NCSL Workshop & Symposium.

UTILITIES COMMITTEE

By the time of the board meeting, the 1990 NCSL Utilities Forum will be history. There have been 15 persons preregistered for the May 2-3, 1990 meeting being held at Consumers Power in Michigan. We are hoping for a good turnout.

PETROLEUM INDUSTRY METROLOGY COMMITTEE

Suzanne has a formation meeting planned for May 1990. She is preparing a mailing to 600 interested parties to get this committee rolling. In addition, she has completed her questionnaire regarding industry needs. This is another committee ready to begin rapid expansion.

INTERNATIONAL MEASUREMENT TRACEABILITY AD-HOC COMMITTEE

Documentation of Compatibility of Standards

Dr. Joe Simmons has provided additional examples of the documentation of compatibility of standards as proposed at the November, 17th meeting of the committee at NIST, Gaithersburg. See the following examples.

The value of this initiative was discussed on several occasions during the NIST management – NCSL executive meeting, 2 April 1990 at Gaithersburg. This documentation which includes only formally published comparisons is considered to be of very high value in respect to the acceptability of measurement data between countries, between organizations, by regulatory, quality and other jurisdictional authorities.

As reported in the February Board meeting the international measurement traceability topic will be an important element of NCSL '90.

My experience in Metrologia '90 in Mexico will likely bring other perspectives and views to the committee.

The committee welcomes its newest member, Peter Unger of A2LA.

Graham Cameron, Committee Chair

FILE NUMBER: IT0001

CATALOG NUMBER: 51100-51163, 53110-53190

PARAMETER: DC Voltage and DC Resistance

DIVISION: 728

TYPE: Intrinsic – Josephson Volt and Quantum Hall Resistance

NATIONAL LABS:
AUTHORS: B.N. Taylor and T.J. Witt


TITLE: New International Electrical Reference Standards Based on the Josephson and Quantum Hall Effects.

ABSTRACT: We give here the background and basis for the new international electrical reference standards of voltage and resistance that are to come into effect worldwide starting on 1st January 1990. Founded on the Josephson and quantum Hall effects, respectively, these new reference standards will improve significantly the international uniformity of electrical measurements and their consistency with SI.

FILE NUMBER: IT007

CATALOG NUMBER: 10010

PARAMETER: Length – Iodine-stabilized Helium-Neon Lasers

DIVISION: 731

TYPE: International comparison

NATIONAL LABS: PEL (New Zealand), NML (Australia), NPL (India), NRC (Canada), PTB (Fed. Rep. Germany) NIST (USA), NIM (China), NPL (United Kingdom), NRLM (Japan), KSRI (Korea)


REFERENCE: Metrologia 24, 39-44 (1987)

TITLE: International Intercomparison of Iodine-Stabilized Helium-Neon Lasers at 633 nm Involving Ten Standards Laboratories

ABSTRACT: An intercomparison has been made of the frequencies of He-Ne lasers stabilized using iodine saturated absorption in $^{127}$I$_2$ at 633 nm. Lasers at ten standards laboratories (PEL (New Zealand), NRC (Canada), NBS (USA), NPL (UK), PTB (FRG), NPL (India), NIM (China), NRLM (Japan), DSRI (South Korea), and NML (Australia)) were each compared in turn with a portable laser from PEL during March to May 1984. The optical frequencies of all participating lasers exhibited a standard deviation of 23 kHz (5 parts in $10^{11}$) with a range of $+40$ kHz. This standard deviation is a factor of seven smaller than the standard deviation of the absolute value recommended for the optical frequency of these lasers. If allowance is made for one iodine cell believed to be contaminated, the standard deviation is reduced to 18 kHz. Power-shift coefficients were measured, and ranged from $+1.4$ kHz/mW to $-6$ kHz/mW, referred to intracavity power. It is concluded from the measured frequency offsets and power shifts that the best frequency reproducibility amongst different designs of laser is likely to be obtained at low levels of intracavity beam power (5-10 mW). The frequency reproducibility was not improved by extrapolating to zero power.

FILE NUMBER: IT0013

CATALOG NUMBER: 61210 – 61250

PARAMETER: Attenuation in Waveguide

DIVISION: 723

TYPE: International comparison

NATIONAL LABS: IENGF (Italy), NIST (USA), OMH (Hungary), RSRE (United Kingdom), PTB (Fed. Rep. Germany)

AUTHORS: H. Bayer


TITLE: International Intercomparison of Attenuation in Waveguide R 140 (WG 18, WR 62) at the Frequency 15 GHz

ABSTRACT: This report deals with the results of an international intercomparison of attenuation in waveguide R 140 (WG 18, WR 62) at the frequency 15 GHz, which was decided and organized by the RF working group of the Comite Consultatif d'Electricite of the International Committee of Weights and Measures (CIPM). Its official designation is GT-RF 75-A 3. Five national institutes participated: IENGF (Italy), NBS (USA), OMH (Hungary), RSRE (United Kingdom) and PTB (Federal Republic of Germany) which acted as a pilot laboratory. The five travelling standards – developed and made available by the participants – have the nominal attenuation values 0.01 dB, 0.1 dB, 10 dB, 20 dB and 40 dB. The essential design principles and a short description of the measuring methods are given. The measurement results are presented in several tables and diagrams, followed by a discussion. The total uncertainties varied between $\pm 0.0002$ dB (at 90 dB) and almost $\pm 0.1$ dB (at 40 dB in the worst case). Apart from the 10 dB travelling standard all others exhibited excellent repeatability and a good long-term behavior.
NCSL GIVES U.S. CONGRESSIONAL TESTIMONY

WRITTEN TESTIMONY FOR THE RECORD
NIST FY91 AUTHORIZATION
SUBCOMMITTEE ON SCIENCE,
RESEARCH AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
by
WILLIAM A. SIMMONS, PRESIDENT
NATIONAL CONFERENCE OF STANDARDS
LABORATORIES
for their
U.S. DOMESTIC INDUSTRIAL MEMBERSHIP
April 3, 1990

Mr. Chairman and Members of the Committee:

My name is Bill Simmons; I am President of the National Conference of Standards Laboratories (NCSL) and am employed by Sverdrup Technology, Inc. The NCSL is an organization of over 1000 laboratories throughout the world but concentrated in the United States. These laboratories range in size from less than ten individuals to in excess of several hundred. They include both independent laboratories as well as those that are components of larger companies. Also included are laboratories of state and local government. My testimony here is on behalf of the domestic, industrial (private sector) membership of the NCSL.

The NCSL has testified concerning NIST Authorizations for a number of years, noting the continuing deterioration of the core missions of NIST and emphasizing the increasing importance of those core missions to a growing number of industries in the U.S. At times we have been critical of the way NIST supported these vital core missions while at other times we praised what NIST was able to do with what seemed to us to be an ever-diminishing share of the total NIST budget. We wondered whether NIST was requesting the needed funds from the DOC and OMB or whether these organizations, not directly on the firing line, were revising downward the NIST requests. We appealed to this Committee to increase the budgets proposed by the Administration and were heartened when the Chairman and Members on both sides of the aisle spoke as one in support of the NIST core missions.

Despite all of this, budgets finally adopted by the Congressional appropriations process were never sufficient to fully fund the core missions. Over time, the shortfall became larger and larger; last year we estimated that it would require additional appropriations of some $15 million a year for five years in the core area alone just to get even.

The budget proposed by the Administration this year includes the largest increase ever submitted, for which we are thankful. This is not to say, however, that the shortfalls of prior years have been erased in this submittal. It is nonetheless welcome at this critical time, in particular as we near EC92. We commend the Administration for the wisdom of this increase and strongly urge this Committee to support what is proposed.

At the same time we would remind the Committee of where we stand: the shortfalls of prior years is still evident and in need of correction. Events in Eastern Europe and the impending changes in Western Europe (EC92) create challenges for the U.S., economically and technically. The role of standardization laboratories in minimizing the potential for non-tariff trade barriers will take on added significance particularly for us and for our relationship with the European Economic Community. An MOU signed in 1987 created EUROMET, an organization intended to foster improved cooperation among the European standards laboratories. Development of measurement services and providing access to those services are among the aims of this metrological organization. When our (less centralized) approach to disseminating the national standards of measurement (and its reliance on one single national laboratory) is contrasted with the Europeans' more officially-hierarchical structure (and emerging multi-national, multi-laboratory capability), it is clear that competition in the calibration and standards arena will be heightened for us.

As we noted last year, there is an irrevocable link between product quality and measurement which has been largely overlooked in this country. The key to product verification and testing required by a modern, efficient and effective quality control program is sound and proper measurement, based on a program of standardization to assure the accuracy and consistency of those measurements. Measurement standardization is achieved most efficiently through an effective, well-understood and properly functioning national measurement system, headed by a competent and committed national standards laboratory. Quality and measurement and their bases in standards and calibration are beginning to be seen as vitally important just at a time when industry is becoming increasingly measurement-reliant or, if not measurement-reliant, clearly should be. An example in this area might be that of threaded fasteners, which has not only been the subject of media attention lately, but is also related to pending legislation in the Congress. Whether all of the problems cited in various reports would have been eliminated with a more comprehensive system of thread measurements is not known. However, it is clear that the incidence of problems would have been lower and the problem of counterfeit or otherwise defective fasteners would have been identified much earlier.

The importance of standards, measurement and calibration as we approach 1992 and the formation of the new European Economic Community (EC92) cannot be overemphasized. Within the new Community, trade barriers will be all but eliminated; non-tariff barriers to trade between the Community and the U.S. must be carefully guarded against.
One such non-tariff barrier relates to standards and measurement. Although we see no current indication that EC92 will foster such actions, we do see a significant cost advantage to members of the Community in this regard compared to outsiders. Our need is to have sufficient standards and dissemination techniques to compete, not depend, on our new trading partner. Furthermore, this system must be able to be recognized by those outside of it, particularly the EEC.

The ability of the U.S. to compete in this new arena will include dependence of a healthy NIST and specifically its core missions of measurement standards development and dissemination. We believe that the Administration's proposal this year aims at doing just that. However, we also believe that it is necessary to begin this new international relationship on a "level field" which requires that current inadequacies in these vital areas, caused by prior year funding shortfalls, be corrected. As noted above, and in our remarks last year, our estimate of the needed additional funds is $15 million a year for five years, or $75 million dollars.

Mr. Chairman and Members of the Committee, we urge support of the budget proposed by the Administration but we would strongly urge that the Committee go a step further by increasing the proposal by the $15 million previously noted to eliminate prior year shortfalls. We believe this would better prepare us for the future and our competitive relationship with the European Economic Community after 1992. Furthermore, we strongly urge the Committee to commit itself to continuing this additional level of funding for the full five years.

RP-7 REWRITE COMMITTEE

Now, this looks like hard duty. The location is Hank Daneman's patio in the hills above Santa Fe. Left-Right, Roy Lindsey, Franklin Band, Chairman Walt Fitzgerald (in the big hat), Charles McMurray, William Dubyk, and Hank.
REPORT FROM METROLOGIA '80
Ixtapa, Mexico, May 8-11, 1990

The conference was attended by 250 registrants. The number
of papers was 66. They ranged in length from 25 to 45
minutes. There were about 20 exhibitors including the
national and industrial laboratories. The venue was the
Ixtapa Presidente Hotel in the state of Guerrero, Mexico.
Ixtapa is a new city created especially for tourism and is
located on the West coast of Mexico between Acapulco and
Puerta Vallarta. The following Mexican organizations
sponsored the conference which lasted 5 days:

Asociacion Mexicana de Calidad – 51 member companies.
Asociacion Mexicana de Metrologia
CENAM Centro Nacional de Metrologia
CINVESTAV – Centro de Investigacion y Estudios
Avanzados del IPN
Comision Federal de Electricidad – Laboratory of Electric
Power Industry
Direccion General de Normas – National Laboratory
SECOFI – Secretaria de Comercio y Fomento Industrial
SNC – Sistema Nacional de Calibracion

This was the first such technical conference emphasizing
metrology in Mexico. Most of the papers were presented in
parallel sessions with tutorials for technicians interspersed.
Simultaneous translation took care of English to Spanish and
Spanish to English, as required.

Foreign representation included Canada, Cuba, France,
Germany, Japan, Norway, Spain, Switzerland and the USA.
International institutions were BIPM, NCSL and OIML.
This turnout was impressive, considering that this is the first
such meeting ever held in Mexico. The next meeting will be
Metrologia '92 at which time many more USA and foreign
institutions can be expected to attend.

The technical range was very good. Dimensional, pressure,
electrical, acoustics, optical, radiation, mass, statistics,
microwave, temperature, laboratory design and quality
control were the topics covered. One of the more interesting
papers was that of Ma. Cecilia Delgado Briseno on the
subject of prehispanic dimensional metrology in Mexico.
When Hernando Cortes arrived in Mexico in 1520, he
remarked how the Indians had special experts whose job it
was to monitor the accuracy of weights and measures. The
Mayans had 13 units of length based on the human body – the
Nahuas had 9; one of which was the maximum distance
from the left foot to the right hand (established as 2,5027 meters).
It was the sophistication of these measurements which
enabled the Indians to build such enduring pyramids as still
exist today.

In 1975, I surveyed 45 laboratories in Mexico. There are a
similar number today but most appear to have advanced
enormously in the past 15 years. Several of the laboratories
are members of NCSL. Further growth of the International
Division is anticipated – especially from Mexico and the
remainder of Latin America. One result should be further
sharing of laboratory technology. Greater self-sufficiency
with respect to traceability is looked for as the DGN
undertakes a major program of laboratory development.

H.L. Daneman

METHOD FOR DETERMINING THE MAGNITUDE OF
EARTH'S GRAVITY DEVELOPED

NAVSTAR Global Positioning System (GPS) satellites are
currently being placed in orbit to form a constellation that
will enable a user to determine the position of a receiver's
antenna anywhere over the Earth during all weather
conditions.

This application was developed at the Naval Surface Warfare
Center, Dahlgren, Virginia, and combines GPS with accurate
accelerometers to determine magnitude of local gravity values
(see Figure). Here, the accelerations due to all forces on a
moving platform are determined by dynamic GPS relative
positioning, velocity, and acceleration techniques with respect
to a fixed antenna location. The acceleration due to all forces
except gravity is obtained by the accelerometers. Corrections
are made for Coriolis and earth spin using GPS obtained
values. The desired magnitude of the gravity vector is
approximately equal to the magnitude of the vector difference
between the GPS and accelerometer-determined accelerations.
For a very stable vehicle platform, such as a
balloon, differentiating the vertical component is sufficient.
This gravity determination procedure can be used for balloon
or aircraft vehicles flying over rugged or inaccessible terrain.
Also, aircraft have the potential to perform rapid, less
expensive gravity surveys that may be used, for example by
the exploration industry.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Flow diagram for GPS data for analysis of
acceleration.}
\end{figure}
FEDERAL LABORATORIES DATABASE

The Federal Laboratories Database is a computerized tool designed to offer desk-top access to a wealth of information about federal laboratories and technology transfer assistance organizations. Delivered on 10 low-density floppy disks, the database will work with any IBM compatible personal computer. No additional software is required as the database is delivered in a compiled version of DBASE III Plus (with over 3,800,000 bytes of information available).ample documentation is provided in the form of a user’s manual; however, the user will seldom have to refer to the manual, as the searching and printing capabilities are provided in a simple menu-driven system incorporated to make the software easy to use.

For additional technical information, Navy Domestic Technology Transfer Fact Sheet, Code MCSI, 40 Danube Drive, King George, VA 22485, (703) 663-2178.

U.S. PATENTS ON CD-ROM

Abstract-Based Search System and Full Text

New Haven CT. MicroPatent, a company with headquarters in New Haven CT, is publishing 17 years of U.S. Patents, over one million inventions, on compact discs (CD-ROMs) for access on personal computers.

In spite of their unquestioned value, patents are an often-neglected source of technical information. And with good reason. Until now, there has been both difficult and expensive to search and obtain copies. "Now with unlimited access at fixed cost, scientists, R&D directors, and patent professionals can search the latest patents, browse by class or keyword, monitor competitors, and more, all right on their own PCs -- in the lab, the office, or at home," said MicroPatent President Peter Tracy.

With MicroPatent’s Automated Patent Searching (APS), 17 years of U.S. Patents are accessible by bibliographic and abstract search of five compact discs. The current subscription disc contains over 120,000 patent entries, all patents issued from January 1989 through the last issue date in March 1990.

The APS disc contains 11 searchable fields for each U.S. Patent, including keyword-searchable title and abstract. Patents identified through the APS search can be retrieved from the appropriate full text disc and saved, downloaded, or printed for dissemination.

Subscriptions are available individually for $950 each for APS or FullText. The discs are delivered during the first week of each month and contain the latest patents from the previous month. Backfiles of both APS and FullText are available to subscribers for the 16-year period, 1973-1988.

Subscribers who do not yet use CD-ROM products can purchase from MicroPatent, at below retail cost, Hitachi’s compact and reliable CDR-3600 compact disc drive. The company will also provide technical advice on getting started.

CONTACT: Judy Hickey, MicroPatent, 25 Science Park, New Haven CT 06511, (203) 786-5500 or (800) 648-6787

NORTHERN TELECOM’S FACILITY JOINTLY ACCREDITED BY NATIONAL RESEARCH COUNCIL AND STANDARD COUNCIL

OTTAWA – Northern Telecom’s Calibration and Metrology Department in Ottawa has become the first organization in that country to pass rigorous examination by experts from both the National Research Council of Canada (NRC) and the Standards Council of Canada (SCC).

On March 21, Northern Telecom Electronics Limited President Dr. Graham Sadler was presented with certificates of assessment (NRC) and accreditation (SCC) officially acknowledging the department’s technical and administrative competence.

While Northern Telecom established these capabilities many years ago, it is now the first organization to meet the requirements of a program created in 1988 by the two crown corporations (SCC and NRC) to recognize excellence in labs that calibrate testing equipment. The program’s objective is to provide Canadian industry with a national network of high quality calibration services traceable to the primary standards maintained by NRC, which conform to international standards of measurement.

The Calibration and Metrology Department, located at Northern Telecom Electronics’ Corkstown Road facility in Nepean, Ontario, calibrates electronic instrumentation employed in telecommunications research and manufacturing. The accreditation includes electrical calibration, frequency, humidity and thermometry.

Assessment of the lab’s technical performance was carried out by experts from the National Research Council, Canada’s leading science and technology agency. Administrative and financial examination was conducted by the Standards Council of Canada, the Crown Corporation responsible for fostering and promoting standardization in Canada.

ISI LAUNCHES LANDMARK SCIENCE NEWSLETTER: SCIENCE WATCH

Philadelphia, PA – The Institute for Scientific Information (ISI) has announced the publication of the first issue of Science Watch, a monthly newsletter dedicated to tracking trends and developments in scientific research.
Science Watch evaluates the research activities and
performance of countries, universities, industrial firms,
private and government labs, and other organizations. By
drawing upon ISI's vast scientific database, the newsletter is
able to quantify, analyze, and characterize the most
prominent features in the current scientific landscape. It
provides a multidisciplinary view of science, with particular
attention paid to the life and physical sciences, clinical
medicine, and chemistry. Each issue includes an updated list
of the ten most cited research papers in two of these fields.
Profiles of top research institutions and commentary from key
players in the scientific community are also featured regularly.

Science Watch is published monthly except August. Charter
subscriptions are available for $50.00 off the regular
subscription price of $US 295.00

For more information, write to the Institute for Scientific
Information, 3501 Market Street, Philadelphia, PA 19104; or
call toll-free: 800-336-4474.

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NOTES FROM THE DLA FACT SHEET

Defense Contract Management Command

BACKGROUND

On Jan. 19, 1990, Department of Defense Secretary Dick
Cheney presented a progress report on Pentagon
management improvements, including those initiatives aimed
at streamlining contract management. One major
improvement cited in the report is the consolidation of all
contract administration services into a single command under
the Defense Logistics Agency (DLA). The Defense Contract
Management Command (DCMC), as the new activity is
called, will be responsible for contract administration services
currently performed worldwide by both DLA and the military
departments. Those services include contract management
support, engineering and program support, contractor
payment and quality assurance.

BENEFITS

DCMC will:

* present one face to industry on regulatory matters, paper
work, payments and policy.
* help DOD save resources by reducing overhead costs while
still providing effective and efficient contract
administration services for the DOD program management
and buying community.
* provide consistency in training to improve the
professionalism of the acquisition work force.
* give acquisition personnel an enhanced opportunity to
serve the American Soldier, Sailor, Airman and Marine at
the least cost to the American Taxpayer.

SAVINGS

* More then $200 million over a 5-year period.
* At least 3,000 contract administration positions will
gradually be eliminated.

INCEPTION

* A chartered task force consisting of representatives from
the Office of the Secretary of Defense, the military services,
the Defense Contract Audit Agency, the National
Aeronautics and Space Administration and DLA worked
together to develop a plan that would most efficiently
consolidate contract administration within DOD.

* In late 1989 the recommendations of the task force were
reviewed and approved by Deputy Secretary of Defense
Donald J. Atwood.

* * * * * * *

GIDEP 1990 CLINIC HELD

By: Curt Sandberg, GIDEP N/L

The annual GIDEP Clinic held at the GIDEP Operations
Center, Corona, CA, during 6-8 March 1990 was well-
attended. Over 130 attendees, coming from government and
industry activities, received training in the operation and
utilization of the GIDEP program. As is customary, there
was no fee for attendance at the Clinic.

This year the Clinic was conducted over a three day period
rather than the normal four. This was made possible by
modifying the format and content of each of the sessions.
This new format was well received by the very enthusiastic
attendees.

Of special note was the presentation given by Judy Tejwani of
Rockwell International, Space Transportation Systems
Division, Downey, CA. Judy presented a very stimulating and
thought provoking overview of the GIDEP Representative's
Responsibilities and the Rockwell system for handling
ALERTs.

For those who were unable to attend the Clinic, the next
major GIDEP event providing training and an opportunity to
improve their GIDEP operations, is the GIDEP Annual
Workshop for 15-18 October 1990 at the Maple Leaf Resort
in Niagara Falls, Canada.

Why don't YOU plan on attending this year's Workshop
RIGHT NOW so that you too can learn to make GIDEP a
more useful data resource in your activity or organization?

* * * * * * *
DMSMS SYMPOSIUM
By: Connie Gamre, GIDEP N/L

The next DMSMS Symposium is scheduled for October 29 - November 1, 1990, in Sacramento, California. This Symposium is sponsored by the Department of Defense with the assistance of the American Defense Preparedness Association (ADPA). A tour of the Advanced Electronics Technology Center at the Sacramento Air Logistics Center, McClellan Air Force Base, is also being planned.

The objectives of this symposium are to:

  Provide a government/industry bridge to a common understanding of the problem.

  Identify the roadblocks preventing effective response to the problem of parts non-availability.

  Provide a summary of the government and industry initiatives now underway.

  Provide an opportunity for non-DOD organizations and industry to offer their views of the problem, and, where possible, offer alternative solutions.

GIDEP participants wanting additional information on this symposium should contact ADPA, Tow Colonial Place, 2101 Wilson Blvd, Suite 400, Arlington, VA 22201. Telephone (703) 522-1820.

RELIABILITY, AVAILABILITY & MAINTAINABILITY IN COMPUTER-AIDED DESIGN
By: Ed Richards, Gidep N/L

The following is an article from the Federal Laboratory Consortium for Technology Transfer Newsletter.

Reliability, Availability, and Maintainability in Computer-Aided Design (RAMCAD) - managed by the Logistics and Human Factors Division, Air Force Human Resources Laboratory and being developed by General Dynamics' Convair Division -- is a research and development effort to provide the capability for conducting "up front" reliability, maintainability, and supportability (RM&S) analyses in the design of major weapon systems. The fundamental approach taken to achieve this capability is through the integration of commercially available RM&S software within computer-aided engineering and design workstations.

RAMCAD has been targeted for the defense aerospace industry in support of the Computer-Aided Acquisition and Logistics Support (CALS) and Air Force Reliability and Maintainability 2000 (AF R&M 2000) initiatives. General Dynamics and Boeing Aerospace Co. are currently using CALS and are assisting in continued development of the technology. The resulting technology, however, can potentially be extended to any group employing the above-mentioned functional engineering discipline.

This technology is primarily oriented toward providing up front RM&S analyses within the design process of new weapon systems. Specifically, the resulting technology provides design engineers an enhanced capability to design weapons systems that: 1) last longer (i.e., are more reliable) and 2) repair in less time and with minimal effort (i.e., are more maintainable), directly benefiting weapon system maintainers and users.

This technology may also be applied to downstream analyses throughout the lifecycle of existing systems, particularly as RM&S technology improves and existing systems evolve beyond their initial design. For example, in support of the operational readiness of existing systems, RAMCAD can be used for conducting predictive analyses on systems that have evolved in the repair and/or redesign processes. It may also be extended to provide maintainers and users at the base level a direct feedback mechanism into the design loop for both new and existing systems.

The GIDEP Database has a limited number of documents which discuss RAMCAD, CALS, and related initiatives. In order to expand the coverage of these important areas, inputs (for use by GIDEP activities) from government and industry in these areas is encouraged.

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1990 NVLAP DIRECTORY PUBLISHED

A comprehensive directory of accredited laboratories and their testing capabilities is now available from NIST. Such facilities are accredited under the National Voluntary Laboratory Accreditation Program.
If you didn't get a copy, ask for NISTIR 90-2480 at the following address:

NVLAP Program Office, NIST, Gaithersburg, MD 20899, (301) 975-4020

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ATE NEWSLETTER AVAILABLE FOR TEST ENGINEERS

Automatic Test Program Generation
NCSL Newsnotes
February 1990
Vol. 12 No. 2

Automatic Test Program Generation... 

Metrology and Test Engineers who work with ATE programs, and especially with interactions concerning DOD and Aerospace activities, can request to be put on the mailing list for the interesting and useful ATE NEWSLETTER.

CONTACT: Ms. May Dymond AV 222-0170, (202) 692-0170

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SOVIET MOVES TO METROLOGY ACCEPTANCE

U.S.S.R. President Mikhail Gorbachav's "Glasnost" and "Perestroika" concept, and the opening up of the Eastern Bloc in general (give or take a Lithuania or two), will provide a market for America's high-tech specialties, particularly in the field of test equipment. (I am certain, however, that the cracks appearing in the "Iron Curtain" - the political divide between eastern and western Europe - do not represent a business opportunity for U.S. non-destructive test specialists).

One firm that has been quick to take advantage of the new situation is Hamilton Engineering Inc., of Seattle, WA which specializes in electromagnetic engineering and facilities, design, machine design and hydraulic engineering, with particular emphasis on unusually complex or difficult projects. According to Don Weber, Hamilton's president, the company is to design and construct, by February 1992, a 10,000-sq-ft state-of-the-art electromagnetic test facility for GOSSTANDART. GOSSTANDART is the Soviet Union's Moscow-based national standards bureau, equivalent to NIST in the U.S.

GOSSTANDART will thus be able to measure electromagnetic emissions from imported and locally produced devices (including automobile components, industrial control equipment, and household appliances such as radio and television). This lab will enable the Soviet Union to calibrate its electronic equipment with that of other nations," said Weber. "I think it shows their desire to increase trade with the West in electronic products." Hamilton will be reimbursed via a dollar letter of credit.

With an eye to other U.S. test equipment companies thinking of taking the plunge into trade with the Soviet Union, Test & Measurement World took a peek at how metrology is currently organized in the U.S.S.R. The All-Union Research Institute of Metrological Services (VNIMS) is housed in a 17th century building - the former Andeyevsky Monastery near Moscow - and is the main scientific organization for international cooperation in metrology, under GOSSTANDART. VNIMS is the secretariat for the Soviet section of the CMEA Standing Commission for Standardization, and as such participants in the "Intertalonpribor" research and production organization. Intertalonpribor coordinates CMEA member countries' metrological, instrument manufacture, research, and production organizations, aids in the design of new standard and reference measuring instruments, and issues reference books on commodity lists, and on suppliers of metrological equipment manufactured in the CMEA member countries.

VNIMS also participates in developing ISO standards, and coordinates Soviet organizations' metrological activities on 200 standards committees. According to VNIMS documents, "The improvement and further development of our country's metrological activity is inseparable from the process of structuring the entire economy. Metrology to a great extent determines the rate of technical progress, and its role is ever-increasing. The Soviet metrological service will control the state development program for the manufacture of measuring, inspection and test equipment for the period up to the year 2000."

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(Continued on page 74)
NCSL/NIST MANAGERS MEETING

NIST hosted the NCSL/NIST Managers Meeting April 2, 1990. The NCSL representatives were Bill Simmons, Del Caldwell, Graham Cameron, and Laurel Auxier. They met with Dr. John Lyons, director of NIST, Dr. Donald Johnson, Director of Technology Services, David Edigerly, Acting Deputy Director of Technology Services, Stanley Rasberry, Acting Director of Measurement Services, and Robert Gladhill, Jeffrey Horlick, and Wayne Stiefel of the NAVI Lap Program. They also heard presentations about a NIST/Industry Consortium on Automated Analytical Systems by Skip Kingston of the Inorganic Analytical Research Division and the Emerging Technologies in Electronics and Their Measurement Needs by Ronald Powell of the Center for Electronics and Electrical Engineering.

NCSL/DOD/NIST TQM MEETING

NIST hosted a two day meeting April 5 and 6, on Total Quality Management, chaired by Gary Davidson and attended by representatives from NCSL, the Department of Defense and NIST. Through a series of brainstorming sessions, the participants agreed on a general strategy and schedule for exploring the application of TQM approaches to industrial calibration laboratories.

ACCOUSTICAL ARRAYS

Ultrasonic transducer arrays are being developed for imaging flaws and for determining material characteristics (porosity, fiber-resin ratio) in thick composite materials. Very high power transmitters are used to illuminate the interior of the composite, and arrays of small “phase-intensive” receivers are used to monitor the scattered and reflected wavefields from within the composite. Seismic methods will be used to process the array signals to recover spatial and material property information.

Array techniques are needed to enhance the signal-to-noise ration since the flaws are usually of low acoustic contrast.

NIST work on this project includes producing acoustic fields of high intensity in the composite, developing high-sensitivity receivers, acquiring waveform data having a dynamic range of 100 decibels and developing inversion and imaging algorithms for optimal operation on data acquired from a layered, anisotropic inhomogenous medium. Source and propagation models for the composites are also under development.

CONTACT: Dale W. Fitting, (301) 497-3445

NIST REDUCES UNCERTAINTIES IN MEASUREMENTS OF PEAK IMPULSE VOLTAGE

Staff in the CEEE Electricity Division have reduced the uncertainties to 0.1 percent in measurements of impulse voltage peaks based on the use of analog oscilloscopes. NIST needs the improved measurement methods for the calibration of voltage dividers to respond to the needs of the pulse-power community.

Typical oscilloscope uncertainties in the measurement of peak voltages of microsecond impulses have been of the order of ± 1 percent. Division researchers previously developed measurement methods that employed dc reference levels and offsets to facilitate measurement on more sensitive oscilloscope scales with resulting uncertainties of ± 0.3 percent. Building on this work, they have achieved the new reduction by using dc reference voltages applied to the form of steps to reduce the amplifier’s response to pulsed and to dc inputs. The researchers have verified the method using a 5-volt standard voltage impulse divider.

CONTACT: William E. Anderson, (301) 975-2423

CME DEVELOPS STEALTH RANGING SYSTEM

Under contract to the Defense Advanced Research Projects Agency, the CME Robot System Division developed a passive ranging system for use in target acquisition by low-flying aircraft. The passive nature of this system makes it superior to active methods (e.g., radar, millimeter wave) for stealth aircraft.

In passive ranging, three-dimensional range information is obtained from the motion of the camera by recording the flow of intensity information across the camera’s image plane as the camera moves through the environment. This “image flow” can be used to obtain three-dimensional information about the environment in the form of a range image. The algorithms for extracting image flow from a sequence of images were developed on the CME pipelined image processing engine, a real-time image processing computer.

CONTACT: Martin Herman (301) 975-3441

CME AND JOHNS HOPKINS TO STUDY CIM FOR PRINTED CIRCUITS

The CME Automated Production Technology Division and the Applied Physics Laboratory (APL) of the Johns Hopkins University have established a cooperative research and development agreement to study the design of a computer-integrated small-batch manufacturing system for electronics and microelectronic parts. The study focuses on surface-mount printed-circuit boards. The project will include the specification of process and quality control techniques and strategies, computer hardware and software, data requirements, and interface and support standards, such as the Department of Defense CALS standards. New concepts for process control sensors will be emphasized. The joint
project draws on NIST expertise in sensors and standards technology and APL skills in applications and electronics manufacture.

CONTACT: Donald G. Eitzen (301) 975-6642

"STANDARD REFERENCE MATERIALS FOR SEMICONDUCTOR MANUFACTURING TECHNOLOGY"

Semiconductor Manufacturing Technology lists a series of SRMs for use in characterizing semiconductor materials and processes. The SRMs include a series of silicon resistivity materials for calibrating four-probe and eddy-current test equipment, sizing materials for calibrating optical and scanning electron microscopes, SRMs for mechanical testing, optical measurements, analysis of photographic films, X-ray diffraction, and the chemical analysis of materials.

CONTACT: Roger Rensberger, (301) 975-2762

STANDARD REFERENCE MATERIALS FOR COATING THICKNESS MATERIALS

Contains a listing of SRMs for calibrating various coating thickness gages. There are materials for calibrating nonmagnetic coating on magnetic substrate-copper and chromium on steel, and solder coating on copper. Copies of the new SRM brochures are available from the Standard Reference Materials program, Room 204, Bldg. 202, NIST, Gaithersburg, MD, 20899; telephone: (301) 975-OSRM (6776)

CONTACT: Roger Rensberger, (301) 975-2762

NEW PUBLICATIONS DISCUSS ADVANCES

To maintain our lead in biotechnology research and commercialize the results of that research, the United States needs a strong base of generic technology in bioprocess engineering. Two recent publications, co-edited by NIST personnel, make significant contributions to that base. *Frontiers in Bioprocessing*, edited by Subhas K. Sikdar and Paul W. Todd of NIST and Milan Bier of the University of Arizona, contains 35 papers originally presented at a NIST-NASA Conference. Areas covered include process integration, fermentation control, sensor development, free-fluid integration, fermentation control, sensor development, free-fluid bioseparations, chromatography, and emerging technologies. One chapter, written by NIST researchers, discusses the rapidly expanding interest in applying microbial processing for metal dissolution and recovery from ores and wastes. The publication is available from CRC Press, Inc., Boca Raton, FL 33431. The second publication, *Downstream Processing and Bioseparation*, discusses the increasingly important role played by downstream processing in the commercialization of biotechnology. Two chapters, written by NIST personnel, discuss aqueous two phase extraction systems for recovering and purifying proteins, enzymes and other molecules. The publication, co-edited by Sikdar, is part of the American Chemical Society Symposium Series, Vol. No. 419, and is available from ACS, Distribution Office, Dept. 225, Washington, D.C. 20036.

CONTACT: Fred McGehean (Boulder), (303) 975-3246

POSSIBLE LIABILITY IN STANDARDS DEVELOPMENT

In view of the recent Supreme Court cases regarding antitrust liability potentially facing standards developers, the NIST Office of Standard Services commissioned a study of the key elements of due process that collectively constitute fairness. NIST-GCR-90-571, *How Due Process in the Development of Voluntary Standards can Reduce the Risk of Anti-trust Liability*, by David Swankin, examines and comments on the rules of 11 representative organizations. The study recommends that standards developers reappropriate criteria.

CONTACT: Walter Leight, (303) 975-4010

PC DATABASE AVAILABLE FOR BIOCHEMISTS

A new computerized database for biochemists in industrial laboratories and universities worldwide brings together for the first time all of the published information on the successful crystallization of proteins and nucleic acids. This important research tool for the design of new drugs and chemical processes was developed by Dr. Gary L. Gilland, NIST research chemist and fellow of the Center for Advanced Research Biotechnology (CARB). The database is designed for personal computer and contains crystal data and the crystallization conditions for more than 1,000 crystal forms of over 600 biological macromolecules. For each crystal entry there is a complete description of crystallization conditions and related crystallographic data. Also provided are evaluated critical data on the physical characteristics of known crystals, including unit cell parameters, space group, crystal density, and diffraction limit. NIST/CARB Biological Macromolecule Crystallization Database, Standard Reference Database 21 is available for $300 from Standard Reference Data Program, A323 Physics Bldg., NIST, Gaithersburg, Md. 20899; telephone: (301) 975-2208.

CONTACT: Roger Rensberger, (301) 975-2762

NOISE CALIBRATION EXTENDED

Coaxial noise sources can now be calibrated by NIST in the additional frequency range of 1 to 2 GHz, and sources with APC 3.5 precision connectors can now be accommodated in the 2- to 12-GHz range. With these new services, NIST can now calibrate sources from 1 to 12 GHz with precision N, APC 7, GR900, and various rectangular waveguide flange connectors. Sources with APC 3.5 connectors can be calibrated at 2 to 12 GHz for all noise power spectral densities up to 18,000K. The frequency range for APC 3.5 connectors is expected to be extended down to 1 GHz by the end of Sept. 1990. Measurement uncertainties typically range
MEASURING THERMAL CONDUCTIVITY OF CERAMICS

NIST scientists have developed an instrument to determine thermal conductivity of materials at high temperature. The apparatus, a miniature guarded-hot-plate, can measure thermal conductivity of ceramics and ceramic composites at temperatures between 700 K and 1500 K in neutral or mildly oxidizing atmospheres. The apparatus is made of boron nitride and high-purity alumina. These materials were selected for their thermal and electrical properties as well as high-temperature compatibility with metallic components in the system. Thermocouple-grade platinum and platinum-rhodium wiring are used for both the heater and thermometry elements. Typical specimen diameter is 7 cm with a thickness between 1 and 8 mm. Specimens must be stable at high temperatures and chemically compatible with system components. For a copy of paper no. 68-69, describing the apparatus, contact Jo Emery, Div. 104, NIST, Boulder, Colo. 80303; telephone: (303) 497-3237.

CONTACT: Fred McGeehan (Boulder), (303) 497-3246

1990-91 SRM CATALOG PUBLISHED

The NIST Standard Reference Materials Catalog 1990-91 (SP 260) lists approximately 1,100 standard reference materials (SRMs) available from the institute. Materials certified for their chemical and physical properties include cements, ores, metals, glass, plastics, food, and environmental standards. Also certified are nutrition and clinical health standards to calibrate instruments that measure marijuana and cholesterol in human urine and serum, fat-soluble vitamins and cholesterol in food products, and levels of enzyme aspartate aminotransferase (AST) to detect heart attacks. New materials listed include polyethylene samples for evaluating the performance of plastic gas pipe, a reference material for calibrating non-destructive evaluation systems to detect fatigue cracks and flaws, and sets low-energy and high-energy test blocks for calibrating Charpy V-notch impact machines. The catalog contains an alphabetical index and a complete numerical listing of the latest renewal SRMs and their certificate dates. Prices for the SRMs are published separately in annual supplements. Copies of SP 260 are available from the Office of Standard Reference Materials, Rm. 204 Bldg. 202, NIST, Gaithersburg, Md. 20899; telephone: (301) 975-OSRM (6776).

CONTACT: Roger Rensberger, (301) 975-2762

REPORT SUMMARIZES NIST ELECTRIC ENERGY RESEARCH

A summary of numerous investigations aimed at improving measurement science for the electrical power industry is contained in a report now available. The document, prepared for the Department of Energy, covers four major research projects. One of these examines the measurement of ions in the vicinity of dc high-voltage transmission line environment.
Another project is concerned with the behavior of the compressed gas insulators (dielectrics) used in high-voltage power systems. Understanding the breakdown of liquid dielectrics such as the oil used as an insulator in power transformers is the goal of another project. (The summary for this research includes a description of a novel high-speed camera designed at NIST to record the random events that take place in the nanosecond range of breakdown phenomena.) A fourth project aims to improve the measurement of fast transient pulses such as lighting and power surges. The free publication, Research for Electric Energy Systems – An Annual Report, is available from the Center for Electronics and Electrical Engineering, B344 Metrology Bldg., NIST, Gaithersburg, Md. 20899.

CONTACT: John Henkel, (301) 975-2762

SUPERCONDUCTIVITY, BIOTECHNOLOGY ARE FEATURED TOPICS

They burst on the scene three years ago adorning magazine covers and promising everything from cheap electrical power to ultrafast trains. But what really happened to the so-called "high-temperature" superconductors? "The Long Road to Superconductivity," a feature article that kicks off the latest issue of NIST Research Reports, explains how NIST is tackling the challenge of creating the ideal superconductor. The 32-page publication also contains stories about a world-class biotechnology facility that is probing the structure and function of proteins and enzymes; the manufacturing "shop of the 90s"; computer "virus" attacks; using computers to 'model' fires; and predicting how steel will behave during and after a fire. Also included are capsule NIST "research updates," a listing that highlights available publications, and a summary of upcoming science conferences. To obtain a copy of NIST Research Reports, contact the Public Affairs Division, A903 Administration Bldg., NIST, Gaithersburg, Md. 20899.

CONTACT: John Henkel, (301) 975-2762

COMMERCE REPORT TAGS 1990S "EMERGING TECHNOLOGIES"

Twelve of today's "emerging technologies" will represent a combined world market of about $1 trillion by the year 2000, according to a report issued by the Commerce Department's Technology Administration. Emerging Technologies: A survey of Technical and Economic Opportunities assesses the competitive position of the United States vis-a-vis Japan and Europe and make 13 recommendations for actions by industry and government to improve U.S. competitiveness. The emerging technologies cited are advanced materials, superconductors, advanced semiconductor devices, digital imaging technology, high-density data storage, high-performance computing, optoelectronics, artificial intelligence, flexible computer-integrated manufacturing, sensor technology, biotechnology, and medical devices and diagnostics. NIST contributed to the technical analysis sections of the report.

CONTACT: Michael Baum, (301) 975-2762

97 COMPANIES COMPETE FOR 1990 QUALITY AWARD

A total of 97 U.S. firms will be competing for the 1990 Malcolm Baldrige National Quality Award – 45 companies in the manufacturing category, 18 service companies, and 34 small businesses. Last year 40 companies submitted applications – 23 manufacturers, 6 service companies, and 11 small businesses. "We are extremely encouraged by the number of applications as well as the increase in all three categories," said Commerce Secretary Robert A. Mosbacher. "This degree of participation indicates a growing commitment by American companies to raise their level of quality management to make them more competitive. It also shows how successful a public-private partnership can be. "NIST -- the Commerce agency that manages the program -- distributed more than 100,000 copies of application guidelines for the 1990 award. The guidelines also serve as a quality improvement checklist that enjoys widespread use among companies for self-assessment of total quality management. The awards ceremony will take place in Washington, D.C., during October or November.

CONTACT: John S. Makulowich, (303) 975-3790

NIST SEEKING PROPOSALS FOR COURSEWARE STANDARDS

Over the next several years, the federal government will invest millions of dollars on computer-based interactive training software, often called "courseware," and the hardware needed to run it. Currently, several manufacturers offer high-performance, low-cost hardware. However, because of proprietary interfaces, software written to run on one manufacturer's product often will not run on another's with our expensive reprogramming. Standardizing the protocols that define how software modules communicate will help make it possible to use the courseware on any manufacturer's equipment. Researchers in the NIST National Computer Systems Laboratory are considering a possible Federal Information Processing Standard for these protocols. NIST will hold a meeting June 14, 1990, to explain the program and the formal submission and evaluation process. For information, contact Systems and Software Technology Division, B266 Technology Bldg., NIST, Gaithersburg, Md. 20899; telephone: (301) 975-3345.

CONTACT: Jan Kosko, (301) 975-2762

NEW PHASE NOISE MEASUREMENT SYSTEM

NIST scientists have developed a more accurate system for measuring phase noise in oscillators, amplifiers, frequency synthesizers, and other sensor components. Of interest to
ANTENNA DATA ANALYSIS AND RESEARCH USING PCS

NIST researchers have developed a new software package that allows scientists, engineers, and programmers to make complex antenna computations on personal computers. The package, termed Planar Near Field Codes, has a highly modular structure and can be used to address diverse research problems. A recent publication describes some of the inner workings of the FORTRAN codes, the data management schemes, and the structure of the codes is open so that a user can incorporate a new application into the package relatively easily. The publication includes some basic research problems to illustrate the use and effectiveness of the codes. Planar Near-Field Codes for Personal Computers (NISTIR 89-3927) is available from the National Technical Information Service, Springfield, VA 22161. Order by PB #90-155839 for $17 prepaid. For order the software package, available for $1500, contact Lorant A. Muth, Div. 723.5, NIST, Boulder, Colo. 80303; telephone: (303) 497-3603.

CONTACT: Fred McGehan (Boulder) (303) 497-3246

GENERATING STANDARD FIELDS

The present and future capabilities of NIST in measuring electromagnetic fields at microwave and millimeter wave frequencies are described in a recently published technical paper. Titled “Standard Field Generation for Microwaves and Millimeter Waves,” the paper notes NIST’s anechoic chamber facility can generate standard fields up to 18 GHz and will soon extend to 40 GHz. Narrow (2 GHz) bands around 60 GHz and 95 GHz will be offered later. NIST transfer-standard probes are available up to 18 GHz and future thermo-optic probes are expected to go to 110 GHz. The paper, no. 64-89, is available from Jo Emery, Div. 104, NIST, Boulder, Colo. 80303; telephone: (303) 497-3237.

CONTACT: Fred McGehan (Boulder) (303) 497-3246

LOW-BACKGROUND INFRARED CALIBRATION FACILITY

The Low-Background Infrared Calibration Facility has been completed. The facility uses an absolute cryogenic radiometer as a fundamental radiometric standard with which to calibrate the temperature and radiant output of black-body sources. The blackbody and the radiometer are contained in a cryogenically-cooled vacuum chamber. The sensitivity of the detector is at the nanowatt level with flat response to approximately 50 micrometers. The first calibration of a low-background blackbody has been completed and a second one has been started.

CONTACT: Al Parr, (301) 975-3739, Raju Datla, (301) 975-2131

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ABSOLUTE CRYOGENIC RADIOMETER

An absolute cryogenic radiometer, constructed in the United Kingdom as part of a joint NIST-NPL project, has arrived in the U.S. The instrument is to be used in a series of collaborative measurements involving the two laboratories. These measurements are being used to compare this radiometer with a similar instrument at NPL and to carry out a collaborative long-term effort to develop transfer standard detectors and working standard detectors. The results of the first intercomparison indicated that the two instruments measured optical power in a consistent manner, within the expected accuracy. The long-term goal of this program is to improve the calibrations provided by NIST and make available more accurate laboratory standards for use in a wide range of radiometric activities. The instrument has a demonstrated accuracy of at least 0.01 percent.

CONTACT: Jonathan Hardis, (301) 975-2373, Al Parr, (301) 975-3739

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APS CELEBRATES TWENTIETH ANNIVERSARY OF NIST PRECISION MEASUREMENT GRANTS

The American Physical Society (APS) Topical Group on Fundamental Constants and Precise Test of Physical Laws organized a special symposium during the APS 1990 Spring Meeting in Washington, D.C. to commemorate the 20th anniversary of the NIST Precision Measurement Grants (PMG) program. The symposium featured four invited talks by past PMG recipients.

NIST awards Precision Measurement Grants to scientists in U.S. academic institutions to promote and encourage fundamental constants, and to foster contacts between NIST scientists and those researchers in the academic community who are actively engaged in such work. Since the program's inception, 46 grants have been awarded for work as diverse as measuring the magnetic moment of the proton and proton-to-electron mass ratio, to testing local Lorentz invariance and timing millisecond pulsars.

CONTACT: Barry N. Taylor, (301) 975-4220

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NIST ESTABLISHES NEW MICROWAVE POWER SERVICES

CEEE'S Electromagnetic Fields Division has announced new special-test measurement service for power measurements for 3.5-mm coaxial connectors in the 2 to 26.5 GHz range. The scattering parameters of these connectors were determined with measurements on Division-developed dual six-port automatic network analyzers, using a mixed-connector calibration technique. A number of measurements were carried out to demonstrate consistency, with the result that the efficiency of the adapter when connected to a power standard contributes no more than 1 percent to the overall uncertainty of the measurement of 1.5 to 2 percent. The Division also completed work on dual six-port systems covering the waveguide bands WR42/28 (18 to 40 GHz) and WR22 (33 to 50 GHz) and is now providing special-test services for power and scattering parameters over three ranges. These new six-port-based services offer improvements in sensitivity and accuracy of up to one order of magnitude over measurements available from tuneflectometer manual systems.

CONTACT: David H. Russell (Boulder), (303) 497-3148

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NIST COLLABORATES WITH MANUFACTURER TO INTRODUCE WIDEBAND TRANSCONDUCTANCE AMPLIFIER BASED ON NIST DESIGN

Owen B. Laug of CEEE's Electricity Division has developed a high-current, wideband transconductance amplifier which can produce currents of up to 35 A root-mean-square (rms) at 100 KHz with a short-term instability of less than ±25 parts per million and is capable of delivering current at 5 A rms at a frequency of 1 MHz. Based on this development, the U.S. company, Guideline Instruments, has now introduced its commercial model 7620 Wideband Transconductance Amplifier at the recent 1990 Measurement Science Conference, with market availability planned for late Spring. Guideline approached the Division to work collaboratively with Division staff to commercialize the amplifier, with the result that Guideline's Ian King visited NIST to learn details of the amplifier principles and design. NIST benefited directly from this interaction as it resulted in design improvements to the amplifier and improved methods for characterizing it.

CONTACT: Barry A. Bell, (301) 975-2402

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FRENCH NAMED MEMBER OF NATIONAL ACADEMY OF ENGINEERING

Judson C. French, Director of the Center for Electronics and Electrical Engineering, has been elected by the members of the National Academy of Engineering of the United States to their membership. He will be formally inducted during the Academy's 1990 annual meeting in October. Academy membership honors those who have made "important contributions to engineering theory and practice, including significant contributions to the literature of engineering theory and practice," and those who have demonstrated "unusual accomplishment in new and developing fields of technology." French was cited individually for "outstanding contributions and leadership in developing unique measurements for electronic components, systems, and semiconductors."
French is fellow of the Institute of Electrical and Electronic Engineers and has received Presidential Rank of Meritorious and of Distinguished Executive. He is a recipient of the Department of Commerce Gold and Silver Medals and of the NIST Edward Bennett Rosa Award.

CONTACT: George Sinnott, (301) 975-2304

PETE’RSOXS NAMED NIST ENGINEER OF YEAR

Oskars Petersons has been recognized by the National Society of Professional Engineers (NSPE) as NIST Engineer of the Year as part of ceremonies held during National Engineers Week honoring Federal engineers. Petersons, chief of CEE’s Electricity Division, was cited for outstanding leadership and exceptional personal accomplishment in a broad program of engineering and reference electrical measurements, national standards, and measurements services. Petersons received his award plaque at a banquet attended by other representatives from all over the U.S. and chaired by the President of NSPE. Director John W. Lyons accompanied Petersons as agency representative for NIST.

CONTACT: Judson C. French, (301) 975-2220

NIST CALIBRATES THROUGHPUT TESTS OF THE HUBBLE SPACE TELESCOPE

Two NIST radiometric standards were used to calibrate five hollow-cathode lamps used in the preflight throughput tests of the Hubble Space Telescope (HST). The calibrations were performed in the Atomic and Plasma Radiation Division of the Center for Atomic, Molecular, and Optical Physics in consultation with Martin Marietta Denver Aerospace, NASA-Goddard Space Flight Center, Lockheed Missiles and Space Company, and the Space Telescope Science Institute. The lamps were calibrated both before and after the throughput tests to enable corrections for any changes in the calibrations of the lamps.

CONTACT: Jules Klose, (301) 975-3230

POSTEK WORK HIGHLIGHTED IN INTERNATIONAL OPTOELECTRONIC REPORTS

The work of Michael Postek of CME, on scanning electron microscopy (SEM) of integrated-circuit dimensions was featured in the March 1990 issue of OE Reports, the international newspaper of optoelectronic applied science and engineering. Postek discussed, in an extended interview, the technical issues involved in industry’s achievement of accurate measurement of the dimensions of submicrometer-sized circuit elements and has work on the development of a new generation of SEM-based linewidth standards as a means to resolve those issues. The work included collaborations with Texas Instruments, Inc., and the Cornell Nanofabrication Facility on the fabrication of the physical artifacts to be calibrated as standards.

CONTACT: Michael Postek, (301) 975-2299, Robert Larabee, (301) 975-2298
LIAISON NEWS

SUMMARY OF THE ILAC COMMITTEE MEETINGS
Singapore, April 2-5, 1990
by
John W. Locke
President, A2LA

Professor Paolo Soardo, Chairman of ILAC 1990, opened the meeting on Monday, April 2, 1990 in an auditorium at Singapore Institute of Standards and Industrial Research (SISIR). After introductions and a summary of expected accomplishments, the ILAC Conference Committee met to finalize arrangements for ILAC meeting in Torino, Italy, October 8-12, 1990. Others at the meeting toured SISIR. The first ILAC Newsletter was distributed, describing plans for these Committee meetings and for the general ILAC meeting in October.

ILAC Committee 1 On Commercial Applications

John Gilmour, Chairman of the Committee organized the meeting. A summary of the Liability Seminar organized and presented by the Committee in May of 1989 was reviewed.


Subjects included: Product liability – the laboratory's responsibility towards its clients; the responsibility of the accreditation body; and, the responsibility of an acceptance body (user). The seminar was favorably received, and since only about 35 people attended, it was suggested that the seminar be expanded and repeated at a later date. Tentative plans were made to include it as a seminar at ILAC 1992 in Ottawa, Canada.

A paper prepared by the Committee was presented:

"Role and Testing and Laboratory Accreditation in International Trade".

Subjects included: The importance of test data in trade; use of accreditation in removing technical barriers to trade; factors affecting the acceptance of foreign test documentation; mechanisms for acceptance of foreign test data; national accreditation systems simplify foreign recognition of test data; the role and value of laboratory accreditation systems; specifiers, certification bodies, and other users in product acceptance; product assurance through agreements; the foundations of effective agreements; recognition between laboratory systems; and limitations of laboratory accreditation.

There was a discussion of the development on product acceptance in Europe.

Key Points related to organization structure:

The European Organization for Testing and Certification (EOTC) (CEN/CENELEC serves as Secretariat.)

Other units reporting to EOTC were:
Western European Laboratory Accreditation Cooperation (WELAC)
Western European Calibration Cooperation (WECC)
EUROLAB
EUROMET

There was a discussion of the British Measurement & Testing Association (BMTA), launched on February 1, 1990 to create a British consensus from the testing community for presentation to EOTC.

ILAC Committee 2 On Accreditation Practice

John Summerfield, Chairman of the committee chaired the meeting.

There was a discussion of the need for guidance on the surveillance of testing laboratories. Results of a questionnaire on how accreditation systems perform surveillance on their accredited laboratories were presented. Because the results indicated a wide difference in implementation, it was agreed that development of a guide to surveillance should be pursued. It was noted that ASTM Committee E-36 has developed a draft document in this area.

Further, ILAC Task Force C had developed a document several years ago which should be used as a basis for further development.

A complaint handling guide, published earlier by ILAC Task Force C has been used by several accreditation agencies on a trial basis. It is suggested that its development be continued along the lines established. A copy of the latest draft was presented.


An analysis of ISO Guides 54 and 55 was presented with recommendation for changes. There was also a comparison of European Norm (EN) 45003. One provision suggested, a new 5g, was of concern:

"Together with its senior executive, staff and committees be free from any commercial and financial pressures which might influence the results of the accreditation process."

Another provision under the heading, Consultancy Services, suggests:

Measures taken by the accreditation bodies to ensure that consultancies do not compromise subsequent accreditations were: 
...c) by not having any financial interest in providing the consultancies."
There was a discussion of the need for training programs. It was suggested that attendees submit the working party chairman information on their training programs. It was mentioned that ASTM E36 was preparing a standard on this subject. Draft SO 10011-1, 2, 3 was reference as having some relevance.

A report was presented on:
"Calculation and Presentation of the Uncertainties in Test Reports."
This report referred to the Bureau of Weights and Measurements (BIPM) activities.

A summary of subcontracting and external services practices in various laboratory accreditations was presented. The summary pointed to the need for development of guidance in this area. A particular need was for a standard for acceptance of reference materials.

This committee meeting was concluded with an extensive discussion on the draft version of ISO/IEC Guide 25. Comments received by the ISO/CASCO drafting subcommittee were reviewed. There was concern about whether this revised guide meets the requirements found in ISO 9002. No conclusions were reached, since the resolution of these comments was intended for the ISO/CASCO Committee meeting scheduled for April 5.

ILAC Committee 3 On Laboratory Management and Operation

Allen Bryden called the meeting to order at 9:10 on April 4. The discussion of the relationship between Guide 25 Revised and ISO 9002 was continued. A number of delegates pleaded that the two standards be more explicitly related so that there would only be one accreditation standard. Other delegates claimed that this would place stringent requirements on laboratories which were not warranted. No agreement was reached at this point in the meetings.

A paper on reference materials was presented:
"Accreditation of Testing Laboratories and Use of Reference Materials" by A. Marshal, LNE.
There was reference to the International Reference Materials Data Base. It was agreed that a study group be formed to prepare guidelines defining competent suppliers of reference materials.

There was a discussion on equipment:
"Calibration and Maintenance of Test and Measuring Instruments in Laboratories"
This document will be updated for the ILAC meeting in Torino.

There was a question about whether ISO Guide 45 on the Presentation Test results needed to be updated. It was decided to wait for finalization of the Revised Guide 25.

A summary of interlaboratory programs prepared by NATA was reviewed:
"ILAC Database Directory of Interlaboratory Comparison Programs"

A number of programs were summarized, none from the United States. Two, two-page formats were suggested for these programs: A) General Information on coordinating Body and Scope of Programs; and, B) Specific Program details. This format appears to require too much detail to be practical. Interest was expressed only in continuing programs, not one-time programs. A distinction should be made between International, Regional, and National programs which accept all interested parties. It was suggested that the information would be including the name and address of the body offering the program.

Little information had been received by the Working Group about laboratory liability. It was pointed out that some accreditation systems require the laboratory to have liability insurance. Lloyds has developed reduced rates for laboratories which are accredited.

A paper on "Sampling and Identification" was reviewed and considerable concern was expressed about several provisions. It was agreed that a discussion paper was needed, not a draft guide, and that alternatives be presented by the Working Group.

There was a discussion of the use of computer acquired data. It was pointed out that there are many relevant documents, some with very extensive computer guidelines which are used. A discussion paper was proposed for presentation at ILAC 90 in Torino, Italy. Bell (TELARC, Sorro (LNE), Rogers (NAMAS), and Gonzalez (Spain) will participate in this effort.

A paper on categorizing Laboratory Scope of Competence was presented for discussion:
"Contribution to a Preliminary Document on Areas of Competence."

This is a very difficult area, because any new categorizing scheme would require considerable change in scopes of accreditation and directory listing for existing laboratory accreditation systems. A number of experiences were described, but not conclusions were arrived at. Concern was expressed over the categorization scheme suggested in the paper.

A paper on cost benefits was reviewed:
"Advantages, Costs, and Disadvantages of a Laboratory Accreditation."

This was considered to have been developed from a very biased questionnaire and data from only three laboratories. The paper will be presented to ILAC Torino for information, without endorsement by ILAC Committee 3. It was suggested that a questionnaire for accredited laboratories, users of accredited laboratories, and applicants would be useful in gathering information to help improve accreditation systems.
All information from the Working Groups needs to be developed and forwarded to the Committee Chairman by July 1, 1990.

**ILAC 1990 – Torino**

Chairman Soardo concluded the meetings on Thursday morning, April 5 by summarizing plans for the ILAC 1990 meeting.

- **Dates:** October 8-12, 1990
- **Poster Session:** 2M x 1M posters for each delegation.
- **Seminar:** "Metrology and Testing – How Testing Can Be Traceable to National Units."

Tentatively, the subjects to be included in the seminar are:
1. What is metrology
2. How traceability is performed: a) Europe; b) USA
3. Reference Materials
4. Results of Intercomparisons
5. Uncertainties
6. "Fortress Europe"

Cost: Delegate; 1,200,000 Lira (Currently $900 U.S.)
Accompanying person; 250,000 Lira
Hotels; 100,000 to 250,000 Lira per day with breakfast.

Attachment 2 is a list of delegates at the meetings.

**ISO CASCO GUIDE 25 MEETINGS**

The ILAC Meeting were followed by a meeting of the ISO CASCO working group on revision of Guide 25. Thirty-eight pages of comments were resolved. There was a serious attempt to include most of the key elements of ISO Standard 9002 in the standard.

**MEETING OF ILAC COMMITTEES**

2-5 APRIL 1990
SINGAPORE – SISIR

Code 14003

**LIST OF PARTICIPANTS**

**CHAIRMEN OF COMMITTEES**

1. Prof P. Soardo  
   Conference and Coordinating Committee
2. Mr. J.A. Gilmour  
   Committee 1
3. Mr. J.D. Summerfield  
   Committee 2
4. Mr. A. Bryden  
   Committee 3

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<td>01</td>
<td>Australia</td>
<td>NATA</td>
<td>Mr. John Gilmour</td>
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<td>02</td>
<td>Australia</td>
<td>NATA</td>
<td>Mrs. Ann-Margret Gilmour</td>
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<td>03</td>
<td>Australia</td>
<td>NATA</td>
<td>Mr. Tony Russell</td>
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<td>Canada</td>
<td>SCC-NAPTO</td>
<td>Mr. Marc Archambault</td>
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<td>05</td>
<td>China</td>
<td>SACI</td>
<td>Mr. Zhao Lin Hua</td>
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<td>06</td>
<td>France</td>
<td>Laboratoire National d'Essais</td>
<td>Mr. Allan Bryden</td>
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<td>07</td>
<td>France</td>
<td>Reseau National d'Essais</td>
<td>Mr. Patrice Heinis</td>
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<td>08</td>
<td>France</td>
<td>Reseau National d'Essais</td>
<td>Mr. Jean-Francois Sorro</td>
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<td>09</td>
<td>Germany</td>
<td>VdTUV</td>
<td>Dr. Hans W. Reuter</td>
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<td>Hong Kong</td>
<td>Hoklas</td>
<td>Dr. L.H. Ng</td>
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<td>Indonesia</td>
<td>Centre for Testing Quality Control</td>
<td>Dr. Mudjiono</td>
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<td>Centre For Testing &amp; Quality Control</td>
<td>Dr. J. Darmawan</td>
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<td>13</td>
<td>Italy</td>
<td>Istituto Elettrotecnico Nazionale</td>
<td>Prof. Paolo Soardo</td>
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<td>14</td>
<td>Italy</td>
<td>Camera di Commercio, Pescara</td>
<td>Mr. Gilberto Ferri</td>
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<tr>
<td>15</td>
<td>Japan</td>
<td>Japan Standards Association</td>
<td>Mr. Toru Watanabe</td>
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PMA LIAISON DELEGATE REPORT

PMA Officers have established a pilot program for the accreditation of Metrologists. An ad hoc committee under the direction of Mike Schmall has developed examinations in the following areas: DC/LF; Dimensional Measurements; Measurement Uncertainty; Temperature; RF/Microwave; Pressure/Flow; and Metrology Systems. The program is intended to assist Metrologists advance their professional status.

The Association is working to produce and publish a 2nd International Directory of Metrologists. The first directory was published in 1989.

Glenn E. Rasmussen, NCSL/PMA Liaison Delegate

ANSI LIAISON REPORT

The American Society for Quality Control (ASQC) convened a meeting of those members and their associates engaged in the U.S. national and international standards writing efforts in the field of quality control. The three-day meeting included meeting of the ANSI Z1 Subcommittee on Systems and Procedures, the U.S. TAGs to ISO/TC 176, Quality Management and Quality Assurance, and TC 69, Application of Statistical Methods, and the ASQC Standards Committee and Standards Council.

SUMMARY

1. The DOD is getting increasingly involved in national and international standards generating activities. DOD commitment to adopting suitable U.S. and ISO standards was reinforced.

2. The national and international umbrella standards for quality systems, ANSI/ASQC Q-90-series and ISO 9000-series standards respectively are being revised; the U.S. is developing positions to reinforce in the standards continuing quality improvements and consideration of customer interests and to increase statistical process controls in all aspects of management including calibration control. The new standards are candidates for superseding MIL-Q-9858A. At the request of Ira Epstein, DOD Assistant Director for International Standards, I have accepted to serve on the U.S. Task Force to revise ANSI/ASQC Q-90 series to establish the U.S. position for revising ISO-9000-series standards.

The ISO-9000 series standards are being adopted, mostly verbatim as national quality standards by all industrialized countries, including the USA, and most developing countries.

3. DOD will withdraw MIL-STD-45662A as soon as a U.S National (ANSI) Standard is published that is acceptable to the DOD. I have committed the ANSE/ASQC Writing Group to work towards attaining that goal.

5. ANSI/ASQC M1-1987, American National Standard for Calibration Systems, will be revised in 1991 to integrate it with ANSI/ASQC M2 (redesignated from Q4), American National Standard for the Quality Control of Measurements. We count on DOD assistance at that time to work on a standard acceptable to all concerned.

6. International product standards will require certification of manufacturers' quality systems by recognized agencies.

7. U.S. active involvement towards a satisfactory solution of the controversies surrounding international recommendations on measurement uncertainties has resumed. I have taken steps to cause a U.S. National Standard on Measurement Uncertainties with limited utility for quality control and metrology to be revised with involvement of metrologists. This standard should establish the U.S. position in the coming debate on ISO recommendations for measurement uncertainties.

8. More involvement of concerned professionals is needed all around. Qualified volunteers are needed to serve on standards writing committees in quality management and quality assurance, as members of the U.S. Technical Advisory Group to ISO/TC 176, and as U.S. delegates to ISO. I would like to have at least one more delegate to the ISO for matters regarding calibration control and measurements. Interested persons are invited to contact me.

A more detailed report, including a summary of the status of ANSI, ISO, and related MIL Standards on quality management and quality assurance, as well as a listing of the countries that have adopted ISO 900-series standards as their own, is sent to selected NCSL officers and the Secretariat with my request to make it available to all interested member delegates.

Rolf B.F. Schumacher, ANSI Liaison

A2LA LIAISON REPORT

Two laboratories, Navistar International Transportation Company of Melrose Park, IL, and G.K.S. Inspection Services of Sterling Heights, Michigan, have been accredited under the A2LA Metrology field of testing for dimensional measurements of length, angle and flatness.

The Association has signed a memorandum of understanding with the Hong Kong Laboratory Accreditation Scheme (HOKLAS). This MOU provides for the mutual recognition to laboratories accredited by each accreditation agency. HOKLAS is an agency of the Hong Kong government.

John Locke participated in the International Laboratory Accreditation Conference (ILAC) committee meetings held in Singapore in early April 1990. Among the significant issues is the pending revision of the ISO Guide 25, generic criteria for evaluating laboratories, expected to be harmonized with the ISO 9000 series, quality assurance system standards. The ILAC plenary session will be held in Turin, Italy in October 1990.

Anyone interested in receiving more information on the above subjects is invited to request such information from A2LA headquarters.

Peter S. Unger, A2LA Liaison

WECC LIAISON REPORT

As a result of NCSL's liaison to WECC, a request was received in February from Dr. Roberto Perissi of the Servizio Di Taratura In Italia (SIT), Commissione Per La Metrologia, (the calibration accreditation organization in Torino, Italy), for a set of NCSL Recommended Practices and an invitation to meet in Washington, May 8th, where he is participating in the instrument society of America sponsored seminar at the Ritz Carlton Hotel "Managing Instrumentation Systems, and Automation in Europe - The Impact Beyond 1992".

I provided a copy of the RP's and advised I would be unable to accept the invitation to discuss RP's and European documentation due to attendance at Metrologia '90 in Mexico at the same time period.

Dr. Perissi has acknowledged receipt of the RP's and looks forward to an occasion for discussion.

Graham Cameron, Liaison Delegate to WECC

CORM LIAISON – QUARTERLY REPORT

CORM Standing Committee on Optical Properties of Materials

The last 30 years of technological advancement in electronics and optics has increased the need for more precise and accurate measurements of the optical properties of materials. The actions of this committee may help to meet this need. Right now, three areas that deserve immediate attention: more precise standards, consensus on measurement geometries, and guidance on and implementation of interlaboratory comparisons.

More precise standards subcommittee – The example below will serve to describe the problem that this subcommittee will address. While the example is somewhat specific, the work of the subcommittee will be more generic.

Available optical material standards (e.g. spectral transmittance or transmission factor) have uncertainties of roughly 0.5%. The user of these material standards, to avoid daily use of them, calibrates working standards. The imprecision of the
calibration increases the uncertainty of the working standard. The use of the working standard increases the uncertainty of future measurements by the precision of the measurement process and the precision of the instrument calibration.

The erosion of accuracy due to the increase in uncertainty mentioned above is large enough to be a major contribution to the between-instrument variation within a single manufacturer. It is often noticeable after replacing a working standard or a master standard.

Consensus on measurement geometries subcommittee – Kevin Car of Labsphere has agreed to chair this subcommittee. This subcommittee plans to list the various classes of measurements being commonly made where geometry is a major source of variation in the results. A decision will be made regarding which of these classes would provide the best opportunity to reach consensus. Finally, the subcommittee will solicit interested parties for their views on each geometry and determine a consensus.

The work of the subcommittee will have enormous impact. If you calibrate an instrument of one geometry with a standard calibrated under a different geometry, you introduce an error. In only a few fields of instrumentation has measurement geometry been so precisely reproduced between manufacturers to allow direct comparison of measurement without regard to manufacturer.

The metrological significance of this is that if the geometry used at NIST does not precisely correspond to the geometry of your instrument, the use of the NIST calibration introduces an error. This error weakens any claim of traceability. Finally, a manufacturer must assume responsibility for the primary standards of any instruments having non-standard geometry. NIST cannot maintain standards for each particular manufacturer’s particular flavor of geometry. If our community can reach a real consensus regarding measurement geometries, the results will guide NIST in providing a minimal number of maximally useful materials.

Laboratory intercomparison subcommittee – This subcommittee will either guide existing intercomparison efforts or carry out one of its own based on a comparison of needs with capabilities of existing efforts. Needs, in this sense, will include the goals of the intercomparison, the range of specimens, the analysis of data, and the availability of data. The work of this subcommittee will change the handling of intercomparisons and the way that participants interact with each other.

W.A. (Bill) Simmons, CORM Liaison Delegate

PRESIDENT’S MESSAGE
(Continued from page 1)

CONFERENCE – AUGUST 19-21

This year it will be my distinct pleasure to welcome you to the 1990 NCSL Workshop and Symposium. When you review the conference events in the preliminary booklet, you will find a superb program. The program offers over 70 papers this year including technical sessions, management sessions, panels, round table discussions, exhibits, and technical poster sessions. You will be exposed to fresh ideas, innovative products, and unparalleled professional contact. The best part of the conference experience is the exchange of information and ideas that apply directly to your work.

The conference will be enhanced by other special activities. Sunday evening begins with a Reception and Exhibit Viewing. Monday evening will be the International Dinner and those of you that sign-up will enjoy Dick Underwood’s talk on "A View of the Earth’s Environment from Space". The banquet Tuesday evening is a special event and a real opportunity to meet and mingle with colleagues and officers of NCSL, then enjoy some fine entertainment. Sorry, no "Capital Steps" this year but I know you will enjoy the evening.

Mary Eicke has put together another great Guest Program. Word of advice for your guests is to sign up early. The attractions of Washington D.C. range not only from historical tours and shopping but to cultural and entertaining opportunities which abound. You are encouraged to take full advantage of conference package.

I look forward to seeing you there.

Bill Simmons, NCSL President

EDITOR’S MESSAGE
(Continued from page 2)

It’s too much to print in its entirety, so I decided to just print excerpts of the commentaries along with the Introduction and Scope Sections of the DRAFT. If this material whets your appetite, I could send you a copy of the whole packet, or you could deal directly with the TAG committee. I found in reading the DRAFT that it’s more than I wanted to know. Yet, for internationally-oriented companies with similar-focused metrology organizations, it would be crucial.

John L. Minck, Editor
The Northern Ohio section of Region 5 met on April 19, 1990 at the facility of Cortez III hosted by Frank Della Torre and Kate Webster. We had 25 members and guests in attendance.

After registration at 8:30 a.m., the meeting began at 9:10 with a short series of announcements regarding the local NCSL section activities and an overview of the day’s meeting.

The morning session belonged to James Rushin of MKS Instruments who presented an overview of vacuum-measuring equipment. After the break, he discussed their spinning rotor gauge device for determining a vacuum. One was available for examination and had everyone’s interest.

In the afternoon Kirt Mosher of Ruska Instruments gave a presentation on pressure-measuring equipment. The meeting adjourned at 4:00 p.m.

ATTENDEES

<table>
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<tr>
<th>Name</th>
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<tr>
<td>Mike Patena</td>
<td>Cleveland Electric Illuminating Co.</td>
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<td>Robert Schrenholz</td>
<td>Cleveland Electric Illuminating Co.</td>
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<td>Al Feldman</td>
<td>John Fluke Mfg.</td>
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<td>Dale Varder</td>
<td>Cortez III</td>
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<td>Rick Abbott</td>
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<td>Dale Smiejkal</td>
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<td>Debbie Brooks</td>
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<td>John Harmon</td>
<td>Gould Recording Systems</td>
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<td>Bill Hinkel</td>
<td>Bailey Controls Co.</td>
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<td>Cynthia Pringle</td>
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<td>Jim Martach</td>
<td>Bailey Controls Co.</td>
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<td>Mike Joyce</td>
<td>Argo Tech</td>
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<td>Len Weiss</td>
<td>Broadview Inc.</td>
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<td>Bob Mattingly</td>
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<td>Kevin Lowry</td>
<td>Lorain Products</td>
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<td>Frank Della Torre</td>
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<td>Kate Webster</td>
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<td>Kirt Mosher</td>
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<td>K. Cates</td>
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<td>S. Font</td>
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ACTIVITIES/SUBJECTS

* Ronnie Eubanks (Otis Engineering Corp., Dallas, 214) 418-4034) briefly discussed NCSL general business.

* Gary Carr (Storage Technology), NCSL West Section Education/Training Facilitator, relayed information on upcoming training classes and asked for input for classes needed in the area. He can be reached at Storage Technology Corp., 2270 S. 88th St., M/S 5116, Louisville, CO 80028, (303) 673-3829.

* John Portman (Rocket Components Co., Englewood, (303) 936-5197) informed the attendees that ISOTECH’s Journal of Thermometry is distributed twice a year for an annual fee of $25.00. To subscribe contact Mr. Henry Sostmann of ISO Thermal Technology Ltd., 2307 Whitley Dr., Durham, NC 27707.

* Roger Castro (Datum Inspection Services, Denver, (303) 371-6818) briefly discussed Fasteners and Quality Control. He welcomes attendees to contact him for additional information.

* Paul Trimbach (Ball Aerospace, Boulder, (303) 939-5080) announced that NIST will be holding a spinning rotor gauge workshop in May. If interested, contact either Deirdre Lavalle, Paul or NIST directly.

* Anthony Thorpe, [Texas State Technical Institute (TSTI), Amarillo, (806) 335-2316 ext. 459]. TSTI is starting a two year associate degree program. He reported on its current status. Their steering committee is meeting this Saturday, March 24th, at which time more details will be finalized. Tony requested information from members on what is needed in the metrology community that would be applicable to teaching their students. This program is also looking for equipment donations and is interested in setting up student internships with appropriate companies.

* Greg Burnett (Hewlett-Packard Co., Englewood) reviewed the progress of the NCSL Calibration Procedures Committee in regards to RP-3. They are currently working on a suggested format for maintenance manuals produced by manufacturers. This format will include schematics and parts lists. Any input is welcomed. Please contact Greg at (303) 649-5460.
After the meeting was adjourned, Gary Carr of Storage Technology Corporation conducted a tour of Building 4 manufacturing area and the metrology lab.

Deirdre Lavallee thanked Storage Technology Corporation for providing the host facilities. Our hosts provided the grand door prize (Fluke multimeter) won by Roger Castro of Datum Inspection Services.

Appreciation is also extended to our topic discussion leaders and guest presenters, as well as to Neil Peacock (HPS Division of MKS Instruments, Inc.) our photographer.

MEETING DISCUSSION TOPICS:

Implementation of the 1990 Changes in the Temperature Scale in Metrology Laboratories

Bill Jump, Eastman Kodak, discussed some changes which Kodak is looking at. He also reviewed temperature equations and the conversion from ITS 68 to ITS 90. Bill offered assistance to anyone in the area who has concerns about the temperature change. He will discuss this topic again at the next meeting, since the attendees felt that there will be more questions as the changes come into effect.

Implementation of the 1990 Changes in Volt and OHM in Metrology Laboratories

Paul Trimbach, Ball Aerospace, reviewed the diary maintained since the last meeting on the 1990 changes. He also covered in detail how these changes will effect Ball Aerospace and how manufacturers will respond to such changes. Paul noted that there is a lack of interest by instrument users other than metrology users.

Bar Coding of Equipment as a Tracking System

Ronnie Eubanks led the discussion on the current state of the art of bar coding equipment as used for tracking purposes. Most companies seem to feel bar codes are beneficial to inventory control but not, as yet, in metrology labs. Some companies put the bar codes on a report instead of an actual instrument. Methods of producing the bar codes itself and selection of bar codes was reviewed.

How to Handle an Audit in Your Metrology Lab

Ronnie Eubanks, Otis Engineering and NCSL Region 6 Coordinator, led a lively discussion on auditing techniques used by both internal and external auditors. A point was made that this time auditors are rarely concerned with software. It was decided that preparedness was the best method to survive an audit.

Fiber Optics

Doug Franzen, NIST, presented an overview of the state-of-the-art of the art of optics, materials used, calibration standards and where the field is headed. NIST is also involved in an internal round-robin for the primary standard for absolute optical power.

TENTATIVE TOPICS FOR SEPTEMBER MEETING:
(9/12/90)

Continuation of "Implementation of the 1990 Changes in the Temperature Scale in Metrology Laboratories", a continued discussion by Bill Jump (Eastman Kodak Co.)

"Fasteners" by Roger Castro, Datum Inspection Services.

"Acoustics" by Greg Burnett, Hewlett-Packard Company.

The Wednesday, September 12, 1990 meeting will be held at the Ball Aerospace facilities in Boulder, CO.
discussed at the January Board of Directors Meeting in Palm Springs were briefly mentioned by Ralph Bertermann.

1. NIST has a new Director, Dr. Lions.
2. The five year NCSL plan is available.
3. NIST is assessing a new surcharge of 16-20%. Send comments to the NCSL in Boulder, CO.
4. Seven new international traceability reciprocating agreements have been signed.
5. NCSL maintains a computer bulletin board. (303) 440-3385.
6. Good Practice RP-1 has been reissued and includes calibration intervals.
7. The 1990 Workshop is to be held in Washington D.C. the week of August 19th. The 1991 Workshop will be held in Albuquerque, New Mexico.

Jim Ryan, a member of the NCSL Metric Ad Hoc Committee, gave a report from St. Louis regarding the status of metrication in the United States. It seems that:

1. The U.S. will maintain a dual system for the next thirty years.
2. Everything in the European Community must be Metric by the year 2000, except aircraft and sea transport.
3. Independent surveys have shown that of the Fortune 1000 firms, 50% favored mandatory conversion in twenty years.

Upon completion of Jim Ryan’s report Ralph Bertermann asked if there was any interest in sectional “round robin”. Kelley McDaniel responded that a recent “round robin” revealed problems with air flow calibrations. There is a significant disagreement between some manufacturers and NCSL member laboratories.

Mr. Peter Ungar was then introduced in Chicago. He represented the American Association For Laboratory Accreditation (A2LA). A2LA is a nonprofit group incorporated as a scientific, education and charitable organization. Its primary purpose is to formulate a system for the voluntary accreditation of testing laboratories.

Following lunch Wayne Cummings, of the John Fluke Manufacturing Co., gave an informative presentation from St. Louis on its recently released software asset management program, MET/TRACK. This PC based program provides information that can be used in generating summaries of calibration reports, out of tolerance instruments, and reverse traceability. Because MET/TRACK is designed specifically for metrology property management, it offers significant advantages over commercially available general purpose data management software.

A tour of Searle’s calibration laboratory was arranged as the final activity of the day. I would like to thank everyone involved in this meeting for their very interesting and informative presentations. I would also like to thank Ralph Bertermann and Barbara Grzenczyk for hosting the meeting.

The next Chicago Section meeting will be held at Baxter Health Care in October of 1990.

David H. Walters, Chicago Section Coordinator For Region 11.

ATTENDEES

Larry Azus
K.V. Abraham
Ralph Bertermann
Barry Brusso
Carl E. Booker
Stan Chytila
Ronald Dettling
Stan Fabinski
Frank L. Froegel
Gary Grabczyk
Jim Gruber
Angel Guma
Ted M. Held
Robert Hemeryck
Gary Karezewski
Dennis Kentner
Bill Keinz
Peter Kirsch
Judy Kloth
Susan Kwasnica
Jack E. Leedom
Anthony J. McCarthy
Mary Malorano
Tony Mann
Craig Mason
Bill Meier
Kathi Miller
Joe Petersen
Marv Piper
Ken Provost
Arnold Raines
Donald R. Ruchhmann
Bonnie Salyards
Jim Smith
Richard L. Spears
Howard Stabenow
Peter S. Unger
Art Vogt
David H. Walters
Tom Waltrich
Stuart Wells
Dorene Westergaard
James Williams
Wesley Yee

John Fluke Company
Johnson Controls
G.D. Searle Company
S&C Electric
Illinois Power Co.
The NutraSweet Company
Rockwell/SSD
Commonwealth Edison
Delta Technical Products
Marquette Electronics
Joslyn Mfg. Company
S&C Electric Co.
Abbott Laboratories
The Upjohn Co.
Illinois Power Co.
Woodward Governor Co.
AGCS
Zenith Electronics Corp.
Baxter Health Care Corporation
Baxter Health Care Corporation
Simpson Electric Company
S&C Electric Co.
Baxter Healthcare
John Fluke Mfg. Company
Baxter Healthcare
John Flude Mfg. Company
Baxter Health Care Corporation
Abbott Laboratories
J.H. Metrology Company, Inc.
AGCS
Baxter Health Care Corporation
Commonwealth Edison
Baxter Health Care
Electro Rent Corp.
Simpson Electric Company
Micro Switch-Freeport
American Assoc. for Laboratory Accreditation
ITT Research Institute
Commonwealth Edison/S.O.A.D.
The NutraSweet Company
Woodward Governor Company
Baxter Health Care Corporation
Woodward Governor Company
B&B Instruments
This spring meeting of the Region 6 Central section of the NCCL was attended by 57 delegates, 37 of whom were measuring and test equipment users.

The meeting began shortly after 9 a.m. with opening remarks by the section leader, Clyde Orrison, followed by the host from Tektronix, Mr. Don McKenzie, who greeted the attendees and provided information concerning the facility and its interesting and "important" features. A large demo room was set up to provide VXI instrument information.

NCCL business announcements were made by the regional coordinator Ronnie Eubanks, NCCL VP Bob Willett, and the section coordinator. Among the topics addressed were (1) Election of NCCL directors, (2) the August National Workshop & Symposium, and (3) NCCL participation in DOD metrication programs.

Mr. Bob Hesselberth (SpeetraCom Corp. (716) 381-4827) presented a 1-2-3 spreadsheet based method for analysis of payback period, present value of cash flows, and internal rate of return for calibration equipment investment decisions.

A video taped presentation by Mr. Tim Bennington Davis (Tektronix Inc. (214) 550-0525) explained calibration methods and NIST traceability paths for several Tek DSO products. Lack of direct access to internal reference does not present a support problem for calibration verification.

Mr. Tony Thorpe (TSTI Amarillo (806) 335-2316) briefed the attendees on planned metrology curriculum for the near future. Mr. Thorpe encouraged those in attendance to provide advice and material support for the program, and thanked region NCCL participants for their assistance in the initial curriculum planning.

Mr. Trei Henri (Hewlett Packard Co. Richardson (214) 231-6101) presented HP's support plans for their VXI products. A brief tutorial on VXI evolution and operation preceded a detailed discussion of the methods HP intends to employ to support calibration labs. Both hardware and software support were topics of discussion.

Mr. Jim Puri (Hewlett-Packard Co. Richardson (214) 381-7161) coordinated a discussion of laboratory auditing practices. Attendees from Region 6 companies addressed various auditing issues, from auditor and auditee perspectives. Mr. Don McKenzie of Tektronix showed examples of audit check sheets provided by his lab to each auditor. The sheets clearly reference each subject of interest to specific locations in the lab's quality control documents.
A brief discussion of methods used to meet the requirements of MIL-STD-45662A Par. 5.2 followed. This section addresses methods of dealing with uncertainty ratios between M&TE and UUT of less than 4.1.

Door prizes for those attending were provided by Tektronix (A bright yellow DM-250), and by the NCSL (2 ceramic coffee cup bearing NCSL logos). The cups were awarded to Mr. Bruce Gould (GD/FW) and to Mr. James Johnson (R-TEC Bedford TX). The bright yellow DMM was awarded to Mr. Dennis Gipson of AT&T Information Systems of Shreveport LA.

The central section (Region 6) is grateful to our hosts (Tek. Inc.) for providing excellent facilities and support. Eye-opening hot coffee and delicious donuts sustained the AM session, and a BBQ lunch held the attendees until the meeting closed in the late PM.

Our next D/FW section meeting will be hosted by the John Fluke Co. at their facility at 1801 Royal Lane, Suite 307 in Dallas TX. Their telephone number is (214) 869-2848. The November 1990 meeting will be on Wednesday Nov. 7, 1990.

**ATTENDEES**

- Gerald Davis
- F.H. Franz
- Lee Romine
- Keith Scoggins
- Byrn Scammel
- James Johnson
- Don McKenzie
- Ken Wischinewsky
- Robert Hankins
- Ed Barker
- John LaBonte
- Howard Adams
- Rick Longley
- Clark Neill
- Rodney Fritchman
- Luke Smith
- Bill Johnson
- Les Hungerford
- Dallas Davidson
- Bruce Gould
- Jim Puri
- Joe Turcott
- Randall Gray
- Jerry Price
- Cliff Snellings
- David Larwill
- Bob Roberts
- Robert McAllen
- Chuck Rowles
- Bob Hesselberth
- Santiago Rodriguez
- Norman Carlson
- Inotek Corp.
- Bell Helicopter
- American Airlines
- Houston Pwr. Light
- Airon Electronics
- R-TEC Systems
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- Buey & Kjaer Inc.
- E Systems
- Chrysler Technologies
- Texas Instruments Inc.
- Cal Labs Inc.
- Airtop Electronics
- Texas Instruments Inc.
- Texas Instruments Inc.
- B Systems
- Tucker Electronics
- Sprague Electric Co.
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- IAM & AW AFL-CIO
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- Rockwell International
- UFL Corporation
- Rockwell International
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- Scientific Devices
- SpectraCom Corp.
- Texas Instruments Corp.
- Compaq Computer Corp.
- Texas Instruments Inc.
- Compaq Computer Corp.
- Multi Amp Corp.
- Continental Electronics
- Hewlett Packard Co.
- Texas Instruments Inc.
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- Hewlett-Packard Co.
- Rockwell International
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- Advantest
- TSTI Amarillo
- Data Marketing Assoc.
- Hewlett-Packard Co.
- Abbot Labs
- Data Marketing Assoc.
- Tucker Electronics
- Hewlett-Packard Co.

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**Group picture of DFW (Central Section)**

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May 3, 1990
Ramada Hotel-Airport
Tempe, AZ
Wayne Benda
Coordinator
Phoenix/Tucson Section

The fourteenth semi-annual Phoenix/Tucson Section Seminar and Workshop was held at the Ramada Hotel-Airport East in Tempe (the Phoenix area). Wayne Benda (Hughes Aircraft), Phoenix/Tucson Section Coordinator, welcomed a group of thirty-eight participants and self-introductions followed.
Data, shown on viewgraph cells, graphically represented results of a survey taken at the October '89 section meeting. Wayne indicated that further discussion would take place later in the day.

William F. (Bill) Quigley, manager of Metrology at Hughes Aircraft in Tucson, was introduced to address the issue of Total Quality Management (TQM) in the metrology arena.

With the aid of the overhead projector, Bill first outlined five basic steps used to identify and address changes which must be made to improve quality and efficiency and, as a result, lower costs. The steps were identified as follows:

A. Process examination
B. Data collection
C. Identification of the most important discrepancy
D. Establishment of root cause
E. Improvement

Each step was then divided into substeps which were individually described. The entire cycle is repeated until additional effort is no longer justified.

Examples of situations at Hughes were used to help visualize how the process worked. Data were presented which illustrated improvement trends. Bill pointed out that management data is not used as a "whipping tool" to drive technicians, but as a guideline for a general operation of the metrology facility.

A dialog between Bill and the attendees followed which included a series of excellent questions and answers.

One comment indicated that equipment users typically wait until the end of the recall time window to submit equipment for recalibration. The calibrator is then deluged with overload to work to perform. Bill explained that the solution to this problem was to provide rapid turnaround time and to convince clients that you can do it. When this is possible, they will be assured that you will not be "shutting them down" for an appreciable time period. Users will then be willing to release equipment before the previous calibration has expired thereby assuring the calibrator a reasonable opportunity to plan a sensible work schedule.

Bill's TQM presentation was well organized and executed. His metrology group at Hughes is under the Product Quality Organization where unique calibration intervals are assigned to each asset based upon use and individual performance.

After the break period, Wayne asked that each of the attendees explain how calibrations were handled at their respective facilities. Were they performed on site or in the lab? Different schemes were described, many of which could benefit from a consistent approach across their multi-divisional structures (Groups, Sectors, etc.).

Calibration laboratories need to be represented at the management level (the higher the better) with the chief advantage being that their needs would be integrated into the entire quality structure of the organization. Without corporate level planning, large companies whose respective divisions operate redundant facilities are often wasting company resources when they could be operating under one "flag" in a synergistic manner.

Bill noted that when setting up a data base, especially over a corporate wide domain, a dictionary of terms is a must. This has to be defined "up front" so that all participants will fully understand what each data field represents and how it is to be used.

Comments from each lab representative were enlightening and also tended to illustrate the high degree of variability in the approaches used to address similar functions at different companies. Many variations result from the size of the company and the type of work performed at each.

A description of the NCSL ensued and the structural design of the organization was illustrated from a viewgraph cell. Wayne noted that Howard Casstrup (ISG) is now the Region 8 Director, replacing Bob Willett (who assumed the position of V.P. of Education and Training). The eleven NCSL regions were also identified.

After a relaxing lunch, Wayne continued his discussion by identifying the many committees which are part of the NCSL including a new ad hoc group which will address Total Quality Management. Bill is a member of the new committee and wanted to know how many would attend a local workshop devoted to the TQM issue. About a dozen hands were raised. Bill would like to bring in as many of the Committee members as possible to conduct a workshop (we'll hear more about this at a later time).

A short history of weights and measures, as developed in the United States, was presented by Wayne. It wasn't until 1836 that Congress standardized weights and measures and provided artifacts to the Governors of each state.

A brief description of the RMC Company of Tucson revealed that a Josephson Array Voltage Standard System is available to their customers. ALL necessary components are available, including the Josephson array, computer, and software, to realize the legal volt in any laboratory. The equipment is set up and lab personnel are taught to operate the system. The price is about $125K.

A discussion of IPTS-90 was initiated with the question "What are you doing with a new temperature scale?" Wayne received a variety of answers, each based on the background of the person responding. He provided some rationale to support the need for changes being made. One included the different linearities of various thermometer materials (mercury, liquid, etc.). Most of us will find the changes
insignificant. Copies of the new table were still not available at meeting time.

NCSL coffee cups were awarded to Bill Quigley for his TQM presentation and to Mary Lynn Springborn, who has assisted with registration at several of our meetings. Mary Lynn's cup was accepted by Lee Walters.

Mike Franckowiak (Precision Measurement, Inc.) made a pitch for the Precision Measurements Association (PMA). PMA is similar to NCSL but is oriented more toward technical achievements as opposed to those in the managerial domain. Membership applications were available from Mike.

Connie Davis (Litton Industries) was looking for a suitable standard to perform a dimensional step measurement. After clarification and some discussion, a Pratt & Whitney Laser Micrometer was recommended for the application.

Wayne polled the group to determine if interest still existed in learning about problems associated with accelerometer calibration. Some interest was noted. Another subject for future discussion included statistical process control and its application toward the adjustment of calibration intervals. Other subjects included equipment automation and relative humidity measurement methods. These subjects will be considered for discussion at future meetings.

The October meeting survey results were again addressed. Wayne presented a view cell which contained written comments and criticisms made on survey sheets at the last meeting. Good feedback was obtained which would probably not have been made verbally. The need for a wireless microphone for "wandering" speakers was considered desirable. The idea will be pursued.

The meeting was adjourned at approximately 3 p.m. The next Phoenix/Tucson Section meeting is being planned for the Tucson area on Thursday, 1 November 1990. See you there!

**ATTENDEES**

Wayne E. Benda
Jim Berg
Wayne E. Brown
Chalmer E. Buntin
Cecil H. Cole
Bud Crisel
Michael Curtis
Constance V. Davis
Claude Evering
Leonard M. Fortunato
Harold J. Foxhoven
Mike Franckowiak
Jean W. Gardner

Mike Gourde
Michael J. Greenleif
Robert A. Holmes
William B. Humes
William B. Hutchinson
Mel Johnson
J. "Wade" Keith III
Allen R. Kirk
John T. Latimer
Don Lisiecki
Raymond F. Malesic
Robert A. Mercier
Bala Mohammed
Gary W. Oliver
Walter A. Pawella
William F. Quigley
Karda K. Rollins
Walter H. Schuknecht
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James Tavernier
Earl P. "Pete" Tofanelli
Lee J. Walters
James E. Whetstone

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Global Wulfsberg
Airojet Electrosystems Company - Azusa, CA
Loral Defense Systems - Arizona
Motorola Government Electronics Group
Datum Inspection Services

Group picture of Phoenix/Tucson Section.
After breaking for a no host lunch, Howard Castrup, ISG, and NCSL Region 7 & 8 director, presented the topic "Test Equipment Intervals". This was a lively topic.

Next on the agenda, John Grajera, LMSC, senior instrumentation engineer, gave a very informative topic, "Laboratory Automation and Networking".

After the afternoon break, a Metrology tour was organized. The meeting ended approximately at 4:00 p.m.

Bard Dunkelberger, Region 7 Coordinator

Region 7 met at Lockheed Missiles and Space Co., Inc. in Sunnyvale, California on 26 April 1990 with 44 individuals. Our host was Dr. Klaus Jaeger, manager of Metrology at LMSC.

The meeting agenda included NCSL information, and special topics on accessory control, test equipment intervals, and laboratory automation and networking.

The meeting started shortly after 8:00 a.m., after a gracious continental "eye opener" breakfast hosted by Lockheed.

It was unfortunate that Bard Dunkelberger, the Region 7 Coordinator could not attend the meeting due to unplanned jury duty. Dr. Jaeger took over and with assistance from Jim Ingram and the substitute speaker, John Grajera, the program came off without a hitch.

Dr. Jaeger gave the welcome and NCSL board report.

Les Mayson, CPPM, President of National Property Management Association presented the NPMA goals and duties of property management.

John Lee, Telogy, was introduced to give a rundown on the Precision Measurement Society. John gave the duties and aims of PMS.

After the break and pictures John Lee was, again, introduced for the topic "Accessory Control Service". John presented new ideas of accessory control in a rental company and its potential use in the industry at large.
10TH ANNUAL CANADIAN WORKSHOP/SYMPOSIUM AND PRODUCT EXHIBITION

November 6-7, 1990
National Research Council of Canada
Montreal RD, Ottawa, Ontario, Canada
Theme: "Metrology in TQM" plus laboratories tour.

Contact: Duane Brown (613) 925-5934, FAX (613) 925-1195.
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Rey Herrera

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Peter E. Crisp

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Larry Grunert

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NATIONAL STANDARD WEEK

(Ed Note: This was printed in the U.S. Congressional Record - Senate, for April, 1990).

By Mr. Hatch: S.J. Res. 291, Joint resolution designating the week of October 14, 1990, as "National Standards Week"; to the Committee on the Judiciary.

Mr. HATCH. Mr. President, I rise today to introduce a joint resolution designating the week of October 14, 1990, as "National Standards Week." This week was chosen to coincide with "World Standards Day," which will be celebrated on October 14, 1990.

Mr. President, as you know, the United States is currently facing a large trade deficit. In response to this deficit, we have spent millions of dollars promoting U.S. products overseas and engaged in extensive negotiations with our major trading partners to try to open foreign markets to American products. However, I believe that we have overlooked one of the simplest and least expensive methods of making our products more competitive. I am talking about effort to promote harmonized product standards.

Some of my colleagues may not be aware of the importance of product standards. Standards are the specifications, measurements, and other requirements that govern the manufacture and sale of products within a country. U.S. exports must meet the applicable foreign standards if they are to be eligible to be sold in a particular country. For this reason, any efforts we can make to help our trading partners write standards that include rather than exclude American products will go a long way toward opening those markets to our goods.

Last year, I helped guide through the Senate a bill which provides money for a standards writing specialist to be sent to Saudi Arabia to help the Saudis write product standards. During this project, I became acutely aware of the importance of standards and standards writing to our national interest. The project is jointly funded by the Department of Commerce and a group of private sector companies, and the standards expert is credentialed by the government.

The benefits of the single small project are significant. For an investment of $250,000 in government funds, it is estimated that exports to the six Persian Gulf nations which have adopted Saudi standards will increase by as much as $500 million. That means 15,000 new jobs and $15 million in tax revenues for the United States.

Mr. President, our foreign competitors are well aware of the importance of standards to international trade. Last year, while we were debating whether or not we would spend $250,000 for a standards expert in Saudi Arabia, the Japanese and Germans dispatched large teams to represent their countries in Saudi Arabia.

This situation points up the pressing need we have to raise the awareness of all Americans to the importance of product standards to our international competitiveness. I believe that a National Standards Week will help to focus national attention on this important issue, and I invite my colleagues to join me in sponsoring this joint resolution.

* * * * * * *

CANADIAN NRC SIGNS AGREEMENTS WITH U.K. AND U.S. RECOGNIZING EQUIVALENCE OF PHYSICAL MEASUREMENT STANDARDS

OTTAWA WA (June 11, 1990) - The National Research Council today concluded agreements with the United Kingdom and the United States recognizing the equivalence of each country's National Standards of Physical Measurements.

The agreements, covering physical measurement standards for mass, length, time, temperature, electricity and light, will assist the flow of international trade between Canada and the two countries.

The signatories now recognize that any measurement made in connection with trade, commerce, scientific activities, and defence will be based on standards that are equivalent to an accuracy ranging from parts-per-thousand (10^-3) for light, to parts-per-ten-trillion (10^-15) for time.

The equivalence is based on detailed comparison of national standards maintained by NRC in Canada, the National Physical Laboratory (NPL) in the United Kingdom, and the National Institute of Standards and Technology (NIST) in the United States. These organizations are the final authority on the physical values assigned to such standards in their respective countries.

The agreements were concluded at a special ceremony, held on the first day of the International Conference on Precision Electromagnetic Measurements, by Dr. Pierro Perron, president of NRC; Dr. John Lyons, director of NIST; and Dr. Owen Jones, head of the electrical science division of NPL.

"Companies today must compete in a global marketplace that emphasizes precision manufacturing and high-quality products," said Perron. "As a result, measurement standards are increasingly important to industry, not just in themselves, but also as the foundation of normative standards which..."
define the performance and properties of goods and services around the world.

International trade contracts today frequently demand that measurement accuracy meet international standards. The agreements will allow Canadian industry to compete in this regard on an equal and solidly documented basis with industry from the United Kingdom and the United States.

For example, Canadian suppliers of U.K. and U.S. firms meeting NRC standards will no longer be required to have their instruments calibrated by laboratories in the two other countries. Establishment of equivalent standards will become increasingly crucial in a world of more open, global trading.

Canadian companies can be assessed to ensure they meet the international standards under NRC’s Calibration Laboratory Assessment Program (CLAS).

The Conference on Precision Electromagnetic Measurements, hosted in Ottawa by NRC from June 11 to the 14th, gathers international experts in physics and electrical engineering to further such fields of study as electrical standards, fundamental constants, time interval and frequency, lasers, cryoelectronics, and novel measurement techniques.

The National Research Council, Canada’s leading research and development agency, provides a comprehensive network of services, facilities, technology transfer programs, and collaborative research opportunities in support of Canadian industry. Drawing on the scientific and technical expertise of its multi-disciplinary laboratories across the country, NRC helps Canadian firms develop and maintain high standards of excellence and international competitiveness.

For more information: Roch Parisien, NRC, Information Services, (613) 993-4519.

**SEEN THIS SYMBOL?**

This mark has been adopted for tagging the calibrations of temperature measurements under the new 1990 temperature scale.

The NCSL Business Office has a supply of these ITS-90 stickers available. Contact Joan at 303-440-3339.
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This schedule is for guidance for anyone who needs to submit material for publication in the Newsletter. You can understand that in a purely voluntary function like this, the Newsletter must be secondary to my regular job. I try to stay on schedule, but there is zero backup, so if I must travel on company business or other, nothing gets done.

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